Adaptive Resilience App (ARA)

User Manual

Disclaimer:

Should you suffer with a mental, emotional or physical health problem please always take advise from your health care professional and/or therapist. The app does not replace any professional advice or treatment, although it may assist you in improving your health, wellness and performance as part of an integrated therapeutic approach.

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I. What do you gain from using the App?

This app provides a comprehensive assessment and training system that helps you to improve your physical and emotional health and wellbeing and to enhance your performance and productivity, even under pressure.
It is based on cutting edge research into the physiology of stress and resilience.
The app will provide you with the following functionalities:

- Wellness & Performance Assessment (WPA)
- Resonant Frequency Assessment (RFA)
- Resonant Frequency Training (RFT)
- Relaxation Training (RT)
- History & Data Access (HDA)

I. Wellness & Performance Assessment (WPA)

This weekly wellness and performance assessment is based on measurement and computing of heart rate variability.
This will tell you about the relationship between ***strain*** (low frequencies - LF), ***capacity to recover*** (high frequency - HF) and potential for ***engagement and sustainable peak performance*** (Middle Frequency - MF). It will allow you to assess your base line before the start of the training and then to monitor the impact your training has on wellness, health risk, health potential and performance. All data can be stored on your device or in the cloud and can also be exported on a spreadsheet for your own use or to share with your coach, trainer or health professional.
Note: The Wellness & Performance Assessment is only available on the full version of the app.

II. Resonant Frequency Assessment (RFA)

Everybody has an individual breathing rhythm (pace) at which training of emotional and physical health, wellbeing and peak performance (engagement) happens at an optimal level. This individual rhythm can change over time and with ongoing training.
This individual pace of breath, which lies between 4.5 and 6.5 breathing cycles per minute, will be assessed by measuring the impact that pacing your breath at these different rhythms has on your physiology. ***When your optimal rhythm has been identified then the audio- visual breath pacer during Resonant Frequency Training will automatically default to this identified rhythm for 20 training sessions.***

After every 20 training sessions, you will be prompted to repeat the **Resonant Frequency Assessment**, to optimize the effect of the next 20 training sessions.
Note: It is possible to override this function and reassess your resonant frequency at any time by ticking the Resonant Frequency Assessment box in the menu.

III. Resonant Frequency Training (RFT)

The Resonant Frequency Training trains a physiological state that underlies sustainable peak performance, flow and engagement even under pressure.
In scientific studies, when performed for 2x 10 minutes every day over a period of six weeks, resonant frequency training has shown to significantly reduce negative stress, depression and anxiety and to improve performance.
Resonant Frequency Training optimizes most parameters of heart rate variability by creating a better balance between sympathetic (fight and flight or strain) and parasympathetic activity (freeze and flop or recovery).
A unique feature of this RFT is, that it trains the MF (middle frequency band) of heart rate variability, which is also increased during experiencing positive feelings (such as enthusiasm, passion, gratitude and appreciation) as well as during engagement and sustainable peak performance.
Daily training of this range of heart rate variability by breathing slowly and diaphragmatically at your individual resonant frequency (between 4.5 and 6.5 breath per minute) has the following benefits:

- greater adaptability and flexibility of your body, when responding to inner or outer demands
- improved emotional regulation (reduction of the negative impact of stress, anxiety, anger, fear, and low mood) under normal circumstances or under pressure
- boosting confidence to handle problems
- accessing resourcefulness for problem solving
- improved judgement and decision making in challenging circumstances
- improved physical and emotional health
- ease of access of physiological activity that supports sustainable high performance and flow
- improved concentration and focus
- improved social skills

- optimising blood pressure
- improved peripheral blood circulation
- increased resilience

III. Relaxation Training (RT)

The relaxation training helps to reduce tension and to let go of strain. It improves the capacity to wind down after physical and/or emotional strain, and constant performance and aids recovery.
During the relaxation training we recommend that you do not do anything else other than sitting or even better lying down in a quiet place and listening to the audio tracks (Soundscape 1 & 2).
Soundscape 1 & 2 have embedded brainwave entrainment technology that uses bilateral sound, binaural beats, and isochronic tones to stimulate fast brain activity (High Gamma waves), mid- range brain activity (Sensorimotor rhythm) and slow brain activity (mid and low Delta waves).
This pattern allows to achieve a deeply relaxed, but focused state of mind, which facilitates recuperation and regeneration.
The effect can further be enhanced by initially slowing and deepening the breathing or prolonging the exhalation, although these means are not necessary to achieve the desired relaxation effect.
This brain wave entrainment technology is best applied, before going to sleep or when requiring the ability to relax and let go of your memories, thoughts and emotions.
The (panning) bilateral drum sound can be consciously followed to enhance the ability to let go of distressing emotions.
The sound tracks can also be used as a background to enhance mental training exercises, such as mindfulness meditation, review and emotional processing techniques and mental rehearsing.
Bilateral sound has also been used in stress management and trauma therapy (such as Eye Movement Desensitising & Reprocessing).
We recommend to listen to one of the sound tracks every day for about 6 weeks, as the effect is cumulative, brain & body become more responsive to this type of audio training day by day. After a few minutes no further breathing exercise is required to sustain or deepen relaxation.

