

BIOMARKERS IN DETAIL

HEART RATE VARIABILITY - TOTAL POWER - CARDIOVASCULAR FITNESS

The better the Total power (HRV) value the better fitness and better adaption/recovery status. This biomarker is known as the key biomarker for heart rate variability, meaning the variation in time between two heart beats. A high HRV score – the greater variability in the time gap between heart beats – indicates a healthy, fit, well-rested heart.

Factors that can decrease HRV:

- Stress
- Dehydration
- Psychological events
- Aging
- Inactivity (decreased fitness condition)
- Insomnia or a bad sleep during the night
- If the client has exercise or experience stress, just before the measurement
- Inflammation/infection
- Inactivity/low fitness
- Overtraining
- Insulin resistance
- Leptin resistance
- Obesity
- Thyroid
- Medication (BP, cholesterol, anti -depressive medicine)

POWER HF – PARASYMPATHETIC NERVOUS SYSTEM – RECOVERY IN GENERAL

This marker shows the activity of the parasympathetic part of the autonomic nervous system in rest. If it is below the reference value, it means poorer recovery capacity in general. There is no deviation for high parasympathetic activity because it is rarely associated with health problems. The Power HF result comes from the HRV measurement which is analyzed via spectral analysis - therefore, a frequency spectrum is measured.

Factors that can decrease Power HF:

- Metabolic syndrome
- Inflammation
- Age
- Some types of pesticides
- Chronic stress
- Neck problem
- Choline depletion
- Inactivity
- High consumption of alcohol

VO2 MAX – PERFORMANCE DURING A LONGER TIME

There are several ways to assess VO2 max - here, we assess VO2 max in relation to HRV since studies have shown a correlation between them. Reduced VO2 max indicates poorer performance during exercise for a longer time. Put it simply, VO2 max is a numerical measurement of the body's ability to consume oxygen. Calculated by measuring the volume (V) of oxygen (O2). During exercise, it must be able to work several times harder than normal to increase the minute volume.

Factors that can decrease VO2 max:

- Stress
- Inactivity
- Overtraining
- Circulation problem
- Heart failure
- Sodium depletion
- Dehydration
- Heat
- Humidity

rMSSD – RECOVERY AFTER EXERCISE

There are two biomarkers for recovery. This one describes the recovery ability after exercise or other high activity, while the power HF describes the body's general recovery capacity. If both markers for recovery are below the reference values, it is important to work on strengthening the parasympathetic nervous system and reducing the activity/dominance of the sympathetic nervous system. This biomarker comes from an HRV measurement and a time domain analyse.

Factors that can decrease rMSSD:

- Inactivity
- Overactivity
- Stress
- Age
- Dehydration
- Sleeping problems

SPO2 %- OXYGEN SATURATION

Oxygen saturation – refers to the extent to which hemoglobin is saturated with oxygen. Hemoglobin is an element in the blood that binds with oxygen to carry it through the bloodstream to the organs, tissues, and cells of the body.

- Values between 95 and 99% are considered normal. I believe that 97-98% is optimal
- Athletes can have higher oxygen saturation (99%) as their normal value.
- 90-95% can generally mean anemia (**lack of iron/B12/folic acid/vitamin C**).
- Under 90% generally means a possible problem with the **lungs/breathing**.
- When acidifying (as well as increasing temperature), the body releases more oxygen from the red blood cells, and if a person is alkaline (or has low body temperature), the oxygen binds more strongly to the red blood cells.
- With high numbers of red blood cells, oxygen saturation can decrease.
- With low numbers of red blood cells, oxygen saturation can increase.
- **Alcoholism** - poor nutrition and deficiencies of vitamins and minerals are associated with alcoholism as well alcohol itself may also be toxic to the bone marrow and may slow down the red blood cell production. The combination of these factors may lead to anaemia in alcoholics.
- **Smoking** - One of the culprits in cigarette smoke is CO, or Carbon Monoxide. CO shares the same binding sites as O₂ in blood hemoglobin (Hg) and have 200 times greater affinity than O₂. So, for that reason when someone smoke, the CO travels across and prevents some Hg from picking up oxygen

DRY LEAN MASS – DRY MUSCLE MASS

Strength training is the most effective form of training for building muscles. Strength exercise can counteract osteoporosis, increase metabolism, improve sensitivity to insulin, lower blood pressure, increase endurance, and improve oxygen uptake. Muscles also increase the amount of growth hormone and testosterone. When exercising, the muscles are first broken down and then built up while sleeping.

