

ROOM CALORIMETER SYSTEMS

A DEEPER UNDERSTANDING OF HUMAN METABOLISM AND ENERGY EXPENDITURE



MAASTRICHT INSTRUMENTS

World's leading company in providing unique room calorimeter solutions for experts in the field of human energy metabolism research.

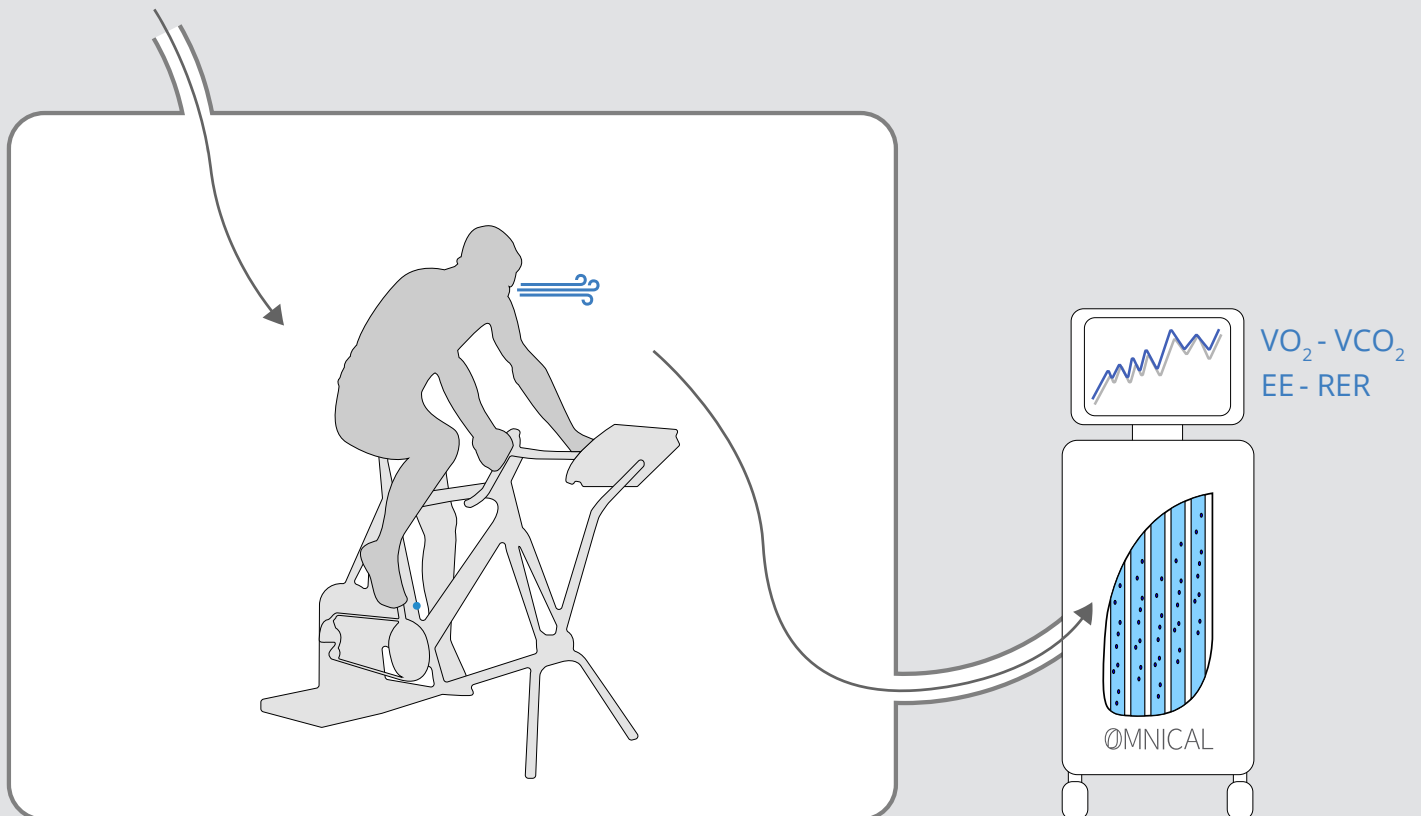
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ROOM CALORIMETERS

Room calorimeters are an invaluable, powerful tool in metabolic research studies. By using indirect calorimetry the research possibilities increase immensely in a wide range of clinical and research settings. These systems allow long term measurements (up to 7 days), without the limitations of a canopy or a face mask. They allow researchers to gain new insights in the dynamics of human energy expenditure, substrate oxidation and so much more.