Known benefits of Relaxation training are:

- Slowing your heart rate
- Lowering blood pressure
- Slowing your breathing rate
- Reducing activity of stress hormones (Cortisol)

- Increasing blood flow to major muscles
- Reducing muscle tension and chronic pain
- Improving concentration and mood
- Lowering fatigue
- Reducing anger and frustration

We also have used the RFT and RT training whilst processing unpleasant past experiences and rehearsing upcoming potentially challenging events, to reduce the impact of negative emotions associated with past negative experiences and to build confidence when facing future challenges.
We also provide Resilience & Stress Management training workshops which have integrated this technology. For more information visit our website www.adaptive-resilience.co.uk

CAUTION:

Do not use the app whist driving or operating machines, or whilst doing any activity that requires your full alertness and attention.

Do not use the app whilst under the influence of alcohol and/or mind altering drugs.

Do not use the Soundscape tracks if you suffer with uncontrolled epilepsy.

Do not use the sound tracks (Soundscape or breath pacing tracks) without permission and/or guidance of your health professional or therapist if you suffer with mental health problems, have experienced major traumas or suffer with post-traumatic stress disorder.

DISCLAIMER:

Although in many cases complementary, the Wellness & Performance Assessment (WPA), Resonant Frequency Training (RFT) and Relaxation Training (RT) do not replace the diagnosis, advice or intervention from your health care professional, therapist and/or health and performance coach.

Should you suspect that you suffer from a physical, emotional or mental health problem, or should any of the autonomic data show to be outside the recommended range, please see your health care professional or therapist for advice.

II. How do I set up the app?

Note: The app and associated files require **XXXMb of storage on your device.

I. Downloading the Adaptive Resilience App

For Android devices

1. Go to Google Play Store.
2. Search for and locate the "Resilience App"
3. Press the INSTALL button to download the app

For iOS devices

1. go to App Store.
2. Search for and locate the "Resilience App"
3. Press the **INSTALL** button to download the app

Note: We recommend the app is kept updated; this can be achieved by enabling automatic updates in your device's application download settings (Play Store and App Store).

II. Entering personal information

Open the app to reveal the Adaptive Resilience main menu with the 5 option boxes, RUN, E-SHOP, INFO, USER MANUAL and HISTORY.

N.B. The first time you select this option after installing/updating the app will trigger the downloading of the 2 music files used in Relaxation Training – these files are large – we recommend downloading when connected to the internet via WLAN.

Press the RUN option box to reveal the personal information input page.

Input:

1. Your name or nickname – this can be any given or nickname you desire.
2. Your Email – this needs to be a current active account
3. Age – in whole number of years
4. Gender – Male/Female/Others

5. Press the OK box to reveal the RUN page – this will initially appear every time you click RUN after set up

N.B. You will receive a welcome email which contains your unique cloud ID – keep this information in a safe place.

III. Sensor choice

Press RUN option from main menu – you will now see text in red showing "Looking for Bluetooth device"
The "Device" option has the default sensor "BLE StressLocator".
Pressing the Device option reveals the Selected option at the top plus the various sensor options thus:

"BTLE device (Polar H7, etc)" – ECG chest band
"Without sensor" – for test purposes only
"StressLocator" – older high energy finger oximeter
"BLE StressLocator" – current low energy oximeter [default]

IV. Communication with the sensor

Turn on the Bluetooth option on your device. If using the BLE StressLocator sensor, Bluetooth pairing is not required on an Android device**. Some BLE sensors will prompt you to enter in the ID of the sensor displayed on the rear. ***
If using a sensor other than BLE StressLocator, Bluetooth pairing instructions are as follows:
Exit from the Adaptive Resilience app and locate the Bluetooth settings on your device.
Turn on the Bluetooth function and search for available devices.
Turn on the sensor and check available devices list – you will see, amongst others, your sensor ID appear.
Press your sensor ID option and follow instructions to pair.
Note: To pair you may have to make your device 'visible'.

III. How do I use the different RUN functionalities?

1. Current User

This page allows the editing and choice of users for the app.

2. Device

This page allows the choice of preset heart rate monitors .

3. Wellness & Performance Assessment (WPA)

We recommend to perform a WPA before starting either of the two trainings (RFT and/or RT) to create a baseline assessment and to allow for monitoring the impact the training(s) have on your health, wellness and capacity to perform over time.

The assessment is performed over a period of 5, 10 or 20 minutes, over which your heart rate variability will be measured and analysed.

For tracking the impact of your training or other interventions on your health, wellness and performance, we recommend measurements of 5 or 10 minutes.

Note: For the most accurate (and comprehensive) health and wellness assessment we recommend measurements of 20 minutes, which can also be performed with a polar chest belt (for accuracy).

The result will give you information about

- your current health risk and health potential (SDNN, VLF, LF and HF)
- the flexibility and adaptability of your body (SDNN)
- your capacity to recover (HF)
- the overall strain on your body (LF)
- the relationship between strain and recovery (LF/HF)

- your ability to engage and achieve states of contentment and sustainable peak performance (MF)

For more detailed information, please refer to the section in this manual ('Detailed Instructions').

You will be able to export the results of your Wellness & Performance Assessment as a csv file that can be imported into an Excel style spreadsheet to keep track of your health improvement or training progress and you will be able to share this information with your coach or therapist. The information will also be uploaded and stored in the cloud and can be accessed by you. *

We recommend to perform the Wellness & Performance Assessment once a week, at the same time of the day, under the same conditions, sitting comfortably, preferably in the morning after getting up, to get an accurate result. We advise to do the assessment before food and drink consumption.

**** Note: The data may be used for product improvement and will be kept anonymous in compliance with the European data protection guidelines.***

The WPA is available in the full version of the app.

