The accuracy of resting metabolic rate prediction equations in male athletes

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The prediction of resting metabolic rate (RMR) via equations which incorporate expedient measures such as body mass, height and age are routinely used to estimate energy expenditure to help formulate dietary recommendations. However, little research has been conducted to determine whether these equations, which were generated on the general population, are valid for athletes. Athletes generally have a greater fat free mass (FFM), which is the main determinant of the RMR, than their non-athletic counterparts. De Lorenzo et al. (1) have reported that several equations significantly underestimated the RMR for their 51 Italian male athletes. The aim of this study was therefore to confirm this finding with the Harris & Benedict (2), Schofield (3), Piers et al. (4) and van der Ploeg et al. (5) equations in 16 highly trained Australian middle distance runners and triathletes ($\bar{X}$ ± SD: age = 23.7 ± 5.9 yr, height = 177.6 ± 6.1 cm, mass = 70.49 ± 7.59 kg, %BF = 11.8 ± 2.6, RMR = 7.74 ± 0.97 MJ/d). The latter two equations were specific for young (18-30 yr) Australian males. The equation developed by De Lorenzo et al. (1) for trained males was also applied to our subjects. The data are presented below:

Equation	RMR (MJ/d)[a]	r[b]	$Mean_{diff}$ (MJ/d)[c]	P[d]
Harris & Benedict	7.37 ± 0.55	0.838	0.37 ± 0.59	0.025
Schofield	7.34 ± 0.48	0.917	0.40 ± 0.56	0.012
Piers et al.	7.01 ± 0.39	0.917	0.73 ± 0.63	< 0.001
van der Ploeg et al.	6.89 ± 0.41	0.917	0.85 ± 0.62	< 0.001
De Lorenzo et al.	7.77 ± 0.57	0.888	- 0.01 ± 0.53	0.846

[a]: mean ± SD, [b]: correlation between measured and predicted RMR, [c]: mean difference between the measured and predicted RMR ± SD, [d]: significance of the difference between the measured and predicted RMR means.

Although the predicted and measured RMR values were highly correlated, all the equations except the one by De Lorenzo et al. underestimated the measured RMR by differences which were both statistically significant ($P \leq 0.025$) and also of longterm physiological significance. It was therefore concluded that the RMR equations, excluding the one specifically derived for male athletes, provide inaccurate individual estimates of RMR.

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