THE TEST ANALYZES:

- **Heart Rate Variability (HRV)** – Determines one's overall health status and autonomic nerve system. "Meta-analyses of published data demonstrate that reduced cardiovascular autonomic function, as measured by heart rate variability, is strongly associated with an increased risk of silent myocardial ischemia (lack of oxygen to the heart w/o symptoms) and mortality."
- **Differential Pulse Wave Index (DPI)** – Overall cardiovascular health.
- **Eccentric Constriction (EC)** – Constriction power of vessels from the left ventricle.
- **Arterial Elasticity (AE)** – Overall elasticity of large, small, and peripheral arteries (arterial stiffness).
- **Remaining Blood Volume (RBV)** – Remaining blood in the vessels after systolic contraction of the heart.
- **Wave Type** – Aging vascular health indicator.
- **Mean Heart Rate** – Average beats per minute or heart rate.
- **Arteriosclerosis Progress** – 7 pictorial wave types showing typical artery status.
- **Stress Score** – Overall stress health compared to resistance levels.
- **Stress Levels** – Mental stress, physical stress, and resistance to stress. Changes in pressure, velocity, blood volume, and other indices.
- **And Other Indices**

THE CLINICAL MEANING OF A DECREASE IN HEART RATE VARIABILITY (HRV)

It is found that a lowered HRV is associated with aging, decreased autonomic activity, hormonal balance, specific types of autonomic neuropathies (e.g. diabetic neuropathy) and increased risk of sudden cardiac death, after an acute heart attack.

Other research indicates that depression, panic disorders, and anxiety have negative impact on autonomic function, typically causing depletion of the parasympathetic tone. On the other hand an increased sympathetic tone is associated with lowered threshold of ventricular fibrillation. These two factors

could explain why such autonomic imbalance caused by significant mental and emotional stress increases risk of heart attack followed by sudden cardiac death.

Aside from that, there are multiple studies indicating that HRV is quite useful as a way to quantitatively measure physiological changes caused by various interventions both pharmacological and non-pharmacological during treatment of those conditions manifesting significant reduction in HRV. (See chart 5.3 Diseases Associated with Lowered HRV).

However, it is important to realize, that up to this point in time, the clinical implication of HRV analysis has been clearly recognized in only two medical conditions:

Predictor of risk of arrhythmic events or sudden cardiac death after acute heart attack

Clinical marker of diabetic neuropathy evolution

Nevertheless, as the number of clinical studies involving HRV in various clinical aspects and conditions grows, HRV remains one of the most promising methods of investigating general health in the future.

DISEASES ASSOCIATED WITH LOWERED HEART RATE VARIABILITY (HRV)

- Myocardiac infarction (MI)
- Angina pectoralis
- Ventricular arrhythmia and Premature ventricular contraction (PVC)
- Sudden cardiac death
- Coronary artery disease
- Congestive heart failure
- Diabetes mellitus & Diabetic autonomic neuropathy
- Brain injury
- Epilepsy
- Multiple sclerosis
- Fibromyalgia & Chronic fatigue syndrome
- Obesity

- Guillian-Barre Syndrome
- Depression & Anxiety disorder (Panic disorder)
- Stress induced diseases

DISCLAIMER

For the past 20+ years, methods of the heart rate variability (HRV) analysis have become one of the most popular means of assessment of the autonomic nervous system (ANS) function because of their simple and very informative nature.

At this time there are well-defined standards and methodologies of using methods of HRV analysis, created special normative databases and criteria of assessment of various HRV parameters with regard to their comparison with normative ranges.

At the same time it is very important to point out that there is a tendency in specific cases to over exaggerate diagnostic value of the assessment of results of HRV analysis when professionals attempt to use these results to make conclusions about presence or absence of certain diseases. The Max Pulse scanning device must be used in the scope that it was intended.

Max Pulse FAQ:

HOW DOES THE MAX PULSE GET ITS READINGS FROM A FINGER PROBE?