Here is what you need to do:

CAUTIONS FOR ACCURATE MEASUREMENT & ANALYSIS

Environmental requirement
Try to keep the measurement time the same when comparing different measurements, since the HRV is known to have circadian rhythm due to changing of ANS balance over 24 hours.
Preferably the assessment should be done **in the morning immediately after waking and before food and drink.**

The appropriate environment:
Avoid too bright light or noise
Maintain comfortable room temperature

Before the measurement:
Avoid caffeine, smoking at least 2 hours before the measurement
Avoid the measurement for 2 hours after meals
Allow time to adjust to the environment and rest a few minutes prior to measurement.
Remove nail varnish from the measurement finger before measuring with the finger sensor.

During the measurement
Maintain comfortable sitting position
Don’t move or talk
Don’t close the eyes or fall asleep
Respiration: Breathe normally. Do not control the breathing intentionally
Do not watch TV, listen to the radio or read

INSTRUCTIONS:

Steps:

Open the app

On the main menu chose ‘RUN’

Switch on the sensor and check for auto- connection with the app

Attach the sensor to body (finger clip, ear clip or belt)

Chose ‘Wellness & Performance Assessment’

Set the duration of the assessment in ‘Time Length’ to 5, 10 or 20 minutes. To track the impact of your training on wellness, health & performance chose 5 or 10 minutes. For a more accurate assessment we recommend a duration of 20 minutes.

Sit in a comfortable chair for the full length of the assessment

Whilst the WPA is running, do not stand, lie, get up or walk! Try to avoid moving, especially the sensor!

Press the play button in the lower right hand corner (white arrow on blue background indicates readiness)

Read the instructions on the next screed then press ‘START’.

You will see a moving green graph with a blue dot on top as well as count down timer, which indicates the remaining duration of the assessment.

The data screen appearing at the end of the assessment shows your results.

By pressing the information icons (i) you will be able to see a brief explanation of the data, and it will also show the normal reference range.

To share the assessment results you can send a screen shot to yourself or others by email or via different media. Please press ‘Share’ and you will be able to select one of the displayed ‘Send Options’. The screen shot will be sent as .png picture file.

If you would like to access the data of your last and of your previous assessments, go to ‘History’ in the main menu and then select ‘Wellness & Performance Assessment’. You will now see all your autonomic data of previous measurement in a scrollable table.

You can export all data by pressing the ‘Export’ button on the top left hand corner. Select a ‘Send option’.

The exported data file is in .csv format and needs to be suitably imported into Excel style programme to view the table correctly.

FURTHER INSTRUCTIONS:

How to view and understand your results?
The results will be displayed on the ***Wellness and Performance Assessment Screen*** after every assessment.
To assist you in understanding the results, an information box will be displayed when you touch the (i) icon.
In this information box a description of the autonomic data is given and normal reference values will be displayed where available.
Please discuss any abnormal values with your health care professional as they can but do not have to indicate an underlying health problem (e.g. thyroid problems, diabetes, etc.)
For more information, please also refer to the specific section in the Manual.

How to track your progress?
Open the ***Comparison Data Screen.***
You will now see columns with autonomic data allocated to the date and time of the assessments. This will allow you to track any trend and improvement.
An information box is displayed when you touch the (i) icon in the first column to provide you with information about the autonomic data in question.
You can also track the effectiveness during RFT and RT, by comparing the scores at different training sessions.
For more information, please also refer to the specific section in the Manual.

4. Resonant Frequency
a. Assessment (RFA)

Every individual has a particular breathing rhythm, at which heart rate variability measures are being optimized and at which you can effectively train your emotional and physical health and performance.

This breathing rhythm is called Resonant Frequency. When we breathe with our individual resonant frequency, which is between 4.5 and 6.5 breathing cycles per minute, our heart rate variability, the rhythmically changing interval between heart beats will be optimized. The Resonant Frequency assessment measures this individual rhythm initially before and after every 10 resonant frequency training sessions (see below) and makes the training default to this identified optimal rhythm.

This is achieved by measuring your heart rate variability whilst your breath is being paced at different speeds of 4.5, 5.0, 5.5, 6.0, 6.5 breath per minute over 3 minutes each. **The whole assessment therefore takes 15 minutes**.

Breathing with the individual resonant frequency creates a maximum amplitude of heart rate variability in the medium frequency range (0.08 – 0.15Hz).

After having assessed the optimal training frequency for the audio or visual breath pacing, the Resonant Frequency Training will automatically default for 10 training sessions to the assesses optimal pace, and will the re-assess this frequency for further 10 training sessions.

Instructions:

Sit in a quiet and comfortable space, and avoid distraction or disturbance
Connect your earphones or head phones to your smart phone
Enable the Bluetooth function
Switch on the oximeter
Pair the oximeter with the app
Put on the ear or head phones
Make sure that the right speaker is over or in the right ear and the left speaker is over or in the left ear
Open the main menu of the app
Press Resonant Frequency Assessment (RFA)
Press the Blue Arrow at the Bottom to start the assessment
You will now hear the lower tone 'C' in the right ear, and the higher tone 'G' in your left ear.
When you her the lower tone 'C' in the right ear – INHALE
When you hear the higher tone 'G' in the left ear – EXHALE
Inhale smoothly and gently through your nose, filling your lungs from the diaphragm upwards to approximately 75% with air.
Exhale smoothly and gently through your nose, starting the exhalation with your diaphragm.
Continue with this process for 15 minutes.
The pace of breathing will change 5x and every 3 minutes.
At the end of the assessment (RFA) your resonant frequency will be displayed and when you start your Resonant Frequency Training it will automatically default to the assessed pace for the next 10 training sessions.
After 10 training sessions you will prompted to repeat the assessment.
Should you have been disturbed during the assessment please repeat it at a later time.
Do only repeat a successful RFA before you are prompted to do so (after 10 training sessions), unless you have a good reason to do so.

