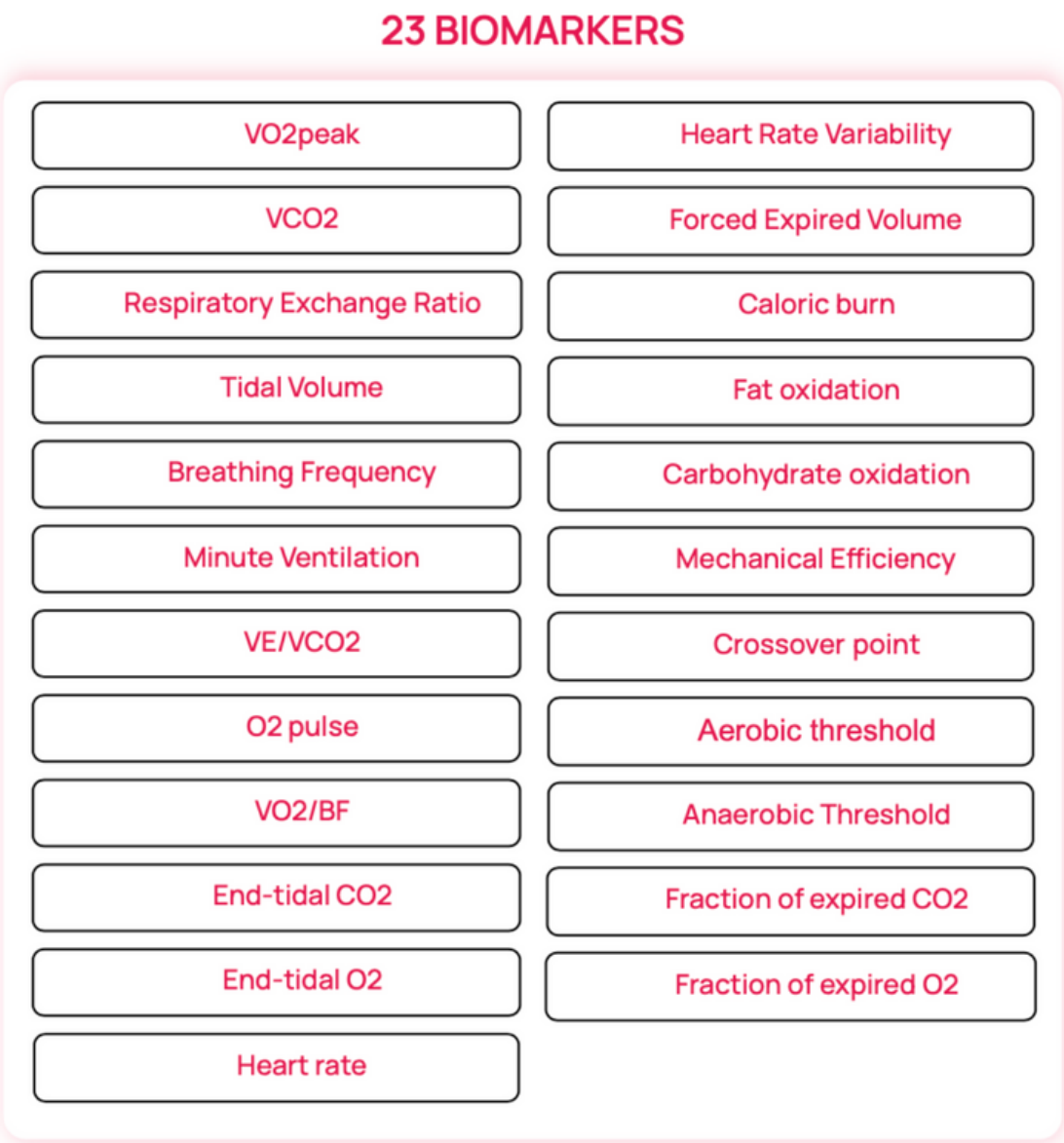
Assessment of the impact of novel therapy on key cardiometabolic variables.