Simplistically, the Max Pulse uses an infrared light finger sensor which implements LEDs as both light emitter and detector to measure one's pulse wave. A Pulse Wave occurs when the heart pumps and it generates a contour wave that travels along the arterial tree. The wave form is generated from the left ventricular chamber of the heart to the big aorta, and is reflected back when the big aorta bifurcates or divides into two arteries.

The Max Pulse then uses pulse-based signal conversion techniques and converts the wave into a digital signal. The digital signal can then be broken down using a variety of mathematical algorithms. Some of the algorithms that are used include Time Domain Analysis (TDA) and Frequency Domain Analysis (FDA). TDA measures the RR interval variation in the time domain. FDA uses the

Fourier Transformation (FFT) to access the frequencies and amplitude of the oscillatory components hidden in the variability signal.

WHAT IS A PHOTOPLETHYSMOGRAPH?

Photoplethysmography measures one's pulse wave signal that indicates pulsation of the chest wall and great arteries followed by the heartbeat. The change in volume caused by the pressure pulse is detected by illuminating the skin with the light from an LED, then measuring the amount of light either transmitted or reflected to a photodiode. Each cardiac cycle appears as a peak. Photoplethysmographs have been around for over 25 years and are currently being used in many clinical applications.

Photoplethysmography is classified into two groups in terms of physical characteristics of parameters. One is "pressure Photoplethsmography", which represents the change of intravascular pressure. The other is "volume capacity Photoplethysmography", which indicates the change of vascular volume capacity. Volume Capacity Photoplethysmography is then classified into three categories by signal processing method for velocity. The categories are Photoplethysmography (PTG), Velocity Pulse Photoplethysmography, and Accelerated Photoplethysmography (APG). The Max Pulse uses PTG and APG analysis.

The Max Pulse uses Volume Capacity Photoplethysmograph technology. Specifically, the PTG and APG applications for determining aging vascular health and Heart Rate Variability (HRV).

HOW DOES THE MAX PULSE MEASURE THE SYMPATHETIC AND PARASYMPATHETIC NERVOUS SYSTEMS?

When a person's pulse wave information is collected, the Max Pulse uses Frequency Domain Analysis (FDA) to gather the three different frequencies of the Autonomic Nervous System: VLF (Very low frequency) – 0.0033-0.04Hz, LF (low frequency) – 0.04-0.15Hz (Also known as "Mayer" waves), and HF (High frequency) – 0.15-0.4Hz (Vagus Nerve). Next, the frequencies are then used to see if they are in the normal ranges by using the following formulas: LF norm = LF / LF + HF – > Sympathetic nerve and HF norm = HF / Lf + HF – > Parasympathetic nerve. Finally, depending on the information gathered, a LF:HF ration is determined and then plotted to show how the Sympathetic and Parasympathetic nervous systems are working in conjunction with their norm and each other (normal (balanced) or hyper or hypo to their norms).

HOW ACCURATE ARE THE READINGS?

The Max Pulse is used extensively in Asia. The parent company (Medicore) uses the Max Pulse in conjunction with 8 University Research Hospitals in Seoul, Korea. As a result, studies show that the Max Pulse has a + accuracy of 2% for the measurements it captures.

IS THE MAX PULSE FDA APPROVED?

Yes, after three years of review by the FDA, the Max Pulse was approved on June 16, 2011 as a Class II Medical Device.

HOW COME I HAVE NOT HEARD OF THE MAX PULSE BEFORE?

Plethysmography technology has been around for over 25 years. It has been used for different applications. It has been a growing science over the last few years specifically because of its significance in being a non-invasive simple test for determining Heart Rate Variability (HRV) and Aging Vascular Health. Since the Max Pulse obtained FDA approval June 16, 2011, The Cardio Group is using advertising campaigns, conferences, continuing education, conventions, referrals and a dedicated sales force, to get the word out to the health care industry