Factors that can decrease muscle mass:

- Calcium depletion
- Vitamin-D depletion
- Inactivity
- Aging
- Menopause
- Obesity
- Stress
- Sleeping problem
- Low intake of protein or digestive problem

HEART RATE PER MINUTE

Heart rate is not included in any score, you will only find heart rate as a reference in the modeling picture.

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

Factors that can cause tachycardia:

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

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

Factors that can cause bradycardia:

- Physically healthy individual who exercise hard and regularly
- Hypothyroid
- Hypothermia
- Functional/anatomical heart problem (Heart failure/Heart arrest)
- Drug side effect
- Some people can have low heart rate as normal

BODY FAT MASS - FAT MASS

If someone eat too much, the energy is stored as fat. Furthermore, the fat mass can increase with stress, an underactive thyroid, and insulin resistance.

What happens inside the fat mass?

- Leptin - a hormone that makes us feel full, so we do not overeat.
- Ghrelin - a hormone that stimulates hunger.
- Insulin - a hormone that increases the storing of fat and lowers blood sugar levels.
- Glucagon - a fat-burning and blood sugar-increasing hormone.
- The higher the percentage of fat mass, the more inflammation in the body. The inflammation occurs in the fat cells.
- An inflamed fat cell becomes insulin resistant, which further increases fat deposits.
- Increased fat storage increases the production of the inflammatory signaling molecules IL-6 and TNF-alpha.
- Resistin is a hormone-like protein that is released from immune defense cells and is linked to inflammation and obesity. Resistin in the blood is also associated with, among other things, insulin resistance, blood lipid disorders, high blood pressure, and atherosclerosis.

BODY MASS INDEX – BMI

The developers have chosen to follow WHO's guidelines but have, however, made a differentiation between age and gender, which WHO does not.

DELTA CONDUCTANCE - PH VALUE INDEX

We make a measurement in the interstitial fluid and thereby obtain the pH value in this fluid space between the cells. Neurologist Albert Maarek, who developed Wellness-Screening, believes that the greatest effect on this value depends on the pH of the water you drink. Although it is his opinion, I recommend that you also look at your client's diet, physical inactivity, etc. if the value indicates acidification. If the level is below the reference value, this means that the person has a lower pH (acidosis), while a level that exceeds the reference value indicates a higher pH (alkalosis). We not measure the pH value we calculate a pH regulation index.

Possible causes of acidosis:

- 1) pH in the drinking water
- 2) High consumption of carbonated drinks (including Soda Stream).
- 3) Unhealthy diet
- 4) High intake of coffee and fruit juice
- 5) Reduced circulation in the tissues
- 6) Weak heart (alternative medicine that inhibits heart capacity)
- 7) Diabetes (ketoacidosis)
- 8) Diarrhea (the body loses basic salts)
- 9) Alcohol and smoking (both are greatly acidifying)
- 10) Kidney problems (the acids accumulate in the body)

Possible causes of alkalosis:

- 1) Low potassium content
- 2) Low sodium content
- 3) Low magnesium content
- 4) High calcium content
- 5) Dehydration (leading to increased concentration of bicarbonate)
- 6) Intake of fluid-producing medication
- 7) Over-consumption of liquorice
- 8) Hyperaldosteronism
- 9) Impaired renal function (kidneys should balance bicarbonate values)

FOREHEAD RIGHT VOLTAGE - THE BRAIN'S SEROTONIN LEVELS

Serotonin is a neurotransmitter that is partly produced in the brain (that is where we measure the serotonin) and is responsible for balancing our emotions. However, serotonin also affects our experience of pain, appetite, and sleep. In normal amounts, serotonin has a calming, relaxing effect and improves sleep. Nerve cells in the brain can themselves form serotonin by converting the amino acid tryptophan supplied via food into serotonin. Estrogen is needed for normal serotonin production.