PNOĒ INC. - 2023

This paper summarizes the findings of the metabolic changes measured through the PNOĒ metabolic analyzer after the exposure of a diverse cohort of ten healthy individuals to a 20-minute Nanovi session. Nanovi is a novel bio-optimization device that's known to enhance cellular activities including mitochondrial function.

About PNOĒ

PNOĒ is an independently validated cardio-metabolic analyzer that assesses. It is equipped with oxygen, carbon dioxide, and flow sensors and is capable of measuring all 23 biomarkers measured during clinical cardio-metabolic tests, including:



About Nanovi

NanoVi® devices are used to speed recovery, enhance overall wellness, and boost mental and physical performance. The approach leverages water science and biophysics to improve cellular activities. Proteins, which are essential for all cellular functioning, need to fold into 3D shapes to work. By supporting protein folding, NanoVi enables cells to repair damage and perform more optimally. Oxidative damage and various factors such as stress, toxins, and aging can hinder the protein folding process, resulting in cellular dysfunction and health issues.
NanoVi supports protein folding by influencing the water that surrounds all proteins.It employs a patented technology that creates ordered or liquid crystalline zone (EZ)" water in a humidified airstream. Once delivered by inhalation, the ordered state of the water transferers across the mucous membrane and the water in the body. Ordered water plays a crucial role in cellular activities because it provides the energy proteins need to fold (via a transfer of entropy). The NanoVi device augments the cells' natural levels of ordered water.

Testing procedure

10 subjects of various fitness levels participated in the experiment that included a resting and active cardio-metabolic assessment with the PNOĒ device before and after exposure to a 20-minute session with the Nanovi device.

Pre and post resting metabolic tests lasted for 8 - 10 minutes whereas pre and post metabolic tests lasted 10 - 12 minutes. Active metabolic tests which lasted 15 minutes were conducted on a cycle ergometer and included a gradual increase in power output from 60 watts to a power output that yielded 8 out of 10 on the rate
of perceived exertion scale for participants. After the post-exercise test, subjects rested for 5 minutes before beginning the Nanovi treatment.

The re-test was conducted within a few minutes of completing the Nanovi session. During the Nanovi sessions, subjects sat on a comfortable chair in a fully relaxed position and breathed normally while being connected to the nasal cannula of the Nanovi device.

Exposure to the Nanovi therapy yielded remarkable cardio-metabolic differences in almost all subjects, indicated through positive changes across several key biomarkers, including Respiratory Exchange Ratio, VO2max, tidal volume, and metabolic rate.

Respiratory Exchange Ratio (RER):

RER is the ratio between the volume of CO2 (VCO2) produced by the body and the volume of O2 (VO2) consumed during a metabolic analysis measurement through the PNOĒ device. The device measures both the VCO2 exhaled and the VO2 inhaled through the lungs during respiration. Therefore, RER= VCO2/VO2. RER can take values from 0.7-1.0, where an RER=0.7 demonstrates pure fat oxidation and an RER=1.0 demonstrates pure carbohydrate oxidation. When a mixture of substrates is utilized, RER is typically around 0.8. In other words, a high RER indicates that carbohydrates are predominantly used, whereas a low RER indicates that fats are mainly oxidized for energy production. A high resting RER is predictive of weight gain and body fat accumulation as well as metabolic inflexibility, a metabolic condition where the body cannot easily switch between fat and carbohydrate oxidation. Metabolic inflexibility is associated with metabolic conditions such as obesity, type-2 diabetes, insulin resistance, and fatty liver. On the contrary, a low resting RER demonstrates a high fat-burning efficiency, high metabolic flexibility, and thus protection from severe metabolic abnormalities like those described above. An RER > 1.0 can occur during maximal effort exercise, prolonged starvation, excessive recent energy consumption, as well as metabolic processes, such as de novo lipogenesis.

