Result Guide

Content:

Disclaimer

Mean heart rate (HR)

Autonomic flexibility (rhythm): Heart rate variability (SDNN)

Autonomic vitality: Very low frequency (VLF)

Strain: Sympathetic activity: Low Frequency (LF)

Engagement: Mid Frequency (MF)

Recovery: Parasympathetic activity: High Frequency (HF)

Balance of the autonomic nervous system: Autonomic ratio (LF/HF)

Engagement Index (MF/HF)

Relaxation Index [HF/(HF+LF)]

Sympathetic & parasympathetic dominance & Engagement

The Effects of Resonant Frequency Training (RFT) on HRV

The Impact of Illness and Medication on HRV

Emotional Health Assessment (DASS-21)

Disclaimer

THE OUTLINED FACTORS (RESULTS) CAN BE SIGNIFICANTLY IMPROVED THROUGH LIFE STYLE CHANGES, EMOTIONAL MANAGEMENT EXERCISES, HEART RATE VARIABILITY TRAINING AND/OR OTHER THERAPEUTIC INTERVENTION.

This App is not a diagnostic tool. It is intended to supplement clinical decision making.

The purpose of this App is to provide information about your health potential and health risk.

This App should be supplemented by health-related information.

This App is not intended to replace the relationship you have with your various healthcare providers. No medical advice is given or implied. Survey results, scores, links to other sites and/or reading the content on this web site are not substitutes for visiting your doctor. We assume no responsibility for how you use the information provided by this App. Please contact a qualified health professional if you are concerned about your health. You should always notify a qualified health professional prior to starting any new treatment or with any questions you may have about your medical condition. This assessment is designed for clients age 18 years or older. It is not intended for children.

The results have been produced without any medical information. The autonomic data is best interpreted in the context of the medical history and any clinical diagnosis if such should exist.

Any interpretation of the autonomic data may have to be complemented by other health assessments that rule out other medical or psychological problems, such as anaemia, under- and over-function of the thyroid, mental health problems. Reports should be interpreted in the context of these basic health assessments.

It is advised to consult a health professional in the case of suspected physical or mental illness and report results that indicate a deviation from the healthy statistical norm to rule out any current underlying health problems.

Recommendations:
It may be important to rule out any significant health concerns. A standard blood screen, including FBC, PV, TFT, Ferritin, U&Es, Calcium, intracellular magnesium, suprarenal activity (DHEA, Cortisol) and Vitamin D3 may be indicated. Please discuss this with your health professional, if appropriate.

This App provides an advanced assessment of the autonomic nervous system. The interpretation of the results and the recommend interventions are based on international comparison data from clinical research and more than five years of clinical experience of the developer of the App.

Autonomic Data

❖ MEAN HEART RATE

Mean heart rate is the average heart rate over 5 minutes. (Scale: beats per minute)

Bradycardia: below 50 bpm
Normal HR: 60-90 bpm
Tachycardia: over 100 bpm

If heart rate is faster than 100 beats per minute (tachycardia)—

A faster than normal heart rate can have the following causes:

- Normal response to the exercise
- Acute emotional change (anxious, frightened, tense, angry)
- Stress and anxiety
- Hyperthyroid (over-function of the thyroid)
- Dehydration
- Anaemia
- Weakened general health
- Lack of sleep
- Effects of caffeine, alcohol, nicotine and other drugs
- ANS dysregulation
- Functional/anatomical heart problem

This list is not comprehensive and other organic causes may exist.

Please see your health professional without delay, if:

- ***you experience long-term tachycardia without heart rate deceleration.***
- ***you experience syncope, dizziness, chest pain, weight loss or headache.***

If heart rate is slower than 50 beats per minute (bradycardia)—

A slower than normal heart rate can have the following causes:

- Physically healthy individual who exercises hard and regularly
- Hypothyroid
- Hypothermia
- Functional/anatomical heart problem
- Drug side effect

This list is not comprehensive and other organic causes may exist.