Trouble Shooting:

The arrow at the bottom of the RFA page is white and not blue

Please check whether your Oximeter is switched on, the batteries are charged, and whether the oximeter is properly paired and connected.

You lose focus during your 15-minute assessment and do not always accurately follow the breath pacing.

Do not worry, with increasing practice you find that you can follow the breath pacing more precisely. The measured values will be still accurate enough to get you started. You may also want to repeat the assessment earlier (before 10 training sessions have been completed).

4. Resonant Frequency

b. Training (RFT)

Maximum beneficial effect from RFT is gained from twice daily training sessions of 10 minutes of diaphragmatic breathing at your individual resonant frequency over a period of six weeks. To sustain the impact of the training after six weeks, fewer training sessions (approximately 1x – 3x a week) will allow you to maintain your progress.

You may also ad hoc use the training to improve your performance or to wind down before and after challenging events and tasks.

The training is conducted by audio breath pacing (tones) and/or visual (bulls eye). The audio breath pacing is particularly effective as it helps to instantly let go of distressing experiences and to develop an internal focus.

Resonant frequency training promotes a balance between stimulation and relaxation, having an energising and alerting effect when feeling tired and a calming effect when feeling agitated or overstimulated.

It also balances and makes more rhythmical the functioning of the autonomic nervous system, mediating between ‘fight and flight’ and ‘freeze and flop’ response, between ‘strain’ and ‘recovery’.

On a physiological level, it supports the development of sustainable peak performance, good judgement and decision making under pressure.

Instructions:

Sit in a quiet and comfortable space, and avoid distraction or disturbance

Connect your earphones or head phones to your device

Ensure head phones and ear phones are placed on their respective ears (left & right)

Switch on the oximeter

Open the app

Chose “RUN” from the main menu

Press ‘Resonant Frequency’

The next page will appear when a Resonant Frequency Assessment is required, which is initially and after very 20 training sessions

If you want to rerun the Resonant Frequency Assessment, tick the box on Resonant Frequency Assessment option

Press the Blue Arrow at the Bottom to start the assessment

An instruction page will open and after reading it, and press start on the lower right hand corner

The next page opens and will show the following components:

A countdown timer (this will 5x countdown from 180 to 0 – the whole assessment session takes 15 minutes)

The plethysmogram (moving green graph with blue dots on the top) – this is an indication that your oximeter reads the pulse signal properly

The HRV power spectral density graph shows the relationship between activity in and outside the resonant frequency spectrum – we aim for maximum values within the resonant frequency spectrum (gold)

The ANS balance shows the ratio between sympathetic and parasympathetic activity

The bulls eye can be used as a breath pacer: contraction of yellow circle for inhalation and expansion for exhalation

SpO_2 – indicates the oxygenation level of your blood in percent
Heart Rate – in beats per minute
SDNN – Standard deviation of NN intervals indicates a measure heart rate variability (time domain)
Engagement Index (EI) – describes the ratio between Resonant Frequency and total power in percent – in training we aim for 100%
You will also hear two sounds: the lower tone 'C' in the right ear, and the higher tone 'G' in your left ear.

When you hear the lower tone 'C' in the right ear – INHALE

When you hear the higher tone 'G' in the left ear – EXHALE

Inhale smoothly and gently through your nose, filling your lungs from the diaphragm upwards to approximately 75% with air.

Exhale smoothly and gently through your nose, starting the exhalation with your diaphragm.

During the assessment, your breath will be paced with 5 different paces to assess the optimal pace for training. Some of the paces may feel slightly uncomfortable.

After the 15-minute assessment, a page will come up and show you your optimal breathing pace (your personal resonant frequency at this time).

The actual Resonant Frequency Training will from now on default your pace for the next 20 sessions.

If you would like to override this default and have your resonant frequency assessed earlier then tick the box 'Resonant Frequency Assessment' in the resonant frequency menu.

Trouble Shooting:

The arrow at the bottom of the RFA page is white and not blue

Please check whether your Oximeter is switched on, the batteries are charged, and whether the oximeter is properly paired and connected.

I lose focus during your 15-minute assessment and do not always accurately follow the breath pacing.

Do not worry, with increasing pract

ice you find that you can follow the breath pacing more precisely. The training (RFT) will be still effective, even if you initially only listen to the breath pacer and as you continue with the training, you will be able to follow the breath pacing for extended periods of time.

I get dizzy whilst practicing the Resonant Frequency training

If you get dizzy, this is usually because you hyperventilate, which is an undesirable effect. Please stop the deep and slow breathing and normalize your breath instantly. When you have returned to your normal self, restart the training, but breathe less deeply by filling your lungs with less air during the paced breath cycle.

During my training I experience some discomfort in the region of my heart or some mild palpitations

This is usually temporary and of no major concern, and will stop soon, but if it should persist then you may have to stop and/or take advise from your health professional.

[Palpitations or irregular heart beat combined with dizziness, chest pain or shortness of breath is a medical emergency and requires immediate attention. This condition can develop entirely independent of the training.]

5. Relaxation Training (RT)

Maximum beneficial effect from RFT is gained from once daily training sessions of 20 minutes over a period of six weeks. To sustain the impact of the training after six weeks, fewer training sessions (approximately 1x – 3x a week) will allow you to maintain your progress.