Factors that can decrease the level of serotonin in the brain:

- Stress
- Digestive problem
- Inactivity/overtraining
- Unbalance estrogen (both decreased and increased levels)
- Progesterone has been shown to increase sensitivity to serotonin, which means that the lack of progesterone reduces the effect of serotonin in the body.
- Increased fat mass
- Vitamin D- depletion
- Omega 3 -depletion
- Toxic substances like heavy metals, pesticides, drug use, and some prescription drugs can cause permanent damage to the nerve cells that make serotonin and other neurotransmitters.
- Certain drugs and substances such as caffeine, alcohol, nicotine, NutraSweet, antidepressants, and some cholesterol lowering medications

deplete serotonin and other neurotransmitter levels.

- Lack of sunlight contributes to low serotonin levels

LF/HF - MENTAL STRESS - SYMPATHETIC DOMINANCE- FIGHT- OR FLIGHT STRESS

When a person has an imbalance in ANS that causes the sympathetic nervous system to dominate, the level of this biomarker will deviate from the normal value. There are a number of different reasons why a person has increased activity in the sympathetic nervous system, and it can be based on both internal and external factors.

Emotional stress factors include feelings and experiences that are perceived as negative. It may be that one feels unhappy, alone, or worried about finances and work.

Chemical stress factors:

- High consumption of coffee
- Heavy metals
- Environmental toxins (solvents etc.) - some chemical toxins are fat-soluble and since the brain is made up primarily of fat, many can get through the protective blood-brain barrier and into the brain cells. When a toxin enters the brain cells, it can cause major imbalances in brain chemistry.
- Pesticides
- Toxins - produced by living organisms
- Drugs
- Alcohol
- Dehydration
- Physical inactivity
- Nutritional diet
- Some medications

Physiological stress factors:

- Trauma
- Surgery's
- Immune responses
- Obesity
- Oxygen deficiency
- Unregulated blood sugar
- Age

FOREHEAD LEFT VOLTAGE - THE BRAIN'S DOPAMINE LEVELS

Note that dopamine levels above the reference value are linked to low dopamine. Dopamine is one of the most important neurotransmitters in the central nervous system and is active both alone and as a precursor to the hormones norepinephrine and adrenaline. Dopamine is released during exercise and short-term stress and allows us to stay more alert and focused when it is really needed. The body needs the amino acid tyrosine to produce dopamine. In stress, dopamine is released as a reaction to the stress hormone cortisol and makes us more alert and focused.

Factors that can decrease dopamine levels in the brain:

- Drug abuse - damages the body's dopamine signaling
- High intake of fast carbohydrates
- High intake of saturated fat
- Lack of protein
- High consumption of alcohol
- Too low protein intake (amino acid tyrosine is needed for dopamine production).
- Digestive problems
- Nutritional Deficiencies
- Prolonged stress
- Inactivity/overtraining

AUTONOMIC NERVOUS SYSTEM BIOMARKERS

FOOT NITRIC OXIDE PEAK - MICROCIRCULATION

This biomarker describes the microcirculation and is a measurement that is performed on the client's foot. If the foot shows reduced circulation, this can also apply to microcirculation in general.

Blood circulation supplies tissues and organs with nutrients and oxygen. At the same time, waste products are disposed of and removed. 75% of this process takes place in the smallest blood vessels belonging to the microcirculation.

Factors that can cause decreased microcirculation:

- Endothelial dysfunction
- Peripheral neuropathy
- Inflammatory bowel diseases
- Heart dysfunction
- Diabetes
- Hypercholesterolemia
- Hypertension
- Renal failure
- Venous insufficiency
- Sleep apnea
- Smoking
- Menopause
- Age
- Obesity
- Inactivity

FOOT SWEAT PEAK - OXIDATIVE STRESS

Note, that the screening does not show any net effect between free radicals and antioxidants. We can see if a person has abnormalities that can be due to damage/consequences of oxidative stress. Please look at different biomarkers that could lead to an increased level of oxidative stress.