Resting heart rate (Age: above 18)

Beats Per Minute: 50-55: Athlete; 55-60: Excellent; 60-65: Good; 65-70: Above average; 70-75: Average; 75-80: Below average; 80+: Poor.

Regular exercises can lower an abnormally high heart rate caused by lack of fitness.

Engagement training, Attentiveness Training and Relaxation Training can improve your heart rate, when practiced 1x or 2x daily over 6 weeks.

Autonomic flexibility (rhythm): Heart Rate variability (SDNN)

Reference range: (32-93ms^2 +)

SDNN measures the variation of the pace of the heart; the heart beat's rhythmic speeding up and slowing down. It reflects the overall autonomic activity on the heart and is a measure for the ***flexibility, adaptability and youthfulness of the body.*** It can therefore also indicate the ***capacity to draw on the body for peak performance.***

A **high SDNN** statistically indicates a good health potential and a reduced risk for illnesses and accidents. It can be an indicator for good vitality, flexibility, responsiveness and youthfulness of the body.

Under certain circumstances, autonomic exhaustion and/or dissociative states after trauma can also show **high SDNN**.

A **low SDNN** statistically indicates an increased risk to develop physical and/or mental illness or of suffering accidents. It can be an indicator for premature ageing, exhaustion, burnout, depression, negative (chronic) stress and withdrawal.

Unusually high or low SDNN can also be medication, drug and alcohol induced or the result of general health problems.

SDNN can be improved through a ***healthy life style*** (rhythm, sleep, breaks, diet, weight control, emotion regulation, stress reduction).

Engagement Training, Attentiveness Training and Relaxation Training can improve SDNN, when practiced 1x or 2x daily over 6 weeks.

SDNN Reference (age related)

Age 10s-40s:

50↑ High normal; **35-50:** Low-Mid normal; **20-35**: Low: **20↓:** Very Low

Age 50s-60s:

40↑: High normal; **30-40:** Mid-high normal; **20-30**: Low-mid normal; **15-20**: Low; **15↓:** Very Low

❖ Autonomic vitality: Very low frequency (VLF) 0-0.04 Hz [ms2]

No reference range available

Very low frequency is a band of the power spectrum of heart rate variability ranging between 0.0033 and 0.04 Hz. The very low frequency band VLF is calculated in milliseconds squared (ms^2). VLF is influenced by a large number of variables, including temperature, hormonal state and a strong parasympathetic influence, but is modulated by sympathetic activity.

Although all 24-hour clinical measures of HRV reflecting low HRV are linked with increased risk of adverse outcomes, the VLF band has stronger associations with all-cause mortality than LF and HF bands.

Low power of VLF has been shown to be associated with arrhythmic death and PTSD. Additionally, low power in this band has been associated with high chronic inflammation, which is a precursor for the development of degenerative diseases such as cancer and coronary heart disease.

Low VLF is also correlated with low levels of testosterone, while other biochemical markers, such as those mediated by the hypothalamic–pituitary–adrenal axis (e.g. cortisol) have not.

Longer time periods using a minimum of 10 minutes recording time (20 minutes is better) should be obtained to provide comprehensive assessment of VLF.

Circadian rhythms, core body temperature, metabolism, hormones and intrinsic rhythms generated by the heart all contribute to the very low frequency rhythm.

There are circadian fluctuations of VLF (as well as LF, MF and HF) in healthy individuals, which is why it is important for comparative assessments to measure VLF at the same of time of day.

Normal VLF power appears to indicate healthy function and increases in resting VLF power can reflect efferent sympathetic activity.

The modulation of the frequency of this rhythm resulting from physical activity, stress responses and other factors that increase efferent sympathetic activation can cause it to cross over into the lower region of the LF band during short-term recordings, when there is a significant emotional stressor. Mental stressors can reduce VLF for hours during recovery from mental stress (slow recovery). This may explain its otherwise unexplained role in cardio-vascular disease prevention.

Normal range for VLF: not available

❖ Strain: Sympathetic activity (LF)

Low frequency predominantly reflects sympathetic, but also to a much smaller extend, parasympathetic activity.