You may also ad hoc use the training to improve your performance or to wind down before and after challenging events and tasks.

The training is conducted by listening to audio soundscapes [choice of 2]. The audio tracks both include binaural ticking and combination low frequency beating which aids relaxation.

Instructions:

Sit in a quiet and comfortable space, and avoid distraction or disturbance

Connect your earphones or headphones to your device

Ensure ear/headphones are placed on their respective ears (left & right)

Switch on the oximeter

Open the app

Chose “RUN” from the main menu

Press ‘Relaxation Training’ and the Relaxation Training page will appear.

Choose the duration you require from the Time length.

Choose the Soundscape you require from the MP3 List.

Press the Blue Arrow at the Bottom to start the assessment

An instruction page will open and after reading it, and press start on the lower right hand corner

The next page opens and will show the following components:

A countdown timer (this will 5x countdown from 1200/600/300 seconds to 0 dependent on Time length)

The plethysmogram (moving green graph with blue dots on the top) – this is an indication that your oximeter reads the pulse signal properly

The HRV power spectral density graph shows the relationship between activity in and outside the resonant frequency spectrum – red denotes sympathetic response and blue denotes parasympathetic response)

The ANS balance shows the ratio between sympathetic and parasympathetic activity

SpO_2 – indicates the oxygenation level of your blood in percent.

Heart Rate – in beats per minute.

SDNN – Standard deviation of Node to Node intervals indicates a measure heart rate variability (time domain).

Relaxation Index (RI) – describes the relationship between sympathetic and parasympathetic responses in percent – we aim for 100%

You will hear a soundscape with blended audio tracks, music, tones and ticks.

Inhale smoothly and gently through your nose, filling your lungs from the diaphragm upwards to approximately 75% with air at your own pace.

Exhale smoothly and gently through your nose, starting the exhalation with your diaphragm.

6. DASS Assessment.

This assessment is to be filled in **********. Please choose your responses to the 21 questions as honestly as possible.
There is a bargraph display of the results at the end of the questionnaire.

7. Application Settings – End of process notification

You have the choice of an audible gong sound when any of the processes have ended.

8. Expert Settings – Send report

This option allows the sending of a report of the previous run to the app developer. If you encounter a problem with the app, please use this function to send a report.

Common functionality

The Wellness & Performance Assessment, Resonant Frequency [Assessment and Training] and Relaxation Training programs all have email reminder functions to prompt when the next session is due and consists of:

Schedule date
Schedule time
How frequently
Time period before schedule time
Reminder active [turn on]

The email will come from the address inputted into the current user information page.

Detailed Information

I. Autonomic Wellness & Performance Assessment

VALUE OF HRV ANALYSIS

- To assess health risk and health potential
- To find out the early signs of development of pathological processes or the presence of a functional disorder
- To assess the level of physical fitness and stress coping ability
- To evaluate effectiveness of training and life style changes
- To monitor the effect of Resonant Frequency training and relaxation training
- To measure the physiology of emotional balance
- To measure the physiology of sustainable peak performance and flow states

The information that you will receive from the autonomic assessment regarding your current state of health and your capacity to perform well and recover from strain should either only be interpreted as part of a comprehensive health assessment with your health professional or health coach. Or used to track the positive impact that your Resonant Frequency training and your Relaxation Training have on your organism.
For this purpose, we have made available the possibility to export your data as a spreadsheet to share your results with your physician, psychologist or coach.
The use of HRV in the context of this app only serves as an indicator that life style changes may be required in order to reduce your health risk and you increase your health potential, or to track improvement of your emotional and physical health.
Although we have based the norm ranges for the autonomic data on published recommendations[i] there are still great variations in terms of what is considered as normal. The ranges that have been informed from different sized studies sample a population of different sex, age, physical fitness, and socio-cultural background, such as living in a city or a rural environment, and with individuals with different professional engagement, and home environments.
The norm values for the autonomic data, that we have provided, cannot be used in order to diagnose any health problems; but it may serve as a 'red

flag'.

Should your assessment show abnormal values, please first and foremost take advise from your health professional, who may request a number of test, as an impaired HRV can be indicator of manifest or developing ill health.

After underlying health conditions have been ruled out and other health risks have been established and addressed, you may consider improving your HRV through HRV training, emotional management and life style changes, such as sleep hygiene, proper rest, enjoyable activities, moderate and rhythmic physical exercises, healthy and balance diet and emotional management.

For MF a 'normal range' cannot yet be provided. MF is part of LF. We single this range out, as its values increase during resonant frequency training (FRT) and long term as a result of RFT outside training events. MF is a reflection of inner engagement, emotional states (e.g. decreasing with 'negative emotions' such as anxiety, fear and anger and frustration and increasing with positive feelings, such as empathy, compassion, gratitude and enthusiasm. As RFT is meant to increase the capacity to engage, enhance performance and good judgement and decision making under duress, and enhance positive emotional response even n challenging circumstances, tracking the values of MF or PPI may allow to monitor the efficacy of the RFT. Further studies about the relationship of MF values in short assessments (5 min / 25 min) and 24h Holter assessments in relationship to health, performance and productivity will be required.