Maastricht Instruments offers a wide range of room calorimeter systems, developed together with the researchers of Maastricht University. This proven technology has been used for over 35 years of in hundreds of research studies, and offers the highest level of accuracy available worldwide.



A room calorimeter allows to study a person's energy metabolism over longer durations under different circumstances. The systems consist of three different parts: the room itself, climate/circulation control and an analysis unit: the Omnical metabolic system. Fresh air is pulled through the room and both the in- and outgoing air is analyzed. This allows free movement of the test subject in a highly controlled environment. Study duration can vary from 2 hours to over 7 days, while fully controlling the environment (temperature, humidity, light, etc), diet, circadian rhythm, exercise protocols etc. Additional equipment and sensors can be easily integrated to widen the possibilities even more.



Wide range of research possibilities



System Accuracy Guaranteed



Research ready, turnkey solution



35 years of experience

MEASUREMENT PARAMETERS

BASIC PARAMETERS

- Amount of CO₂ produced (VCO₂)
- Amount of O₂ consumed (VO₂)
- Temperature
- Pressure
- Flow
- Humidity





DERIVED PARAMETERS

- Energy Expenditure (EE)
- Respiratory quotient (RQ/RER)
- Substrate oxidation (%Carbohydrate, %Fat, %Protein)
- Resting Metabolic Rate (RMR)
- Sleeping Metabolic Rate (SMR)
- Diet Induced Thermogenesis (DIT)

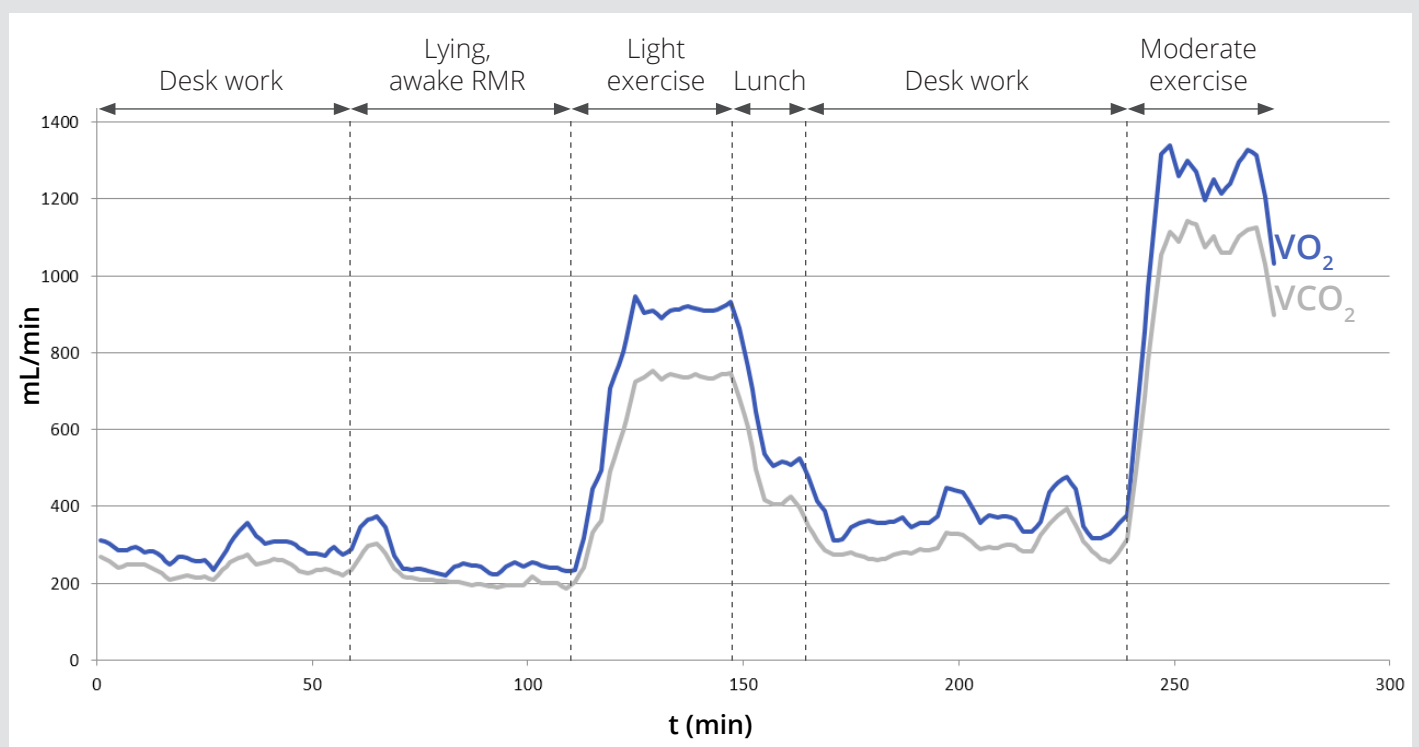
STUDY TYPES

-  Rest
-  Sleep
-  Sedentary activities
-  ADL / Low level exercise
-  Exercise testing
-  Diet