Factors that can cause oxidative stress:

- Diabetes
- Atherosclerosis, or the hardening of the blood vessels
- Inflammatory conditions
- High blood pressure
- Heart disease
- Certain pesticides and cleaners
- Cigarette smoke
- Radiation
- Pollution
- Alcohol
- Transfats
- High intake of fast carbohydrates
- Unhealthy diet

ADJUSTED UPPER VOLTAGE - HYPOTHYROID

Hypothyroidism is a condition in which the thyroid gland is not able to produce enough thyroid hormone. Since the main purpose of thyroid hormone is to "run the body's metabolism," it is understandable that people with this condition will have symptoms associated with a slow metabolism.

Factors that can cause hypothyroidism:

- Poor gut health
- Toxins
- Food intolerance (especially gluten)
- Blood sugar imbalances
- High intake of glucose
- Adrenal stress
- Weak adrenals
- Inflammation
- Autoimmune problem
- Essential fatty acid deficiencies

- Vitamin A, D and C
- Vitamin B
- Iodine
- Selenium of iodine
- Zinc and magnesium
- Foods that contain goitrogens, such as soy, which interfere with the utilization

ADJUSTED MIDDLE AVERAGE - DIGESTIVE SYSTEM

In this section, you will get more information about the client's digestion. You can also click on the digestion on the "Modeling" body image. If it blinks at any part of the digestion, it indicates a deviation. The digestion can be seen in the colors of yellow or orange. Here, it is important that you apply your own knowledge and information about the client's symptoms. Do you suspect leaking intestines, Candida, or perhaps parasites? Do not look at this as a truth, but as indications of possible problems and based on information from the measurement of galvanic skin resistance.

- | | |
|-------------------------|----------------------------------|
| 1) Mild inflammation | 5) Peristalsis (bowel movement) |
| 2) Gluten intolerance | 6) Suggest probiotics |
| 3) Chronic inflammation | 7) Inflammation in the intestine |
| 4) Dairy intolerance | 8) Low stomach secretion |

There is much that can harm the digestive system; here are some examples:

- | | |
|--|-----------------------------|
| ➤ High stress levels reduce the activity of the parasympathetic nervous system that promotes digestion | ➤ Alcohol |
| ➤ Being overweight | ➤ Gluten from wheat |
| ➤ Unhealthy diet | ➤ Casein from milk products |
| ➤ High carbohydrate intake | ➤ Trans fat |
| | ➤ Processed foods |
| | ➤ Diet rich in Histamine |

EXPIRATION/INSPIRATION RATIO -PARASYMPATHETIC IN BREATHING

The body maintain the cardiac output stability (minute volume) The results is expressed as E/I Ratio (expiration/Inspiration Ratio)

- Inhalation - the heart rate should go up
- Exhalation - the heart rate should go down

Factors that can decrease E/I ratio:

- | | |
|--|------------------------------|
| ➤ Decreased level of good bacteria in the digestive system | ➤ Dysfunction in the thyroid |
| ➤ Abdominal disease | ➤ Diabetes |
| ➤ Stress | ➤ Cardiovascular problem |
| ➤ Chronic fatigue | ➤ Inflammation |
| ➤ Depression | ➤ Respiratory diseases |

Cardiovagal: The parasympathetic response measured via cardiac function, which is under control of the vagus nerve, which influences heart rate variability. All factors that can have a negatively effect on the parasympathetic nervous system can create a deviation in this biomarker.

K30/15R - PARASYMPATHETIC REGULATION, STANDING

When the person stands up we measure differences in the heart rate in a standing position. The pulse should increase the first 15 seconds and then stabilize in 30 seconds for optimal parasympathetic signaling, hence the name K30 /15R for this biomarker. The parasympathetic signaling is an early marker that can be linked to the development of diabetes and the sequelae that include damaged nerves. It is important that the parasympathetic part be activated to cause the heart rate to drop. Also, the blood pressure will be stabilized by increased activity of the parasympathetic system, which inhibits some of the sympathetic regulation.