Finally, although there is a high correlation between short measurements and 24 hour assessments, a 24-hour assessment will give you a better inside into your autonomic health, as it can discriminate between waking and sleep data and it is also possible to match autonomic activity with all significant activities during the day. At London Integrated Health we provide these assessments for individuals and corporate environments. The results will be interpreted individually by or under supervision of trained health care professionals.

www.adaptive-resilience.co.uk
www.londonintegratedhealth.co.uk

The Autonomic Wellness & Performance Assessment analyzes the "Heart Rate Variability" (HRV), which gives significant information on Autonomic Nervous System (ANS)'s regulating function and balance status.
HRV is a highly correlative predictor and indicator for health, all course mortality and performance.
Training HRV Resonant Frequency Training (RFT) and Relaxation Training (RT) has shown to improve emotional and physical health and performance.
HRV measures the intensity, balance and the rhythm of sympathetic (strain - fight and flight) and parasympathetic (recovery – 'tend and befriend') activity.
The change (variation) of heart rate during short term measurement (5 - 25 minutes) is analyzed with the method of time domain and frequency domain to provide the degree of balance and activity of autonomic nervous system.

Factors that influence Heart Rate Variability

Heart rate variability declines with age, poor mental, emotional and physical health, and when experiencing tension, agitation, anxiety, anger and low mood.
Heart rate variability worsens as a result of sleep deprivation, smoking, sedentary life style and alcohol abuse.
Heart rate variability improves with moderate and preferably rhythmic exercise, emotional management, rhythmic life style, and HRV training.

Autonomic Data and Normal Range

All HRV parameters are calculated on 'normal-to-normal' (NN) inter-beat intervals (or NN intervals) caused by normal heart contractions paced by the sinus node (pacemaker of the heart). It reflects the rhythmic influence of the autonomic nervous system (sympathetic – speeding up; parasympathetic – slowing down) on the heart.
Clinical standards for long term (24h) and short term measurements (5-25min) have bene set out by the Taskforce publication on heart rate variability[ii]. Since its publication in 1996, numerus studies have been conducted, and meta-analysis of the study results that have contributed towards refining norm data.[iii]

I. MEAN HEART RATE HRT (Beats per minute)

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

Bradycardia: Below 50 bpm **Normal HRT:** 60-90 bpm **Tachycardia:** Over 100 bpm

Tachycardia: If the HRT is faster than 100 beats per minute.

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
- Anemia
- Weakened general health
- Lack of sleep
- Effects of caffeine, alcohol, nicotine and other drugs
- ANS dysregulation
- Functional/anatomical heart problem

Please see your health professional without delay, if

- **there's long term tachycardia without heart rate deceleration**
- **experiencing syncope, dizziness, chest pain, weight loss or headache**

Bradycardia: If the HRT is slower than 50 beats per minute.

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

- Physically healthy individual who exercise hard and regularly
- Hypothyroid
- Hypothermia
- Functional/anatomical heart problem (Heart failure/Heart arrest)
- Drug side effect

II. SDNN (MS)

SDNN is the most representative parameter of HRV. Sometimes the term 'HRV' in medical papers indicates 'SDNN' among many parameters of HRV analysis. Thus low SDNN is low HRV, which primarily indicates reduction in dynamic complexity.
"Healthy individual has more irregular and complex HRV signal." Decrease in HRV has received increasing attention as a prognostic indicator of risk associated with a variety of chronic diseases, behavioral disorders, mortality and aging.[iv]

Normal range for SDNN: 32 –

A low SDNN may have the following causes:

- Weakened ANS's ability to keep homeostasis against to internal/external environmental challenges
- Lowered coping ability to various emotional/physical stressors
- General weakness of health

A high SDNN may have the following causes:

- Good health, adaptability and resilience
- 'Emergency energy saving' due to exhaustion (fatigue, burnout)
- Withdrawal (disassociation) after trauma or in some form of depression

III. Total Power (TP) 0-0.4HZ

Total Power is a short-term estimate of the total power of power spectral density in the range of frequencies between 0 and .4 Hz. This measure reflects overall autonomic activity where sympathetic activity is a primary contributor. Total Power is calculated in milliseconds squared (ms2).
TOTAL POWER is the sum of all activity, such as ULF, VLF, LF, and HF and reflects the effect of the total activity of the autonomic nervous system on the

heart. As total power is high in childhood and declines with age, it is one of the measures that can assess biological (as opposed to chronological) age and vitality.
Generally, decrease in TP is observed in individuals under chronic stress, with disease, premature ageing or under the influence of medication, chronic alcohol and drug misuse.
The clinical meaning of TP in frequency domain is similar with that of SNDD in time domain.

Age	Total Power	Normal TP
10s	Age dependent also. TP below 1,000 can be considered as decreased (weakened) TP.	2,000↑
20s		
30s		1,500↑
40s		
50s		1,000↑
60s		

IV. Very Low Frequency (VLF) 0-0.04 HZ

Very Low Frequency is a band of power spectrum ranging between 0.0033 and 0.04 Hz. Very Low Frequency band is calculated in milliseconds squared (ms2).
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.[v vi vii].
Low VLF power has been shown to be associated with arrhythmic death[viii] and PTSD.[ix] Additionally, low power in this band has been associated with high chronic inflammation,[x], [xi] which is a precursor for the development of degenerative diseases, such as cancer, coronary heart disease and cancer. Low VLP has 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.[xii] Longer time periods using a minimum of 20 minutes recording time should be obtained to provide comprehensive assessment of VLF, although 5 min measurements have also significant predicting power.[xiii]
Long-term thermoregulation, the renin-angiotensin system and other hormonal factors as well as parasympathetic activity appears to contribute to this band. The amplitude and frequency of this rhythm is modulated by efferent sympathetic activity [xiv xv]
The VLF rhythm appears to be produced by the heart itself and is an intrinsic rhythm that appears to be fundamental to health and wellbeing.[xvi xvii]
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 [xviii] [xix], that's why it is important for comparative assessments to measure at the same of time of the 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,[xx] 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. [xxi]

