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Fitmate

Resting Energy Expenditure (REE) with Mask

Comparison between two metabolic monitors in the measurement of resting energy expenditure and oxygen consumption in diabetic and non-diabetic ambulatory and hospitalized patients.

Lupinsky L, Singer P, Theilla M, Grinev M, Hirsh R, Lev S, Kagan I, Attal-Singer J. Nutrition. 2015 Jan;31(1):176-9. doi: 10.1016/j.nut.2014.07.013. Epub 2014 Aug 7.

PURPOSE: The aim of this study was to assess the validity and reliability of the Fitmate metabolic system in measuring the oxygen consumption and resting metabolic rate (RMR) in ambulatory and hospitalized patients.

METHODOLOGY: We conducted a prospective simultaneous clinical comparison. We enrolled 37 patients (19 women and 18 men) for the four groups of the study. Group 1 (n = 12) included patients receiving home parenteral nutrition. Group 2 (n = 5) included diabetic overweight outpatients with body mass index >30 kg/m² and hemoglobin A1c > 8 g/dL. Group 3 (n = 10) included hospitalized patients receiving artificial nutrition. Group 4 (n = 10) included patients with congenital heart disease, pulmonary hypertension of any etiology, and other heart disease who have had hemodynamic evaluation during catheterization by the adult congenital team. The patients were tested successively during the same session using the Fitmate metabolic system for 15 min and the Deltatrac II metabolic monitor for 20 min, measuring resting energy expenditure and oxygen consumption. The test was conducted in random order.

RESULTS: No significant differences were found between Fit Mate and Deltatrac II for oxygen consumption (238 ± 18 and 240 ± 18 mL/min, respectively, P = 0.72, r = 0.86, mean ± SD absolute difference 22.32 ± 16.99 mL/min) or RMR (1659 ± 122.34 and 1625 ± 118.4 kcal/d, P = 0.28, r = 0.87, mean ± SD absolute difference 152.9 ± 111.95 kcal/d). A degree of limit of agreement (403 kcal) was observed using the Bland-Altman test. When compared with Harris-Benedict predictive equations, Fitmate was found to be superior in accuracy.

CONCLUSIONS: These data indicate that the Fitmate using a mask provided a fair evaluation of REE despite a large limit of agreement. It remains a reliable and valid system for measuring oxygen consumption and RMR in nonventilated patients.

Inter- and intra-day test-retest reliability of the Cosmed Fitmate ProTM indirect calorimeter for resting metabolic rate

Bill Campbell, Gina Zito, Ryan Colquhoun, Nic Martinez, Courtney St Louis, Mallory Johnson, Laura Buchanan, Matt Lehn, Yasmin Smith, Brad Cloer, and Kathryn Raines. J Int Soc Sports Nutr. 2014; 11(Suppl 1): P46. Published online 2014 Dec 1. doi: 10.1186/1550-2783-11-S1-P46

PURPOSE: In order to make objective and intelligent decisions regarding caloric intake for fat loss/physique enhancement, one's resting metabolic rate should be measured. It is important that the device used to measure resting metabolic rate be valid and reliable. Therefore, the purpose of this study was to establish the inter- and intra-day test-retest reliability of the Cosmed Fitmate ProTM indirect calorimeter for resting metabolic rate (RMR).

METHODOLOGY: 34 participants (18 males [27 ± 9.5 years, 176.3 ± 7.0 cm, 85.5 ± 14.8 kg, 27.4 ± 4.1 BMI] and 16 females [31 ± 13 years, 163.4 ± 5.8 cm, 61.1 ± 12.3 kg, 22.9 ± 4.6 BMI]) volunteered to have their RMR measured a total of three times on two different days. On day 1, two 15-minute RMR tests were completed in back to back fashion. On day 2 (occurring within 7 days of day 1), another 15-minute RMR test was conducted. All RMR tests were conducted after an overnight fast in a rested condition. Reliability of RMR was evaluated using Pearson's correlation, intraclass correlation coefficients (ICC), standard error of the measurement (SEM), and standard error of the measurement as a percentage of the mean (SEM%). Systematic error was examined using a one-way repeated measures ANOVA. Data was analyzed using SPSS version 22.0. Consent to publish the results was obtained from all participants.