VO2max:

Maximal oxygen uptake or maximal aerobic capacity is defined as the maximum rate at which a subject can consume and utilize oxygen during an incremental exercise measurement to exhaustion while running, cycling, or rowing on the respective ergometer. A subject's VO2 max is reached when their oxygen uptake remains constant, although the intensity of the exercise test increases. VO2max is measured through a cardiometabolic analyzer, which very accurately measures the volumes of oxygen and carbon dioxide (VO2 and VCO2), such as the PNOĒ device. It is expressed in L/min or mL/min/kg. A VO2 max test is the gold standard method for assessing cardiovascular and respiratory fitness. According to the American Heart Association (AHA), VO2 max is the strongest predictor of all-cause and disease-specific mortality, thus biological age. Therefore, the fitter an individual is in terms of their cardiorespiratory fitness, meaning the higher their VO2 max, the lower their biological age and the more protected they are from chronic severe health issues, such as cardiovascular disease (CVD).

Tidal Volume:

Tidal Volume (VT) is the amount of air a person moves through their lungs with each respiratory cycle (a full inhalation/inspiration followed by a full exhalation/expiration). In other words, the volume of inspired and expired air that helps keep oxygen and carbon dioxide levels stable in the blood is what we call VT. The lungs are responsible for delivering a tidal volume capable of maintaining adequate ventilation. However, in cases of increasing demand, the diaphragm and other inspiratory muscles contribute by altering VT. For example, when oxygen consumption increases, and carbon dioxide accumulates during exercise, these muscles increase tidal volume to meet exercise demands. The average resting VT for a healthy male is around 500 mL and for a healthy female, around 400 mL. VT is measured both during a resting metabolic analysis measurement and a VO2 max through a cardiometabolic analyzer, such as the PNOĒ device. VT can also be measured through spirometry. VT is clinically significant because abnormal resting or exercise VT values are associated with pulmonary pathologies, such as chronic obstructive pulmonary disease (COPD). An abnormal resting VT is also a sign of hyperventilation, one of the most common but under-diagnosed health conditions that decrease quality of life. Chronic hyperventilation, which can either be attributed to respiratory disease or psychological stress, can reduce cognitive function, increase feelings of fatigue, and deteriorate psychological issues, such as stress and anxiety.

Resting Metabolic Rate:

Resting Metabolic Rate (RMR) is one of the three components of total daily energy expenditure (TDEE), along with the thermic effect of food (TEF) and activity-induced energy expenditure (AEE). RMR is the energy the body requires to maintain vital physiological functions such as body temperature regulation, respiration, heart rate, etc., at rest while being awake, in a fasted state, and in a thermoneutral environment. It accounts for up to 75% of TDEE and is affected by many factors such as age, sex, body composition, and disease status. The gold standard method for measuring RMR is indirect calorimetry, where a metabolic analyzer, such as the PNOĒ device, precisely measures the volume of carbon dioxide (VCO2) exhaled and the volume of oxygen VO2) inhaled through the lungs during respiration. The Weir equation transforms the volume of gasses (VCO2 and VO2) into the RMR, which is expressed in kcal. RMR can also be determined through predictive equations, such as the Harris-Bennedict and Mifflin equations, which are not as reliable though. The RMR measurement demonstrates whether a subject has a slow or fast metabolism, which is very important for a tailored dietary prescription. Therefore, RMR measured through indirect calorimetry is vital for accurately determining an individual's daily caloric burn and, thus, daily caloric intake. As a result, any weight goal, in terms of weight loss, maintenance, or gain, can more easily and effortlessly be attained through an accurate daily calorie prescription.