Sympathetic activity is responsible for mobilising and expending energy under pressure. It is usually increased during waking and reduced during sleep.

Strain (stress) can lead to sympathetic "fight and flight" response.

Normal sympathetic activity during day indicates that energy can be mobilised for high performance without straining the organism overly.

Too high sympathetic activity during waking or over 24h may indicates increased stress and strain.

Too low sympathetic activity may indicate a lack of engagement and energy, and can be the result of lack of sleep, lethargy, fatigue, autonomic exhaustion, burnout or dissociated states after trauma.

Unusually high or low sympathetic activity can also be ***medication, drug or alcohol induced*** or the result of general health problems.

The low frequency component LF can reflect both sympathetic (mainly) and parasympathetic (lesser) activity. Parasympathetic influences are particularly present when respiration rates are below 7 breaths per minute or when an individual takes a deep breath. So, it is important not to intentionally control breathing during the assessment. For more accurate analysis, natural breathing without any conscious respiratory manipulation is highly required.

A high power of LF can also be the result of engagement and flow state, as mid frequency (MF) is part of the low frequency (LF) spectrum (see MF below). It is therefore best to interpret LF in conjunction with the Engagement Ratio MF/LF:

High power of LF in conjunction with a low MF/LF Ratio indicates predominantly sympathetic activation (strain)

High power of LF with high MF/LF Ratio indicates engagement and flow.

To increase (too low) sympathetic activity (low frequency) we recommend practicing Attentiveness Training 1x daily for 6 weeks.

To reduce (too high) sympathetic activity we recommend practicing Relaxation Training daily for 6 weeks.

Engagement training can also lower the non-MF fraction of low frequency (see below) and increase the total of LF power.

Normal range LF: 193 – 1,009 ms^2

Engagement: Mid Frequency (MF)

Mid Frequency MF is part of the low frequency spectrum and lies in direct neighbourhood to the exclusively parasympathetic high frequency spectrum (HF).

Mid Frequency MF represents a combination of parasympathetic and sympathetic activity.

Power of Mid Frequency MF rises, when in a ***positive emotional state*** (positive excitement), for example when you experience joy, gratitude, empathy and passion.

It also increases when you are ready for and/or in a ***state of sustainable peak performance and engagement.***

High levels of mid frequency may be health and performance promoting.

Is it often reduced during stress, anxiety and depression; also, when over-engaged or withdrawn.

MF rises during and after Engagement Training and Attentiveness Training.

Normal range for MF: not available

Recovery: Parasympathetic activity (HF)

High frequency power HF represents parasympathetic (vagal) response.

Parasympathetic (vagal) activity is responsible for ***recovery.***

It is usually reduced during waking and during REM sleep in comparison with deep sleep. It is also is reduced, when under pressure (tension).

It is increased during deep sleep, relaxation, and after food intake (digesting), unless suffering with digestive problems, such as food allergies etc.

Normal to high parasympathetic activity is an indicator for a ***good capacity to recover***.

Normal to high parasympathetic activity ***reduces inflammation and generally protects health.***

Too low parasympathetic activity can be an indicator for

- negative stress, anxiety and worry
- poor recovery
- increased health risk
- increased chronic inflammation
- Premature ageing

Too high parasympathetic activity may indicate a number of issues:

- Day time sleepiness (for example when suffering with insomnia)
- A dissociated state after trauma, or an emergency programme as a result of autonomic exhaustion, (pre-) burnout.
- An autonomic state of "Freeze' or paralysis.

Unusually high or low parasympathetic activity can also be medication, drug and alcohol induced or the result of general health problems.

To increase (too low) parasympathetic activity (LF), we recommend practicing Relaxation training daily for 6 weeks.

To reduce (too high) parasympathetic activity (LF), we recommend practicing Engagement Training and/or Attentiveness Training daily for 6 weeks.