Factors that can decrease K30/15 (all the factors that can decrease the parasympathetic):

- Stress
- Vitamins B6, B12 and folic acid
- Digestive problem
- High intake of fast carbohydrates
- Inflammation
- Metabolic syndrome
- Inflammation
- Age
- Some types of pesticides
- Chronic stress
- Neck problem
- Choline depletion
- Inactivity
- Some studies show that radiation from cellphones can
- High consumption of alcohol

LF STANDING/SUPINE RATIO - BARORECEPTOR RESPONSE TO CHANGE OF POSITION

LF Standing/Supine ratio (SP/HR - regulation) - This section shows how well the baroreceptors sense the pressure change and send signals to the brain to increase blood pressure when the person stands up. If a person has had high blood pressure for a long time, the baseline will change. This section describes the ability of baroreceptors to signal to the brain about pressure change.

Factors that can have a negative effect on the baroreceptor activity:

- Chronic hypertension,
- Coronary artery disease
- Endothelial dysfunction
- Heart failure
- Diabetes
- Obesity, and with
- Aging
- Chronic structural changes such as decreased large artery compliance and Cardiac hypertrophy impair the afferent sensitivity of arterial and cardiopulmonary baroreceptors.
- Oxidative stress impairs baroreflex function
- Increased circulating levels of angiotensin II (Ang II) reset the baroreflex function curve to a higher mean level of arterial BP.
- Stress

SP RESPONSE STANDING - SYMPATHETIC CONTROL DURING POSITION CHANGE

The signals from the brain go to the sympathetic part of the nervous system that uses norepinephrine as a neurotransmitter. When entering the "Comments" of this section, you will be informed if the noradrenaline content is reduced; it is this biomarker that indicates low sympathetic activity and low noradrenaline production. If the sympathetic part is not activated, the sympathetic regulation fails.

Factors that can decrease SP response to standing:

- Heart failure
- Diabetes
- Stress
- Adrenal fatigue
- Nutrition deficiency
- Digestive problem
- Too little proteins in the diet

ORTHOSTATIC HYPOTENSION - BP DROPS WHEN CHANGING POSITION

This term is used when a person's blood pressure falls too much in a standing position.

Possible causes:

- Disability in the autonomic nervous system
- Parkinson's,
- Diabetes
- Dehydration
- Heat (sunbathing, sauna, and fever)
- Alcohol
- Anti-hypertensive medications
- Salt deficiency
- Anemia
- Diarrhea
- Adrenal fatigue
- Tall people are more often affected by OH

POSTURAL ORTHOSTATIC TACHYCARDIA (POTS)

When a person changes position from sitting to standing and tachycardia (abnormally high pulse) occurs, the person can either have symptoms similar to POTS or be affected by POTS. Symptoms can be moderate to more severe. POTS is a disease that causes abnormally high heart rate and low blood pressure.

The following may be linked to the development of POTS or symptoms like POTS:

- Overtraining
- Coffee
- Alcohol
- Fast carbohydrates
- Dehydration
- Salt deficiency
- Neuropathy
- Cardiac Disease
- Chronic Fatigue Syndrome
- Fibromyalgia
- IBS
- Hyperthyroidism
- Some drugs may cause symptoms of POTS without being a development of POTS.

In many people with POTS, it has been found that the disease has broken out after:

- Viral infection
- Vaccination
- Extensive surgery
- Pregnancy

ENDOTHELIUM

The endothelium is a very important part of the body's vascular system. All the way into the cavity of the blood vessel is a cell layer called the endothelium. Endothelial cells in the blood vessels produce nitric oxide (NO) which is one of the body's most important molecules. It is a gas that is formed in the endothelial cells that line the blood vessels throughout the body. Thus, there is nitrogen oxide throughout the bloodstream, which, among other things, signals to the body to widen the vessels when necessary to improve circulation so that oxygen and nutrients reach the whole body and waste products are expelled from the body. In the care, nitroglycerin is prescribed in cardiac-related chest pain because nitroglycerin increases the production of nitric oxide.