RESULTS: Average RMR values for each test are shown in Table Table11 below. The intra-day RMR Pearson correlation was r = 0.96 (p < 0.01) and the inter-day RMR Pearson correlation was r = 0.90 (p < 0.01). Intra-day RMR ICC was 0.981 and the inter-day RMR ICC was 0.946. Intra-day RMR SEM (SEM%) was 70.62 (4.13%) kilocalories. Inter-day RMR SEM (SEM%) was 116.9 (6.89%) kilocalories.

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CONCLUSIONS: The Cosmed Fitmate ProTM indirect calorimeter is a reliable instrument for measuring resting metabolic rate in non-overweight males and females. The instrument demonstrated test-retest reliability both within the day and between two different days. Relative consistency was acceptable with ICC values of 0.981 and 0.946 for intra and inter-day measures, respectively. Absolute consistency was also acceptable with SEM values (expressed as a percentage of the mean) of 4.13% and 6.89% for intra and inter-day measures, respectively. Further, the ANOVA results indicated no systematic error among tests and days.

Portable Indirect Calorimetry for Estimating Resting Metabolic Rate both Reliable and Feasible in Community Dietetics

J.A. Langius, A. Steensma, C.X. Kaloter, P.M. Groen, F.M. Vlieland, W.A. Visser, D.W. Voskuil. Clinical Nutrition 2014 Vol. 33 Supplement 1 S86:

PURPOSE: To assess test-retest reliability of a desktop indirect calorimeter (FitMate®RMR, Cosmed) in non-fasting circumstances and after minor exercise, and to qualitatively study dietitians' and clients' perception of feasibility in community dietetic practice.

METHODOLOGY: Quantitative reliability study A total of 70 individuals participated (some twice): n=18, four measurements under fasting and resting circumstances (two repeated measurements per day, two days); n=27, four measurements under different circumstances (two measurements/day, one day in fasting state, one day after light breakfast); n=34, two measurements under different circumstances (repeated measurement before and after minor exercise followed by 10 minutes rest, one day). All measurements were performed in supine position. Intra-class correlation coefficients (ICC) were calculated to assess reliability. Qualitative feasibility study Eight dietitians and eight clients (Rivas Zorggroep) were interviewed after conducting and experiencing a RMR measurement respectively. Semi-structured interviews were audio-recorded and transcribed. Data were analyzed thematically, identifying and labeling segments of text.

RESULTS: Median RMR ranged between 1705 and 2027 kcal in 10 measurement sessions. All ICC's were higher than 0.70, suggesting sufficient reliability. The highest ICC (0.96; mean difference 44 kcal) was found for repeated measurements under identical circumstances on the same day. The lowest ICC (0.71; mean difference 141 kcal) was found for different circumstances (fasting vs non-fasting) on different days. Dietitians found RMR assessment applicable in their dietetic practice and expected it to improve personalized counseling. Clients experienced no barriers for RMR measurement and expected it to increase their insight in energy balance and diet.

CONCLUSIONS: Estimating RMR using the Fitmate®RMR is sufficiently reliable and feasible to implement and improve counseling in community dietetic practice.

Indirect calorimetry in the assessment of the energy requirement in overweight and obese women

Ewa Lange, Dominika Głbska, Dariusz Włodarek. Advances in Science and Technology Research Journal Volume 7, No. 20, Dec. 2013, pp. 91–97

PURPOSE: Individual total energy expenditure may be calculated as a sum of basal energy requirement and energy expenditure associated with physical activity. Measurement of basal energy requirement is not often conducted in dietetic practice, but may be applied using indirect calorimetry.

METHODOLOGY: The aim of the analysis was to present the possibilities of using the Fitmate PRO monitor in the assessment of resting metabolic rate and basal energy expenditure with a method of indirect calorimetry in a group of 91 overweight and obese women in various age.