Normal range for VLF: not available
High correlation between VLF and TP and SDNN (approx. 80%)

V. Low Frequency (LF)

Low Frequency is a band of power spectrum range between 0.04 and 0.15 Hz. This measure reflects both sympathetic and para-sympathetic activity. Generally, it is a strong indicator of sympathetic activity.
Parasympathetic influence is represented by LF when respiration rate is lower than 7 breaths per minute or during taking a deep breath. Thus, when subject is in the state of relaxation with a slow and even breathing, the LF values can be very high indicating increased parasympathetic activity rather than increase of sympathetic regulation. Low Frequency band is calculated in milliseconds squared (ms2).
The low frequency component can reflect both sympathetic and parasympathetic 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's important to educate patient before the measurement not to intentionally control his breathing.
For more accurate analysis, natural breathing without any conscious respiratory manipulation is highly required.
LF is highly associated with the SNS's activity which enables the energy supply and loss of energy can be predicted through lowered LF with fatigue.
Also in patients who display exaggerated sympathetic activity, as occurs in patients with migraines, LF fluctuations are much stronger that in healthy subjects and can be reduced by propranolol, clearly demonstrating the beta-sympathetic mediation in this band.

Normal range LF: 193 – 1,009ms2

VI. Medium Frequency (MF) or Resonant Frequency (RF)

Medium Frequency is a band of power spectrum ranging between 0.8 and 0.15Hz. It measures sympathetic and parasympathetic activity. Medium Frequency is increased, when a person experiences stimulating positive emotions, such as enthusiasm, passion, empathy, compassion, appreciation or gratitude. It is also increased when being actively engaged, in a sustained peak performance state (flow).

Normal range for MF: not available

VII. High Frequency (HF)

High Frequency is a band of power spectrum ranging between 0.15 and 0.4 Hz. This measure reflects parasympathetic (vagal) activity. HF is also known as a 'respiratory' band because it is caused by respiration [this phenomenon is known as respiratory sinus arrhythmia (RSA)]. Heart rate is increased during inhalation and dropped during exhalation. High Frequency band is calculated in milliseconds squared (ms2).

Reduced PNS (and HF) activity has been found in patients under stress or suffering from panic, anxiety or worry. Lowered PNS (and HF) activity is also believed to account for much of the reduced HRV in aging.

Generally increased in HF accompanies the increase in HRV.

In patients who suffer with burnout, post-traumatic stress, disassociate disorders and some forms of depression, PNS (and HF) can be unexpectedly high. For these patients the Resonant Frequency Training (RFT) is more indicated then the Relaxation Training (RT), as it trains Engagement rather than Relaxation.

Normal range for HF: 82 -3,630ms2

VIII. LF/HF Ratio

This is the ratio between the power of Low Frequency and High Frequency bands. This measure indicates overall balance between sympathetic and parasympathetic systems. Higher values reflect domination of the sympathetic system, while lower ones - domination of the parasympathetic system. This ratio can be used to help quantify the overall balance between the

sympathetic and parasympathetic systems.
High LF/HF ratio: Acute stress response, anxiety, phobia, rage, panic, tension, agitation, hyper-arousal
Low LF/HF ratio: Slow mental speed, hypo-arousal, lethargy, chronic nervous breakdown, burnout, depression, post-traumatic withdrawal

Normal range for LF/HF: 1.1-11.6

IX. Peak performance Ratio (PPR)

The PPR is calculated as follows: MF/LF-MF +HF
An increase in PPR in the Wellness & Performance Assessment over time indicates an increasingly positive emotional state (life satisfaction and sense of happiness), improved resilience, and an enhanced capacity to actively engage in a sustained peak performance state even under pressure (flow).

Normal range for PPR: not available

X. Relaxation Ratio (RR)

The RR is calculated as follows: HF/LF+HF
An increase in RR indicates an increased relaxation response with increase in parasympathetic and reduction in sympathetic activity.

Normal range for RR: not available

XI. The Effect of Resonant Frequency Training on HRV

Breathing at your resonant frequency increases MF and reduces VLF, LF-MF, and HF. A training specific (RFT) increase in amplitude of MF power, alongside with reduction of VLF, LF-MF, and HF is a desired immediate effect. This can be tracked on the app in real time, when in RFT mode.
The long term effect of RFT can be monitored in the improvement and normalization of all HRV parameters, such as HR, SDNN, TP, and HF/LF as well as the increase of the Peak Performance Ratio (PRR), which can be

monitored through the Autonomic Wellness & Performance assessment. (See Peak Performance Ration PPR)

XII. The Effect of Relaxation Training on HRV

During relaxation an increase of the amplitude in the HF band should be observed, indicating increase parasympathetic activity. Simultaneously a reduction in VLF, LF and MF can be tracked on the app in real time, when in 'Relaxation Training' (RT) mode.
A desired long term effect may be an overall increase LF power and a lowering of the LF/HF ratio, indicating a shift towards increased parasympathetic and reduced sympathetic activity observed over time in the Wellness & Performance Assessment. This indicates an improved capacity to let go, recover from strain and recuperate. I people that have a relatively high parasympathetic activity at the outset, relaxation exercise may be initially not indicated or even contra-indicated, and the training should exclusively focus on RFT.