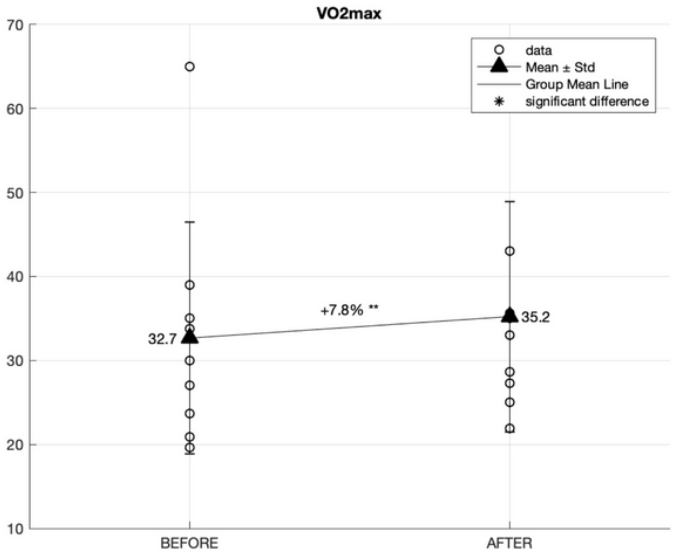
Crossover point:

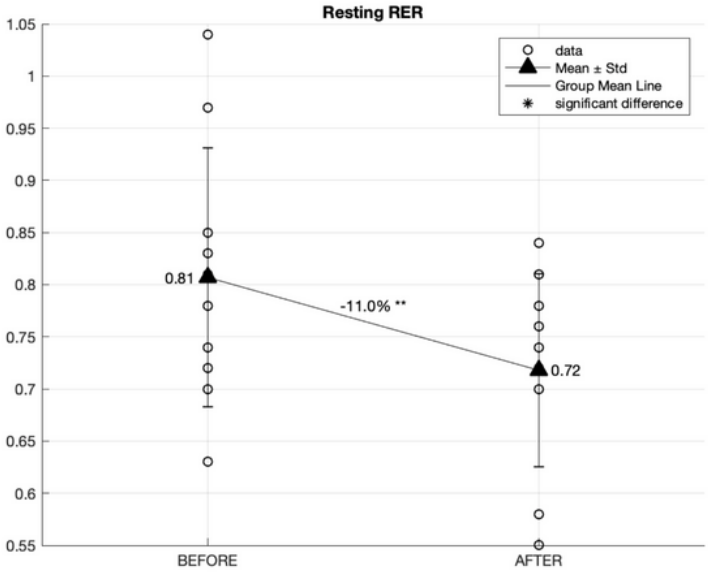
The crossover point is relevant to an incremental exercise measurement done through a cardiometabolic analyzer, such as the PNOĒ device. It occurs at the exercise intensity where fat and carbohydrate utilization intersect when the subject tested transitions from fat to carbohydrate utilization. Specifically, at low exercise intensities (25%-60% VO2 max), fat is the main substrate that provides adequate energy for exercise. As exercise intensity increases (> 65% VO2max), carbohydrate utilization starts to pick up, and fat utilization starts to fall. The point where the fat and carbohydrate utilization cross, meaning there is an equal (50/50) contribution from both substrates to energy production, is called the crossover point. The crossover point delineates the lower limit of training zone 2, which is the fat-burning zone. Typically, the more trained an individual is, the later the crossover point during the incremental exercise occurs. In other words, the fitter, a person is, the greater their ability to keep burning mainly fat while the exercise intensity increases, thus training for longer periods sparing their valuable glycogen stores.