RESULTS: The mean results of the resting metabolic rate measured with method of indirect calorimetry using the Fitmate PRO monitor did not differ in the age groups of overweight and obese women. The results of the resting metabolic rate measured with method of indirect calorimetry using the Fitmate PRO monitor were correlated with body mass, height, fat mass, muscle mass and waist circumference.

CONCLUSIONS: The Fitmate PRO monitor may be a valuable tool in everyday dietetic practice to assess the basal energy expenditure with method of indirect calorimetry in a group of overweight and obese women.

Validation of Cosmed's FitMate in measuring oxygen consumption and estimating resting metabolic rate.

Nieman DC, Austin MD, Benezra L, Pearce S, McInnis T, Unick J, Gross SJ. Res Sports Med. 2006 Apr-Jun;14(2):89-96.

PURPOSE: The purpose of this study was to assess the validity and reliability of the FitMate metabolic system (Cosmed, Rome, Italy) in measuring oxygen consumption and estimating resting metabolic rate (RMR). The FitMate is a new, small (20 x 24 cm) metabolic analyzer designed for measurement of oxygen consumption and energy expenditure during rest and exercise.

METHODOLOGY: Subjects included 60 healthy adults (N = 30 males, N = 30 females) ranging in age from 19 to 65 years (mean +/- SD age, 36.9 +/- 13.4 years) and body mass index (BMI) from 19.2 to 44.8 kg/m2 (27.7 +/- 6.2 kg/m2). Subjects were given two 10 min RMR tests in one test session during which RMR was measured simultaneously with the Douglas bag and FitMate systems.

RESULTS: No significant differences were found between Douglas bag and FitMate systems for oxygen consumption (242 +/- 49 and 240 +/- 49 ml/min, respectively, P = 0.066, r = 0.97, mean +/- SD absolute difference 2.83 +/- 11.68 ml/min) or RMR (1,662 +/- 340 and 1,668 +/- 344 kcal/day, P = 0.579, r = 0.97, mean +/- SD absolute difference 5.81 +/- 80.70 kcal/day).

CONCLUSIONS: These data indicate that the FitMate is a reliable and valid system for measuring oxygen consumption and RMR in adults.

Resting Energy Expenditure (REE) with Canopy

A comparison of COSMED metabolic systems for the determination of resting metabolic rate.

Vandarakis D, Salacinski AJ, Broeder CE. Res Sports Med. 2013;21(2):187-94. doi: 10.1080/15438627.2012.757226.

PURPOSE: This study determined the reliability of measuring resting metabolic rate (RMR) with COSMED's FitMate™ metabolic system using a canopy dilution set-up compared with a previously validated COSMED QUARK CPET research-based system in 30 healthy adults (age: 28.4 ± 7.0 yrs, weight: 79.9 ± 20.2 kg, percent body fat: 22.5 ± 8.6%). The FitMate was developed as an inexpensive metabolic system for RMR and fitness testing.

METHODOLOGY: Subjects were randomly assigned to start testing on either the FitMate or Quark CPET for four 10-minute measurements.

RESULTS: Test-retest intraclass correlations were 0.95-0.99, p ≤ 0.0001 for all parameters tested. Ve, RMR, VO2, and heart rate were not significantly different between the two systems.

CONCLUSIONS: These results suggest that the FitMate is a reliable canopy dilution system for RMR measurements in healthy adults.

Exercise Testing (Maximal)

Comparison of COSMED'S FitMate™ and K4b2 metabolic systems reliability during graded cycling exercise.

Jeanick Brisswalter & Marcus Peikriszwili Tartaruga. Scandinavian journal of clinical and laboratory investigation ISSN: 1502-7686 2014 Pages: 722-724

PURPOSE: This study compared the reliability of the Cosmed FitMate ™ and K4b2 metabolic systems during light to heavy steady state exercise.

METHODOLOGY: Expired gas, ventilation were recorded in 50 subjects, using in a random order among four sessions, either the FitMate ™ or the Cosmed K4b2.

RESULTS: No differences in oxygen consumption were observed between the two systems whatever the intensity. Intraclass correlation were high for both analyzers (respectively for the FitMate ™ system and the Cosmed K4b2; ICC: 0.76 – 0.88 vs. 0.88 – 0.95).