Low nitric oxide content can, among other things, lead to:

- High blood pressure
- Impotence
- Arthritis
- Sleep apnea
- Insomnia
- Memory problems

- Immunological problems

Endothelium functions:

- Meet the circulation needs by causing the vessels to contract (vasoconstriction) and widen (vasodilation). Important part of the body's circulation homeostasis.
- Participate in the formation of new blood vessels (angiogenesis)
- Linked to the immune system and has anti-inflammatory properties.
- Has anticoagulant properties
- Contributes to the production of new mitochondria (the cells' powerhouse).

STRESS INDEX - LOW-GRADE INFLAMMATION

Most public diseases have a common denominator: chronic low-grade inflammation. Most often we do not notice that there is an inflammation in the quiet of our blood vessels, neurons, or other parts of the body. Inflammation is a natural reaction from our immune system, but prolonged inflammatory reactions can eventually lead to chronic low-grade inflammation. It is also called "the silent killer" because it does not always produce any symptoms.

Inflammation contributes to atherosclerosis (vasoconstriction) and makes the plaque in the vessels fragile so that they are more easily broken, which increases the risk of blood clots which, in the worst case, leads to heart attack or stroke. The abdominal fat that exists between the intestines and organs can release inflammatory substances that can damage the vessel walls and contribute to atherosclerosis.

Low-grade chronic inflammation can increase the risk of:

- | | |
|---|-----------------------|
| ➤ Cardiovascular disease | ➤ Diabetes |
| ➤ Asthma | ➤ Cancer |
| ➤ Bowel disorders (IBS, Crohn's, Helicobacter pylori) | ➤ Dementia |
| ➤ Rheumatoid arthritis | ➤ Alzheimer's disease |
| ➤ Arthritis | ➤ Depression |
| ➤ Osteoporosis | ➤ ADHD/ADD |
| ➤ High blood pressure | ➤ Allergies |
| ➤ Urinary tract infection | |

Factors that can cause inflammation:

- | | |
|--|--------------------------------|
| ➤ Being overweight | ➤ Smoking |
| ➤ Unstable blood sugar - diabetes | ➤ High intake of alcohol |
| ➤ Inactivity | ➤ High intake of coffee |
| ➤ Overtraining | ➤ Dehydration |
| ➤ High intake of fast carbohydrates | ➤ Too much or too little sleep |
| ➤ Processed foods | ➤ Some medications |
| ➤ Fatty acid imbalance (omega 3/6) | ➤ Pollution |
| ➤ Vitamin D deficiency | ➤ Lactose - milk products |
| ➤ Stress | ➤ Intestinal problem |
| ➤ AGE - is found in grilled, fried, deep-fried foods | |

PTG INDEX - IMMUNE RESPONSE

This marker is related to the innate immune system, as is part of the first line of defense's immunological response.

- The biomarker is based on two T cells called CD4+ and CD8+, according to the study below.
- CD4+ cells act as a helper as they drive a response from the immune system and activate CD8+.
- CD8+ is considered a "killer" because it has the task of eliminating viruses, bacteria, or other pathogens.

Some symptoms of impaired immune system:

- Fatigue
- Allergies
- Recurrent infections
- Urinary tract infection
- Irritated and/or bleeding gums
- Poor wound healing

Factors that can decrease the immune response:

- An unhealthy diet, not rich in fruits/veggies
- Too little Soluble fiber in the diet
- Inactivity
- Increased fat mass
- Zink and Vitamin D deficiency
- To low levels of good bacteria's
- Low levels of Omega 3
- Maintaining a healthy weight
- Smoking
- High consumption of alcohol
- Sleeping problems
- Stress
- High intake of antibiotics

PTG AGUMENTATION INDEX - FAT PROFILE

Biomarker for total cholesterol and triglycerides. Too high intake of fast carbohydrates means a large insulin release which causes the liver to increase its secretion of fat in the blood. Fat cannot be transported in the blood without the help of VLDL. VLDL transports the fat mainly to the fatty tissue, and what remains is a residual particle called LDL - the "bad" cholesterol. Note that there are two different types of LDL: the residual products formed at high sugar intake contain low levels of a compound of cholesterol and the fatty acid, linolenic acid, which is antibacterial. In order to reduce the amount of harmful LDL we should primarily exclude fast carbohydrates from the diet.