Normal range for HF: 82 - 3,630 ms^2

Balance of the autonomic nervous system: Autonomic ratio (LF/HF)

Normal range: 1.1-11.6

sympathetic dominance: >4.8

autonomic balance: 1.3-4.8

parasympathetic dominance: <1.3

The autonomic ratio (LF/HF) calculates the relationship between sympathetic (high frequency power – HF - strain) and parasympathetic activity (low frequencies power – LF - recovery) and is a measure for the balance of the autonomic nervous system.

An average autonomic ratio indicates an appropriately balanced autonomic nervous system in otherwise healthy individuals.

If the LF/HF ratio is between 1.3-4.8, it is clinically considered as balanced status.

Result Guide

A predominantly sympathetic activity (high autonomic ratio = >4.8) indicates strain or stress and an increased fight and flight response.

A predominantly parasympathetic activity (low autonomic ratio =<1.3) may indicate relaxation, or daytime fatigue, exhaustion, (pre-) burnout, depression, dissociated states after trauma (disengagement).

Unusually high or low autonomic ratio can also be ***medication, drug or alcohol induced*** or the ***result of general health problems***.

A high autonomic ratio LF/HF can also be the result of engagement and flow state, as mid frequency (MF) is part of the low frequency (LF) spectrum (see MF above). It is therefore best to interpret LF/HF in conjunction with the Engagement Index MF/LF.

A high autonomic ratio in conjunction with a low MF/LF ratio indicates predominantly sympathetic activation (strain).

A high autonomic ratio with high MF/LF ratio indicates engagement and flow.

The autonomic ratio is also best interpreted together with the sympathetic (LF) and parasympathetic (HF) activity (see above).

High LF/HF ratio with low MF/LF ratio: Acute stress response, anxiety, phobia, rage, panic, tension, agitation, hyper-arousal

High LF/HF ratio with low MF/LF ratio: Engagement, flow, positive emotional states (empathy, gratitude etc.)

Low LF/HF ratio: Slow mental speed, hypo-arousal, lethargy, chronic nervous breakdown, burnout, depression, post-traumatic withdrawal

High LF/HF: > 4.8 – predominantly sympathetic activity

Low LF/HF: <1.3 – predominantly parasympathetic activity

Middle LF/HF: 1.3-4.8 – balanced autonomic activity

LF/HF should only be used in healthy individuals to assess autonomic balance. LF/HF was found to be useless in determining the sympatico-vagal balance in patients with cardiac disease and seriously decreased overall HRV with significant sympathetic over-activity. In these subjects, LF/HF ratio is usually as low as that in healthy subjects with predominant vagal modulation.

In females, LF/HF is approximately one third (36%) lower than in males (relative higher parasympathetic activity in females compared to men).

Normal range for LF/HF: 1.1-11.6

Engagement Ratio (MF/LF)

Reference range: not available – experimental recommendation 0.3+

This ratio shows the relationship between mid-frequency (engagement) and low frequency (strain). MF may be predominantly vagal, whereby the non-MF part of LF is predominantly sympathetic. MF/LF is increased when a person experiences stimulating positive emotions such as enthusiasm, passion, empathy, compassion, appreciation or gratitude. It is also increased when one is actively engaged or in a sustained peak performance state (flow).

MF/LF increases, when practicing Engagement Training and/or performing an engaging activity with emotionally positive tone.

Normal range for MF/LF: n/a

Relaxation Ratio [HF/(HF+LF)]

Reference range: not available – experimental recommendation 0.3+

This ratio looks at the parasympathetic nervous system in relationship to the overall activity of the autonomic nervous system. During relaxation, this ratio should go up as HF increases and MF and LF decrease.

The Relaxation Index increases when practicing Relaxation Training.

