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.

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.

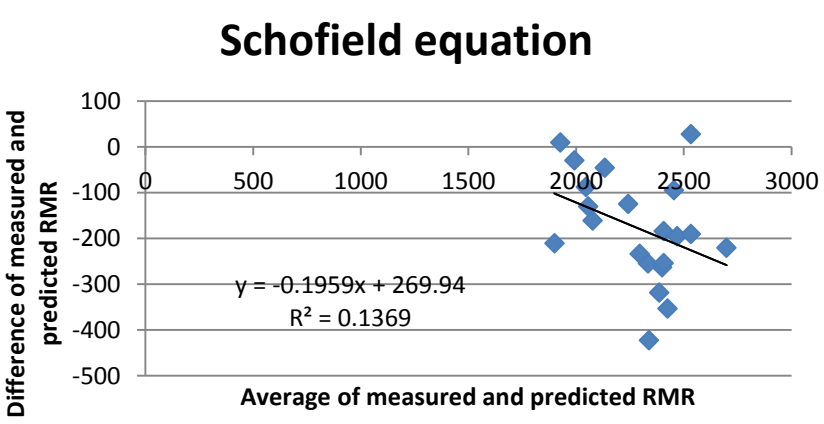
Methods: This study compared measured resting metabolic rate (RMR) using indirect calorimetry to RMR using 17 prediction equations.

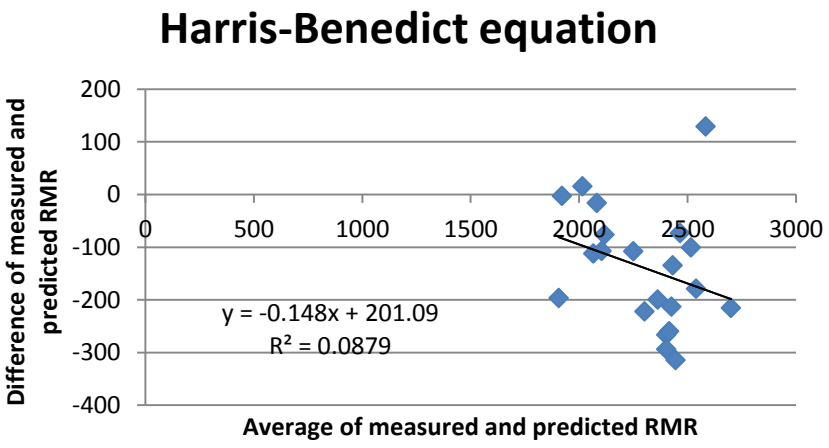
- Anthropometric and metabolic data was collected for 23 male rugby athletes
- A literature review was conducted for evidence relating to the measurement and prediction of RMR in athlete populations.
- Paired samples t-tests and root mean square prediction error (RMSPE) were used to compare measured and predicted RMR.

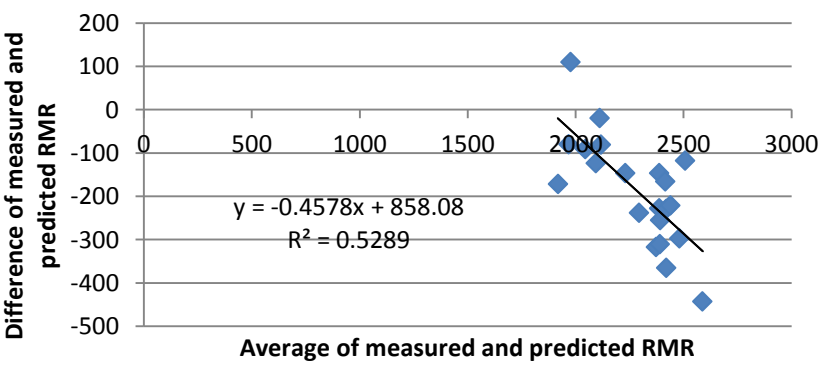
Results: The prediction equations significantly and systematically underestimated RMR in rugby players for all equations ($p \leq 0.001$).

- 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 ± 217 kcal/d (RMSPE).

	Mean kcal/d	Paired t-test		Mean Diff. kcal/d	RMSPE kcal/d
Measured RMR	2356 ±247	t	p-value		
Harris Benedict	2203 ±207	6.5	0.000	-154 ±112	189
Schofield	2189 ±204	7.1	0.000	-168 ±114	201
Cunningham	2187 ±154	5.9	0.000	-169 ±138	217







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.**

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