CONCLUSIONS: The FitMate ™ metabolic system could be a useful reliable and easy-to-use metabolic system in energy expenditure measurement.

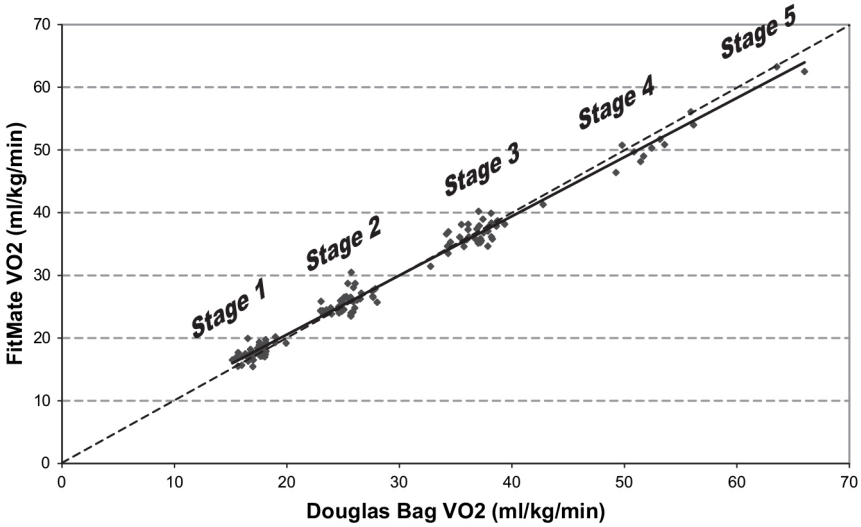
Validation of Cosmed's FitMate in measuring exercise metabolism.

Nieman DC, Lasasso H, Austin MD, Pearce S, McInnis T, Unick J. Res Sports Med. 2007 Jan-Mar;15(1):67-75.

PURPOSE: The purpose of this study was to assess the validity of the FitMate metabolic system (Cosmed, Rome, Italy) in measuring oxygen consumption during graded exercise. The FitMate is a new, small (20 x 24 cm) metabolic analyzer designed for measurement of oxygen consumption during rest and exercise.

METHODOLOGY: Subjects included 40 healthy adults (N = 20 males, N = 20 females) ranging in age from 18 to 37 kg/m2 (mean +/- SD age, 22.5 +/- 3.6 years) and body mass index (BMI) from 18.3 to 32.5 kg/m2 (23.2 +/- 3.3 years). One-minute FitMate and Douglas bag measurements were made during steady state conditions at the end of each 3-minute stage of the Bruce treadmill graded exercise test, and subjects continued until they could not attain steady state exercise during a stage.

RESULTS: Oxygen consumption difference scores (Douglas bag minus FitMate measurements) did not differ between males and females, so data were combined and analyzed for the entire group. During the first three stages, mean oxygen consumption did not differ significantly between the Douglas bag and FitMate systems (26.5 +/- 1.1 and 26.7 +/- 1.3 ml.kg-1.min-1, respectively, P = 0.140) with a mean absolute difference of 0.23 +/- 0.91 ml.kg-1.min-1 or 14.2 +/- 67.5 ml.min-1.



CONCLUSIONS: In conclusion, the FitMate metabolic system accurately measures oxygen consumption during graded treadmill exercise when compared with the Douglas bag system in male and female adults.

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 for the evaluation of the COSMED FITMATE Pro indicate that the system is reliable and accurate to within ~ ± 5.0% of the predicted values for VO2. Overall, the COSMED FITMATE Pro appears to be accurate for VO2 assessment of athletes during exercise.

Exercise Testing (Sub-Maximal)

Validation of the Cosmed Fitmate for prediction of maximal oxygen consumption.

Lee JM, Bassett DR Jr, Thompson DL, Fitzhugh EC. J Strength Cond Res. 2011 Sep;25(9):2573-9. doi: 10.1519/JSC.0b013e3181fc5c48.