Emotional Stress Indicators:

High LF/HF ratio
Sympathetic Dominance
Acute stress response, anxiety, phobia, rage, panic, tension, agitation, hyper-arousal

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

Healthy balance of PNS & SNS
If the LF/HF ratio is between 0.5-2.0, it is clinically considered as balanced status.
LF/HF ratio is lower in women (more parasympathetic) than in men (more sympathetic)

Physical Stress Indicators:

High Heart Rate / Low SDNN
Physical symptoms have been complained in many cases. (somatization) Higher stress level individuals are more likely to be Psychosomatic Disorder.
Increased health risk, reduced health potential

Low Heart Rate / High SDNN
Reduces health risk, increased health potential
Sometimes also sign of exhaustion or withdrawal (burnout, depression, post-traumatic dissociative state

Engagement & Sustained Peak Performance

High Peak Performance ratio (PPR)

A high PPR indicates a predisposition for good emotion regulation, emotional wellbeing with sense of happiness and contentment and a capacity to access flow and peak performance states even under pressure.

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[i] David Nunan, Ph.D.; Gavin R. H. Sandercock, Ph.D.; David A. Brodie, Ph.D.
A Quantitative Systematic Review of Normal Values for Short-term Heart Rate Variability in Healthy Adults

[ii] Task Force. Heart rate variability: Standards of measurement, physiological interpretation and clinical use. Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology. Circulation 1996; 93:1043–1065.

[iii] David Nunan, Ph.D.; Gavin R. H. Sandercock, Ph.D.; David A. Brodie, Ph.D.
A Quantitative Systematic Review of Normal Values for Short-term Heart Rate Variability in Healthy Adults
Heart Rate Variability in Healthy Adults. Pacing Clin Electrophysiol. 2010;33(11):1407-1417.

[iv] Ken Umetani, MDA,B,C; Donald H Singer, MD, FACCA,B; Rollin McCraty, MSC; Mike AtkinsonC. Twenty-Four Hour Time Domain Heart Rate Variability and Heart Rate: Relations to Age and Gender Over Nine Decades. *Am Coll Cardiol*. 1998;31(3):593-601. doi:10.1016/S0735-1097(97)00554-8

[v] Tsuji, H., et al., Reduced heart rate variability and mortality risk in an elderly cohort. The Framingham Heart Study. Circulation, 1994. 90(2): p. 878-883.

[vi] Hadase, M., et al., Very low frequency power of heart rate variability is a powerful predictor of clinical prognosis in patients with congestive heart failure. Circ J, 2004. 68(4): p. 343-7.

[vii] Tsuji, H., et al., Impact of reduced heart rate variability on risk for cardiac events. The Framingham Heart Study. Circulation, 1996. 94(11): p. 2850-5.

[viii] Bigger, J.T., Jr., et al., Frequency domain measures of heart period variability and mortality after myocardial infarction. Circulation, 1992. 85(1): p. 164-71.

[ix] Shah, A.J., et al., Posttraumatic stress disorder and impaired autonomic modulation in male twins. Biol. Psychiatry, 2013. 73(11): p. 1103-10.

[x] Lampert, R., et al., Decreased heart rate variability is associated with higher levels of Inflammation in middle aged men. Am Heart J, 2008. 156(4): p. 759 e1-7.

[xi] Carney, R.M., et al., Heart rate variability and markers of in Inflammation and coagulation in depressed patients with coronary heart disease. J Psychosom Res, 2007. 62(4): p. 463-7.

[xii] Theorell, T., et al., Saliva testosterone and heart rate variability in the professional symphony orchestra after "public faintings" of an orchestra member. Psychoneuroendocrinology, 2007. 32(6): p. 660-8.

[xiii] David G Bishop, Robert D Wise, Carolyn Lee, Richard P von Rahden & Reitze N Rodseth (2016): Heart rate variability predicts 30-day all-cause mortality in intensive care units, Southern African Journal of Anaesthesia and Analgesia, 2016 DOI: 10.1080/22201181.2016.1202605

[xiv] Akselrod, S., et al., Power spectrum analysis of heart rate Ouctuation: a quantitative probe of beat-to-beat cardiovascular control. Science, 1981. 213(10): p. 220-222.

[xv] Cerutti, S., A.M. Bianchi, and L.T. Mainardi, Spectral analysis of the heart rate variability signal, in Heart Rate Variability, M. Malik and A.J. Camm, Editors. 1995, Futura Publishing COmpany, Inc.: Armonk NY. p. 63-74.

[xvi] Berntson, G.G., et al., Heart rate variability: origins, methods, and interpretive caveats. Psychophysiology, 1997. 34(6): p. 623-48.

[xvii] Science of the Heart. Exploring the Role of the Heart in Human Performance. An Overview of Research Conducted by the HeartMath Institute. www.heartmath.org/research/science-of-the-heart/ 2016

[xviii] Huikuri, H.V., et al., Circadian rhythms of frequency domain measures of heart rate variability in healthy subjects and patients with coronary artery disease. Effects of arousal and upright posture. Circulation, 1994. 90(1): p. 121-6.

[xix] Singh, R.B., et al., Circadian heart rate and blood pressure variability considered for research and patient care. Int J Cardiol, 2003. 87(1): p. 9-28; discussion 29-30.

[xx] Bernardi, L., et al., Physical activity inOuences heart rate variability and very-low-frequency components in Holter electrocardiograms. Cardiovasc Res, 1996. 32(2): p. 234-7.

[xxi] McCraty, R., Atkinson, M., Tomasino, D. and Bradley, R. T., The coherent heart: Heart-brain interactions, psychophysiological coherence, and the emergence of system-wide order. Integral Review, 2009. 5(2): p. 10-115.