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Quark CPET

Exercise - Breath by Breath

Validation of the COSMED Quark CPET Respiratory gas analyser in the BBB mode

Third party validation by Lennart Gullstrand, Thomas Lindberg and Juan Alonso. 2013 Elite Sport Centre, Bosön, Swedish Sports Confederation, Lidingö, Sweden

METHODOLOGY: The study included 9 well trained athletes with a VO2 peak around 5 L· min-1 and high VE exercising at well controlled submaximal steady state conditions and at work rates leading to exhaustion. The reference measurement method used was the Douglas bag method (DB).

CONCLUSIONS: Despite some differences between the Quark CPET in the BxB mode and the DB reference method this device is most interesting in many aspects. The validation results are in the range of other similar BxB devises.

Validation versus "First Principles" Metabolic Calibrator.

Third party validation by Australian Institue of Sport (AIS) 2010.

METHODOLOGY: The 'first principles' metabolic calibrator is capable of delivering precise cyclic air flows of known tidal volume, frequency and gas makeup. "First principles" systems are advantageous in validation testing because their calibration is based solely on easily measured and verified quantities such as length and time. See: Gore CJ, Catcheside PG, French SN, Bennett JM, Laforgia J. Automated VO2max calibrator for opencircuit indirect calorimetry systems. Med Sci Sports Exerc 1997; 29(8):10951103.

CONCLUSIONS: The results of the test indicate that overall, the COSMED Quark CPET Metabolic Cart appears to be accurate for assessment of the metabolic rate of athletes during exercise.

Useful Links

COSMED Homepage

http://www.cosmed.com

Exercise - Mixing Chamber

Validity of COSMED's quark CPET mixing chamber system in evaluating energy metabolism during aerobic exercise in healthy male adults.

Nieman DC, Austin MD, Dew D, Utter AC. Res Sports Med. 2013;21(2):136-45. doi: 10.1080/15438627.2012.757227.

PURPOSE: This study validated the accuracy of COSMED's Quark cardiopulmonary exercise testing (CPET) metabolic mixing chamber system in measuring metabolic factors during maximal, graded exercise testing.

METHODOLOGY: Subjects included 32 physically active men between the ages of 18 and 34 years. During the first test session, subjects were measured for maximal oxygen consumption twice (15 min separation) with the CPET and Douglas bag systems (random order). During the second test session, subjects exercised through four stages of the Bruce treadmill protocol with measurement by the CPET and Douglas bag systems (random order) during steady state at the end of each 3-minute stage.

RESULTS: Statistical analysis using a 2 (systems) x 5 (time) repeated measures ANOVA showed that the pattern of change in VO2, VCO2, VE, FeO2, FeCO2, and RER did not differ significantly between CPET and Douglas bag systems.

CONCLUSIONS: This validation study indicates that the CPET mixing chamber system provides valid metabolic measurements that compare closely with the Douglas bag system during aerobic exercise.

Validation of the Cosmed Quark CPET Respiratory gas analyser

Third party validation by Lennart Gullstrand, Thomas Lindberg and Juan Alonso. 2013 Elite Sport Centre, Bosön, Swedish Sports Confederation, Lidingö, Sweden

METHODOLOGY: The study included 10 well trained athletes with a VO2 max $\geq$ 5 L· min-1 and high VE max exercising at well controlled submaximal steady stateconditions and at work rates leading to exhaustion. The reference measurement method used was the Douglas bag method (DB).

CONCLUSIONS: Despite differences in VE and some other differences the validation results this device is most interesting in many aspects. For use in the Sports medicine area the 7 L volume mixing chamber will probably match any big and well trained endurance athlete with exceptional tidal volumes (> 5 L).

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Resting - Canopy Hood

A Test of Validity of a New Open-Circuit Indirect Calorimeter.

Ashcraft CM, Frankenfield DC. JPEN J Parenter Enteral Nutr. 2014 Mar 10.

BACKGROUND: Indirect calorimetry is an accurate way to measure resting metabolic rate. The Deltatrac Metabolic Monitor is considered a criterion standard but is no longer manufactured. New-generation indirect calorimeters have been introduced, but there are limited published validation data comparing these devices to criterion instruments.

METHODOLOGY: A prospective, observational, N-of-1 trial was conducted to validate a new-generation indirect calorimeter against a gold standard device. This design was chosen to minimize and define the degree of biological variation, thus focusing on variation due to the devices. Measurements of gas exchange using both indirect calorimeters were conducted daily for 10 consecutive days. Another set of measurement pairs was conducted using just the criterion device for 10 days. Ninety-five percent confidence intervals of differences were used to test for bias. Precision was defined as repeat measures with one device falling within 5% of the other at least 90% of the time.

RESULTS: There were no statistically significant differences between the devices for any measured or calculated parameter. Interdevice differences were no larger than intradevice differences using the criterion instrument. The values obtained from the new device were precise and unbiased compared with the values obtained from the gold standard device.

CONCLUSIONS: The new indirect calorimeter measures gas exchange in a reliable and accurate manner compared with a gold standard device. The two devices are equivalent.

A new indirect calorimeter is accurate and reliable for measuring basal energy expenditure, thermic effect of food and substrate oxidation in obese and healthy subjects

Emilie Blond, , Christine Maitrepierre, Sylvie Normand, Monique Sothier, Hubert Roth, Joelle Goudable, Martine Laville. e-SPEN, the European e-Journal of Clinical Nutrition and Metabolism Volume 6, Issue 1, February 2011, Pages e7–e15

PURPOSE: The objectives of the study were to validate accuracy and reliability of the QUARK RMR, an indirect calorimeter versus the DELTATRAC II™, a well-established reference system which is no longer available, in resting and post-prandial conditions.

METHODOLOGY: A crossover, randomized study was performed in 30 subjects for two consecutive days. Resting metabolic rate (RMR) was measured for three 45 min periods using alternating calorimeters. Means of RMR were then compared with Pearson's test and Bland and Altman plot. Thermic effect of food (TEF) and substrate oxidation were assessed for 3 h with each calorimeter, 15 min after meal ingestion, and were compared by longitudinal analysis.

RESULTS: Means at rest of VO2, VCO2, RMR and substrate oxidation were not significantly different with both devices. The variability of VO2, VCO2 and RMR measurements, at rest, for each device, on two consecutive days, was similar to that measured with QUARK RMR and DELTATRAC II™ the same day, under standardized conditions. Longitudinal analysis of TEF and post-prandial substrate oxidation was equivalent with the two devices.

CONCLUSIONS: The QUARK RMR calorimeter seems to be a valid system to measure energy expenditure in resting and post-prandial conditions in obese and healthy subjects.