Dietary advice:

1. Reduce the intake of fast and processed carbohydrates (sugar, flour, etc.) as they reduce the good HDL cholesterol and increase the amount of the small, harmful LDL particles.
2. Eat lots of natural fat. Specially saturated fat increases the good "fluffy" LDL and the good HDL cholesterol.
3. Reduce intake of trans fats and artificial fats.
4. Reduce the intake of omega-6 found in common refined vegetable fats and oils.
5. Eat a lot of fatty fish, such as mackerel and wild-caught salmon.

PTG SECOND DRIVATIVE INDEX -VASCULAR TONE - BLOOD VESSEL TONE

The tone of the blood vessels is determined by many different competing contracting and expanding factors that affect the vessels. They can be divided into external factors derived from the outside of the organ or tissue where the blood vessel is located, and internal factors derived from the vessel itself or the surrounding tissue. The primary function of the external factors is to regulate blood pressure in the arteries by altering systemic vascular resistance, while the internal mechanisms are important for controlling the local blood flow in an organ. The higher the resistance from blood vessels, the harder the heart must pump, the higher the risk of heart disease.

Factors that can increase the vascular tone:

- Magnesium is a relaxing mineral that can be considered for increased vascular tone.
- Stress
- Endothelial dysfunction (everything that have a negatively effect on the endothelial cells)
- High blood pressure

PTG TOTAL POWER - INSULINRESISTANCE

The pancreas is a gland that produces insulin, and insulin regulates the body's blood sugar level. Insulin binds to receptors found on the cells and causes the sugar (glucose) to be transported into the cells. In insulin resistance, this signaling does not work as it should and the body is forced to produce more insulin to lower blood sugar levels.

Factors that can increase insulin resistance:

- High intake of carbohydrates
- Inactivity
- Stress
- Sleeping problems
- Obesity
- Low graded inflammation

➤ Smoking

➤ Chromium depletion

PTG VLF INDEX - COAGULATION

When we are bleeding in the blood vessels, the body reacts by activating a coagulation process. If the blood coagulation is prolonged, the risk of blood clots increases. This biomarker is compared to fibrinogen in blood that increases during coagulation for any reason.

Factors that can increase coagulation:

- Smoking
- High consumption of alcohol
- Overweight/obesity
- Age
- Prolonged inactivity
- Pregnancy
- Hormone ther./birth control pills estrogen
- Unhealthy diet
- Low graded inflammation
- Zink - necessary for immune function and wound healing

HEMODYNAMIC BIOMARKERS

Hemodynamics is a summary term for the physiological mechanisms of blood circulation, including the function of the heart and the resistance of the blood vessels. Thanks to the hemodynamic functions, the body can adapt to the continuous variations in blood pressure and blood flow and provide all cells with oxygen, nutrition, and hormones. Hemodynamics refers to, among other things, heart rate, blood pressure, the heart's stroke volume, and minute volume.

BLOOD PRESSURE

High blood pressure is an important risk factor for: stroke, myocardial infarction, peripheral vascular disease, kidney failure, and cardiovascular death. Systolic pressure (high pressure) occurs when the heart is contracted. It is the highest pressure in the blood vessels. Diastolic pressure (low pressure) occurs when the heart relaxes between two strokes. It is the lowest pressure in the vessels.