Normal range for HF/(HF+LF): n/a

Result Guide

	SDNN	LF	MF/LF	HF	HF/LF
Sympathetic dominance	Low	**High**	Low	Low	**Low**
Engagement (Balance)	High	Medium	**High**	Medium	**Medium**
Parasympathetic dominance	High	Low	Low	**High**	**High**
Autonomic vitality	High	High	High	High	High
Autonomic depression	Low	Low	Low	Low	Low

Autonomic States

Sympathetic dominance:

- Strain & tension
- Fight or Flight
- Entrapment

Parasympathetic dominance

- Letting go, relaxation & recovery
- Freeze or Flop
- Withdrawal

Engagement

- Emotion regulation
- Balance between strain & recovery
- Sustainable peak performance
- Flow state

Autonomic depression

- Chronic stress
- Depression
- Exhaustion
- Chronic inflammation

Autonomic vitality

- Physical health
- Emotional health
- Peak performance

❖ The Effect of Engagement Training (ET)

Breathing at your resonant frequency increases the amplitude of MF power and therefore also the MF/LF ratio, and reduces VLF, LF-MF and HF during training. This can be tracked on the Adaptive Resilience App in real time when in RFT mode.

The long-term effects of ET can be monitored in the improvement and normalization of all HRV parameters: HR, SDNN, LF, HF and HF/LF ratio, as well as an increase of MF/LF ratio, which can be monitored through the Autonomic Health Assessment AHA.

This correlates with improved capacity to engage and/or let go, performance enhancement under pressure, improved emotion regulation and predisposition to more positive emotional states. There may be a reduction of negative stress, anxiety and low mood and anger.

❖ The Impact of physical and mental Illness and Medication on HRV

Illnesses, such as diabetes, cancer, hypo- or hyperthyroidism, heart failure, anxiety disorder and depression as well as medication, drugs, caffeine and alcohol, can influence heart rate variability. This means that under those conditions, normal reference ranges do not always apply.

HRV assessments can still be used to track the improvement or progression of health conditions, but only in the context of other diagnostic parameters and under the supervision of a health professional.

Irregular heart beat (arrhythmia) does not allow for reliable HRV measurements. With the exception of arrhythmia, heart rate variability assessments can be valuable to track the progress and positive impact of HRV training in patients who are chronically ill or on medication.

The autonomic ratio LF/HF should only be used in healthy individuals.

The Autonomic Health Assessment and the Expert View should preferably done immediately after getting up in the morning, or at least two hours after food intake, caffeine and nicotine. Alcohol should be avoided prior to the assessment.

Result Guide

❖ Emotional Health Assessment

The DASS-21 has been developed and published by Lovibond, S.H. & Lovibond, P.F. (1995). *Manual for the Depression Anxiety Stress Scales*. (2nd. Ed.) Sydney: Psychology Foundation.

This assessment highlights areas of risks or concerns and also allows you to monitor the progress you will make in time. It allows you to ***screen for possible emotional health problems, assess the intensity of these symptoms and compare them at different times***.

Everybody experiences some feelings/thoughts of depression, anxiety and stress to some degree, but if you are experiencing them frequently and strongly, then you should consider seeking professional help.

Automated interpretations can be misleading and potentially dangerous. The test is offered to highlight potential problems and also to audit progress and the efficacy of interventions on your emotional health. ***The automated DASS-21 should not be used to diagnose mental or emotional health problems. This can only be done by a qualified health professional.***

Should you score symptoms with moderate intensity and above, then interpretation of the DASS-21 should be carried out by individuals with appropriate training in psychological science, including emotion, psychopathology and assessment.

When the DASS-21 is administered to individuals who have sought professional help, or who are displaying high levels of distress, interpretation should be carried out by an appropriately qualified health professional such as a clinical psychologist or medical doctor.

The automated DASS-21 should not be used with children below the age of 14 years because it is likely that some children would not fully understand all of the terms used.

Should you suffer with symptoms of emotional and/or mental health problems, please consult with your health professional and/or therapist.

If the score of the test should show moderate or above intensity of symptoms for depression, anxiety and/or stress, then please consult with your health professional and/or therapist.

DASS	Normal	Mild	Moderate	Severe	Extremely severe
Depression	0-9	10-13	14-20	21-27	28+
Anxiety	0-7	8-9	10-14	15-19	20+
Stress	0-14	15-18	19-25	26-33	34+