ENVIRONMENT CONDITIONS

-  Temperature
-  Humidity
-  Hypoxia
-  Light / Circadian Rhythm

The graph below shows an example of a study protocol, lasting a total of 4,5 hours. Shown are the VO₂ and VCO₂ coming directly out of the Omnical metabolic system, connected to a basic room calorimeter. In this protocol the subject was instructed to come in fastened and perform a combination of activities over this period: desk work (fastened and non-fastened), lying on a bed and performing light/medium exercise. These kind of combined protocols give room calorimeters a huge advantage over the traditional mask/canopy methods.



WIDE RANGE OF POSSIBILITIES

A broad range of system options are available, starting from an affordable system that is priced at a fraction of the cost normally associated with room calorimeters. It is installed in a matter of hours and immediately ready to perform groundbreaking research. The system can be used for a wide variety of research, ranging from nutritional studies to sports recovery. It can even accommodate bedridden subjects who cannot be measured using traditional techniques with masks or hoods. The most advanced systems are capable of fully controlling all conditions inside: temperature, humidity, light conditions and many other parameters. All systems allow free movement inside and are easy to use.

For all its room calorimeter and other metabolic systems, Maastricht Instruments guarantees accuracy on VO₂ and VCO₂ levels and provides equipment and methods to perform methanol burns, validating accuracy and increasing confidence in research results.



APPLICATIONS

Indirect calorimetry remains the gold standard in measuring energy expenditure and substrate oxidation in a wide range of clinical and research settings. The methods most commonly used have a severely limited time frame: both hood and mask measurements only last 20 minutes typical. This gives limited insight into the dynamics of physiological responses in the human body. Longer measurements are crucial to gain a better insight in human metabolism. The most practical way of achieving this is in a room calorimeter. Test subjects can move around, spend multiple days in a fully controlled environment, all while measuring energy expenditure and the associated parameters.

Obesity and type-2 diabetes

Recently, associations between obesity and type 2 diabetes has yielded a whole new range of research application investigating the link to energy expenditure and substrate utilization (e.g. fats and carbohydrates). Room calorimeters are an ideal modality for such research as they capture long-term dynamics, which are of greater relevance when considering life-style or habitual behavior. They are also the only method of capturing true 24-hr response, an actual representation of the subject's free-living conditions

Sleep and Circadian Rhythm

The relationship between metabolic function and circadian rhythm has become increasingly investigated, with the effects of modern 24-hr culture being linked to the rise in metabolic syndrome, and the impact of poor quality sleep being seen as a confounding factor. Due to the requirement to include sleeping periods and extended diurnal cycles, chambers are the only method of investigating these phenomena. In addition, the ability to control the dark-light cycle, makes the chambers the ideal candidate for circadian intervention.

Dietary Intervention

The concept of energy balance is key to the disciplines of dietetics and nutrition. However, the energy expenditure side of this equation often relies on food questionnaires and interviews, which are often subjective, and known to lack robustness and accuracy. This is changing with an increase in the number of studies incorporating indirect calorimetry into the protocols. Room calorimeters are particularly relevant to this field of study due to an interest in long-acting physiological response to food, with many measurements taking up to 6 hours to be completed.

EXAMPLES



Singapore:
Full climate controlled rooms



Versatile design:
Room calorimeter for hospitalised patients

MAASTRICHT INSTRUMENTS

Maastricht Instruments BV (MI) is a private limited company originating from the engineering department of the Faculty of Health, Medicine & Life Sciences of the Maastricht University Medical Center+ in the Netherlands. The company is founded in 1998 and has grown into a specialized high-tech company providing worldwide high demanding customers with innovative technical solutions in the field of medicine and life sciences.

Maastricht Instruments has a close working relationship with the Department of Human Biology of Maastricht University Medical Center+. This department has over 35 years of experience in the field of indirect calorimetry and is one of the world's leading research groups related to human energy metabolism research. Through this relationship, Maastricht Instruments has gained advanced knowledge in development of high-end indirect calorimetry equipment.

The objective of Maastricht Instruments is to provide customers active in the field of human energy metabolism, nutrition- and sports sciences with high-end indirect calorimetry equipment ensuring reliable and validated results.



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