Factors that can increase blood pressure:

- Low levels of potassium
- High intake of salt
- Magnesium depletion
- Stress
- Chronic excessive alcohol consumption
- Smoking
- Inactivity
- Obesity
- High intake of products that contain caffeine
- Overconsumption of licorice
- Age
- Insulin resistance and pre-diabetes
- Inflammation
- Increased cholesterol levels
- Trans fats
- Kidney dysfunction
- Endothelial dysfunction
- Atherosclerosis
- Emotional and mental problems
- Sleep apnea
- Hyperthyroidism
- Birth control pills
- Drugs NSAID (example - ibuprofen)

Low blood pressure

Hypotension is best understood as a physiological state, rather than a disease. For some people who exercise and are in top physical condition, low blood pressure is a sign of good health and fitness. For many people, excessively low blood pressure can cause dizziness and fainting or indicate serious heart, endocrine or neurological disorders. Some experts define low blood pressure as readings lower than 90 mm Hg systolic or 60 mm Hg diastolic. If either number is below that, the pressure is lower than normal.

Factors that can cause low blood pressure:

- Pregnancy. Because the circulatory system expands rapidly during pregnancy, blood pressure is likely to drop.
- Heart problems- include extremely low heart rate (bradycardia), heart valve problems, heart attack and heart failure.
- Endocrine problems. Thyroid conditions such as parathyroid disease,
- Adrenal insufficiency (Addison's disease),
- Low blood sugar (hypoglycemia) and, in some cases, diabetes can trigger low blood pressure.
- Dehydration
- Blood loss. Losing a lot of blood, such as from a major injury or internal bleeding, reduces the amount of blood in your body, leading to a severe drop in blood pressure
- Lack of the vitamins B-12 and folate can lead to anemia that can cause low blood pressure.
- Water pills (diuretics)
- Alpha- and beta blockers
- Drugs for Parkinson's disease
- Certain types of antidepressants (tricyclic antidepressants)
- Drugs for erectile dysfunction, particularly when taken with the heart medication nitroglycerin.

STROKE VOLUME - HEART

This biomarker shows the blood volume that the heart pumps out per beat.

Factors that can increase stroke volume:

- | | |
|--|---|
| <ul style="list-style-type: none"> ➤ High sympathetic activity ➤ Adrenaline and noradrenaline ➤ High calcium content ➤ High level of thyroid hormones ➤ Reduced vascular resistance ➤ Glucagon - has the opposite effect to insulin. The secretion of glucagon is not only stimulated by hypoglycemia (low blood | <ul style="list-style-type: none"> sugar), but also by increased concentration of amino acids in the blood (this is an indication that the body breaks down protein in the body) and increased activity in the sympathetic nervous system. ➤ Athletes and well-trained people ➤ Strong heart ➤ High systolic pressure |
|--|---|

Factors that can reduce stroke volume:

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| <ul style="list-style-type: none"> ➤ High parasympathetic activity ➤ Acetylcholine ➤ Oxygen deficiency ➤ High potassium content ➤ High and low sodium or potassium content ➤ Low level of calcium ➤ Low body temperature ➤ Too little thyroid hormones ➤ Too high heart rate - the atrium of the heart cannot be filled enough before it is contracted, which reduces the stroke volume | <ul style="list-style-type: none"> ➤ Fluid deficiency - leads to reduced blood volume which results in reduced stroke volume. In case of fluid deficiency, the heart rate should increase and normalize the heart's minute volume. ➤ Low muscle strength in the heart ➤ Beta blocker ➤ Calcium inhibitor (drug) ➤ Heart conditions ➤ Low blood pressure |
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CARDIAC OUTPUT - HEART'S MINUTE VOLUME

This biomarker gives a value to the heart's minute volume. You get the minute volume by multiplying the heart beats per minute by the stroke volume.

Increase the heart's minute volume:

- If a person is healthy and has increased minute volume of the heart, it is usually due to increased activity in the sympathetic nervous system and/or a decrease in the activity of the parasympathetic nervous system.
- Well-trained, muscular individuals can have a higher minute volume
- If the body needs a higher amount of blood, the minute volume increases.
- Reaction that increases the heart rate also increases the minute volume
- High blood pressure can lead to higher minute volume

Reduce minute volume:

- Low stroke volume
- Medication that affects the stroke volume/heart rate
- Bradycardia (low heart rate)
- Heart conditions

Chronic high blood pressure, smoking, medication, kidney disease, physical inactivity, unhealthy diet, and genetic factors can reduce the heart's ability to pump out blood.