The prediction of athlete resting metabolic rate – is it time to reassess the method?

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Title: The prediction of athlete resting metabolic rate – is it time to reassess the method?

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Introduction: Effective energy prescription requires an accurate assessment of the athletes’ RMR. The use of published prediction equations using total body mass (TBM) or fat-free mass (FFM) with other covariates is common; but there is little evidence to validate their use or to determine which are most predictive in athlete groups.

Methods: This study compared measured resting metabolic rate (RMR) using indirect calorimetry to RMR using 17 prediction equations.
- Anthropometric and metabolic data was collected for 23 male rugby athletes
- A literature review was conducted for evidence relating to the measurement and prediction of RMR in athlete populations.
- Paired samples t-tests and root mean square prediction error (RMSPE) were used to compare measured and predicted RMR.

Results: The prediction equations significantly and systematically underestimated RMR in rugby players for all equations (p≤0.01). 
- The Harris Benedict equation provided the most accurate estimate of RMR and predicted energy requirements within ±189kcal/d (RMSPE).
- The commonly-recommended Cunningham equation using FFM was predictive ±217kcal/d (RMSPE).

Conclusions, discussion and/or practical application:
- There are several sources of error that need to be addressed when applying these prediction equations to athletes.
- There is a need to identify the unique characteristics of athletes that act as covariates to develop effective prediction equations for athletes.
- Systematic underestimation of predicted RMR in comparison to measured RMR in rugby athletes
- Plausible errors in measurement via indirect calorimetry if metabolism elevated due to training/recovery
- Increased underestimation at higher body weights
- Current RMR prediction equations based on non-athletes with lower muscularity.
- Broad limits of agreement (unexplained variation) for all equations.

Best Practice Guidelines for the measurement of RMR (Compher et al, 2006).
- Allow > 2 hours after moderate activity and >14 hours after vigorous physical activity before RMR measurement
- This timeframe may be inadequate as metabolism may be elevated after strenuous physical activity for 24 – 48 hours.