PURPOSE: The main purpose of this study was to assess the validity of the Cosmed Fitmate (FM) for the prediction of maximal oxygen consumption (VO(2)max). In addition, this study examined whether measuring submaximal VO(2), rather than predicting it, can improve upon the prediction of VO(2)max.

METHODOLOGY: Participants for the study were 48 young to middle-age adults (32 men, 16 women), with a mean age of 31 yr. Each participant completed a submaximal and maximal treadmill test on 2 separate occasions. During the submaximal test, VO(2)max was predicted using the FM. This device extrapolates the linear regression relating heart rate (HR) and measured VO(2) at submaximal work rates to age-predicted maximum HR (HR = 220 - age). The criterion measure was obtained using a graded, maximal treadmill test, with VO(2) measured by the Douglas bag (DB) method.

RESULTS: There was no significant difference between VO(2)max predicted by the FM and VO(2)max measured by the DB method. The results of this study showed that a strong positive correlation (r = 0.897) existed between VO(2)max predicted by the FM and VO(2)max measured by the DB method, with a standard error of the estimate (SEE) = 3.97 ml·kg(-1)·min(-1). There was a significant difference in VO(2)max predicted by the American College of Sports Medicine (ACSM) metabolic equations and VO(2)max measured by the DB method ($p = 0.01$). The correlation between these variables was r = 0.758 (SEE = 5.26 ml·kg(-1)·min(-1)).

CONCLUSIONS: These findings indicate that a small, portable, and easy-to-use metabolic system provides valid estimates of VO(2)max, and improves upon predictive accuracy, compared to using generalized ACSM metabolic equations.

"Tailored" Step Test For Rapid, Accurate And Safe Vo2max Determination In Healthy Elderly

Bellotti, Cecilia; Casiello, Lorenzo; Pogliaghi, Silvia. Medicine & Science in Sports & Exercise: May 2009 - Volume 41 - Issue 5 - p 362

PURPOSE: The study aimed at developing and validating a "tailored" version of the Åstrand step test, suitable for VO2max determination in healthy elderly. Furthermore, we tested the hypothesis that a direct measure (compared to estimation) of the step test VO2, adds accuracy to VO2max determination in this population, characterized by low fitness and muscle strength and reduced coordiantive ability.

METHODOLOGY: In 27 healthy elderly (age 68+5, 14 M, 13 F) a target VO2 (tVO2) for the step test was calculated as 60% of the VO2max (predicted based on their referred activity pattern). Thereafter, subjects performed a 5-min test, on a 30 cm step, with a stepping rate (10-25 steps*min-1) "tailored" based on tVO2 and the predicted cost of stepping. Heart rate (HR) and VO2 were measured using a portable, hand-held, metabolic analyzer. VO2max was estimated based on Åstrand equation and age correction using either tVO2 (testVO2max) or measured VO2 (m-estVO2max). Finally, VO2max was measured directly (dVO2max) during an incremental cycling test to exhaustion with breath by breath determination of cardiorespiratory variables, with a traditional metabolic chart Agreement among t-estVO2max, m-estVO2max and dVO2max was evaluated by Bland Altman

analysis.

RESULTS: All the subjects completed the incremental exercise to exhaustion (maximal HR 98±7% of age-predicted value, maximal respiratory quotient 1.1±0.04). Mean ± standard deviation dVO2max was 27±5 ml*kg-1*min-1. All the subjects were also able to complete the "tailored" step test with no difficulty. m-estVO2max was not significantly different from dVO2max (bias -0.3, not different from 0; precision 4.1 ml*kg-1*min-1). On the contrary, t-estVO2max was significantly underestimated compared to dVO2max (bias -2.3, ≠ 0; precision 4.6 ml*kg-1*min-1).

CONCLUSION: The study developed and validated a "tailored" version of the Åstrand step test, suitable for a rapid (5 min duration), safe (submaximal test) and accurate (unbiased) VO2max determination in healthy elderly individuals. In this population, estimation of the step test VO2 leads to a small (9%) yet significant error in VO2max estimation. Therefore, our data suggest that a direct measure of the step test VO2 should be performed to assure accuracy to VO2max.estimation.