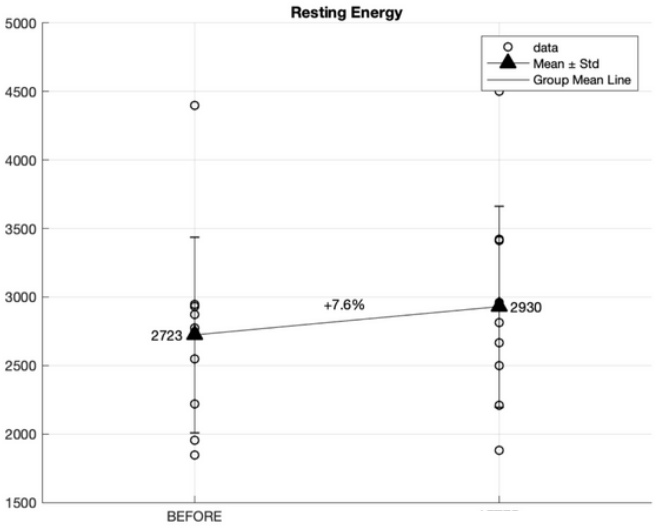
Discussion

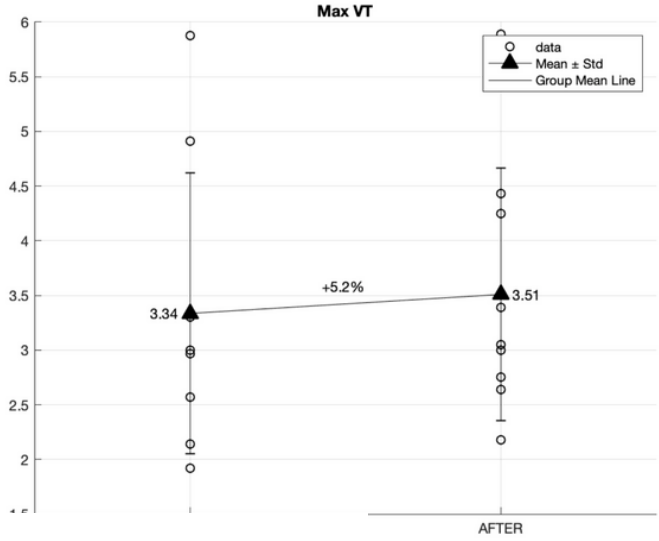
Based on the information collected, it is concluded that exposure to a 20-minute session with the Nanovi device yields significantly positive biological changes across key areas of human health. A key observation that sanctions further investigation is that individuals who are fitter, measured with a high degree of confidence based on their baseline VO2max test, experience much more drastic positive changes compared to less fit individuals. Although the mechanism of this phenomenon is not yet fully understood, it is hypothesized that improved capillary density of fitter individuals and the concomitant ability of their cells to absorb oxygen leads to better response to the Nanovi treatment.

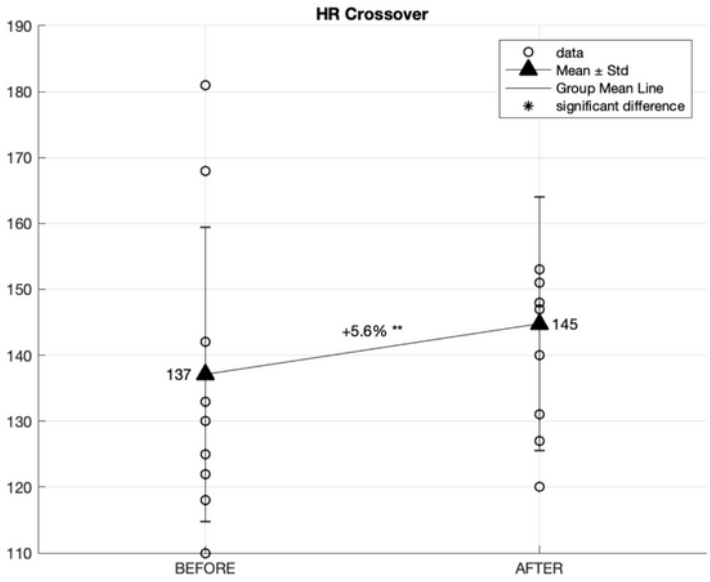
The following graphs show the differences before and after the Nanovi treatment for key cardiometabolic metrics, including VO2 max, maxVT, Crossover, Resting RER, and resting energy expenditure.











It is important to note that although statistically significant differences were observed in three of the five cardiometabolic variables, namely VO2 max, resting RER, and Crossover point, positive changes were also observed in resting energy expenditure and max VT. The statistically significant increase in VO2 max, resting RER, and crossover point strongly indicates that the Nanovi device improves one's fat-burning efficiency and biological age. The remaining 18 biomarkers are Not critical for evaluating change for this study.

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