Age-related decline of resting energy expenditure in humans with similar body weight: First results of the indirect-calorimetry (IC-) BASAROT project

P061

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Rationale

It is well established that resting energy expenditure (REE) decreases with age. Data derived from indirect calorimetry (IC) are still limited with respect to the number of high aged individuals, BMI groups and health conditions. Therefore, IC generated REE of the BASAROT sample and those calculated according to the Harris-Benedict (HB) equation were used to re-evaluate the proposed association between REE and age.

Methods

The IC-BASAROT sample combines the result of IC performed in 2622 individuals from 10 centers (7 Germany, 2 Italy, 1 Netherlands) done under strictly standardized conditions (e.g. at least 8h of fasting) in free-living, mostly healthy adults aged 18 to 100 years including all BMI ranges. IC was performed by canopy technique (Cosmed Quark RMR/Sensor Medics Vmax29) in 96.5% of cases and by face mask (Cosmed Fitmate) in 3.5%. Weight was measured by calibrated scales and height was determined to the nearest of 1mm.

Results

REE in the total sample (BMI: 26.9±9.1 kg/m², 43.7±17.6 y) correlated more positively with body weight than with BMI (Figure 1). Gender+body weight explained 75% of REE variance, gender+BMI 69% and gender+age only 28%. To reduce confounding by body weight we performed age-related analysis in the subgroup of women weighing 50-79 kg (n=780, BMI: 23.4±3.4 kg/m², 41.4±18.5 y) and men weighing 60-89 kg (n=500, BMI: 24.9±3.0 kg/m², 47.5±19.3 y) and compared results with REE_{HB} (tab. 1).

IC results from 18 to 100 y showed an approximately 50% lower decrease in REE than HB in women (-129 kcal/d vs. -257 kcal/d) and in men (-200 kcal/d vs. -406 kcal/d, tab. 1). REE_{IC} (n=1280) did not correlate with age (r=-0.042; p=0.132, fig 2). In line, we observed a significant overestimation of REE by HB up to 39 y in both sexes and an underestimation in men 60 y of age and older.

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Conclusion

Age-related decline in REE appears to be lower than expected and might due to changes in body composition both in the younger and older generation. No indication of the often proposed systematic overestimation of HB in women was seen. Overall, findings should be considered in future models for estimating REE.

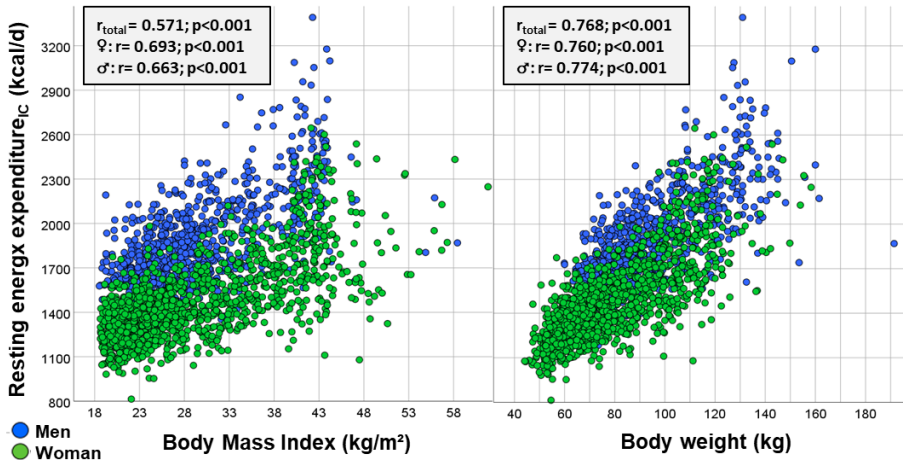

Figure 1: Correlations of REE_{IC} with BMI or body weight, n=2187

REE_{IC} = resting energy expenditure measured by indirect calorimetry

780 women (body weight: 50-79 kg)					500 men (body weight: 60-89 kg)				
Age (y)	REE_{IC} (kcal/d)	REE_{HB} (kcal/d)	p	BW (kg)	Age (y)	REE_{IC} (kcal/d)	REE_{HB} (kcal/d)	p	BW (kg)
18-29 n=321	1351±133	1450±72	**<0.001**	62.6±7.2	18-29 n=140	1754±187	1841±119	**<0.001**	75.5±7.7
30-39 n=106	1370±166	1424±79	**<0.001**	64.3±7.9	30-39 n=75	1674±190	1801±120	**<0.001**	77.6±7.7
40-49 n=88	1377±144	1384±82	0.0582	66.1±8.5	40-49 n=53	1713±193	1721±132	0.754	77.2±8.4
50-59 n=105	1302±154	1330±81	0.032	65.4±8.2	50-59 n=56	1705±170	1669±122	0.105	79.5±7.3
60-69 n=86	1322±174	1308±85	0.319	67.8±8.5	60-69 n=96	1700±186	1631±96	**<0.001**	81.4±6.2
70-79 n=46	1268±145	1231±83	**0.042**	64.9±8.0	70-79 n=52	1567±174	1512±110	**0.010**	78.4±6.8
80-100 n=28	1222±126	1193±90	0.119	66.6±8.8	80-100 n=28	1554±219	1435±131	**<0.001**	77.0±8.5

IC=indirect calorimetry, BW=body weight, mean±standard deviation, paired sample t-test

Table 1: Measured (REE_{IC}) versus calculated REE (REE_{HB}, Harris-Benedict equation)

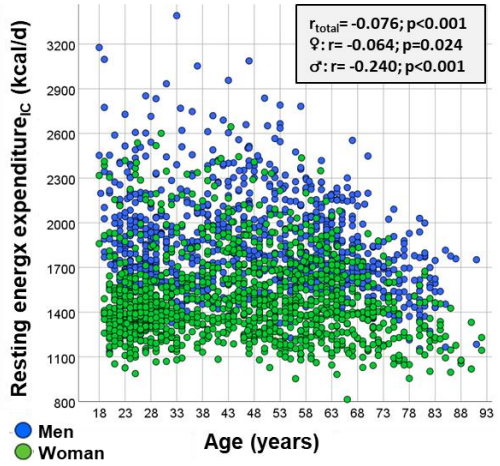

Figure 2: Correlations of REE_{IC} with age, n=2187