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VALIDATION OF RESTING ENERGY EXPENDITURE PREDICTION EQUATIONS IN HIGHLY TRAINED ADOLESCENT ENDURANCE ATHLETES

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Introduction. Ensuring appropriate caloric intake is paramount for adolescent athletes, as it directly impacts their athletic prowess and overall health. The computation of daily energy expenditure involves considerations of resting energy expenditure (REE), which serves as the baseline for energy needs. While indirect calorimetry remains the gold standard for REE measurement, its practicality is often limited by the requirement for specialized equipment and time-intensive procedures. Consequently, predictive equations based on anthropometric parameters, age, and gender are commonly employed to estimate REE, albeit they may overlook individualized factors such as muscle mass and hormonal status.

Moreover, socio-demographic characteristics influence REE, emphasizing the need for equations validated within specific populations. In this context, the present study seeks to evaluate actual and predicted energy expenditure among highly trained Ukrainian adolescent male endurance athletes. By identifying the most appropriate equations for this population, the study aims to enhance the precision of dietary strategies in sports practice, thereby optimizing performance outcomes and safeguarding the athletes' well-being.

Materials and Methods: anthropometric assessments and indirect calorimetry (Fitmate, Cosmed, Italy). Statistical analyses were conducted using XLSTAT software (Lumivero, USA). The research transpired at the State Scientific Research Institute of Physical Culture and Sports, encompassing 27 measurements of REE via indirect calorimetry on male adolescent athletes participating in national teams for endurance sports, including biathlon, modern pentathlon, triathlon, and kayaking. The comparison entailed evaluating actual resting energy expenditure values against those predicted by six equations: World Health Organization (WHO), Institute of Medicine (IOM), Schofield, Henry, Hannon, and Reale.

Results and Discussion. Descriptive statistics of the participants are presented in Table 1.

Table 1

Descriptive statistics of the subjects

Characteristics	Male athletes (n=27)		
	Mean ±SD	**Min.**	Max.
Height, m	1,79 ± 0,05	1,70	1,88
Age, years	16,59±0,64	15,00	17,00
Body weight, kg	71,1 ± 7,4	63,8	88,8
Body mass index, kg/m^2	22,4 ± 1,8	19,3	27,0
REE, kcal/day	2019 ± 337	1471	2628
REE, kcal/day/kg	28,0 ± 3,5	21,4	35,9

Notes: SD – standard deviation; Min – minimum; Max – maximum

Figure 1 illustrates the comparison between actual and predicted resting energy expenditure in the examined athletes.

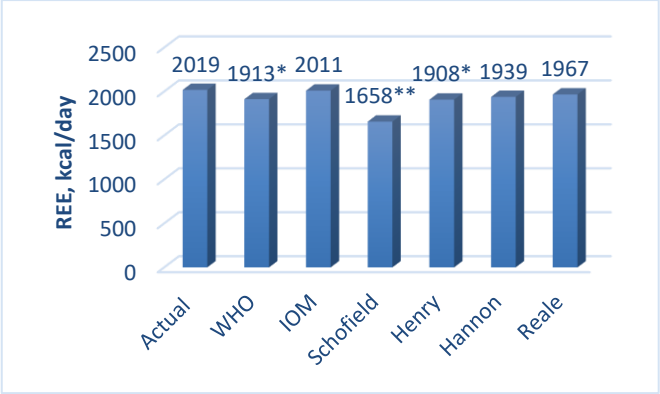

Fig. 1. Mean group differences between actual and predicted REE for adolescent male athletes (n = 27)

Notes: * highly significant difference from measured REE ($p \leq 0.001$)
** significant difference from measured REE ($p \leq 0.05$)

REE predicted by the WHO, Schofield, and Henry equations are significantly lower than measured values. Despite being developed for a broad population IOM equation does not differ significantly from measured REE on a par with specially developed for adolescent athletes Hannon and Reale equations.

Conclusions:

1. WHO, Schofield, and Henry equations underestimate resting energy expenditure in highly trained Ukrainian adolescent male endurance athletes.

2. IOM, Hannon, and Reale equations proved to be the most accurate among the investigated resting energy expenditure prediction equations in highly trained Ukrainian adolescent male endurance athletes.

Bibliography

1. Resting Energy Expenditure Prediction Equations in the Pediatric Population: A Systematic Review / J. Fuentes-Servín et al. Frontiers in Pediatrics. 2021. Vol. 9. URL: https://doi.org/10.3389/fped.2021.795364 (date of access: 04.04.2024).

2. Energy Requirements of Male Academy Soccer Players from the English Premier League / M. P. Hannon et al. Medicine & Science in Sports & Exercise. 2020. Publish Ahead of Print. URL: https://doi.org/10.1249/mss.0000000000002443 (date of access: 04.04.2024).

3. Metabolic Rate in Adolescent Athletes: The Development and Validation of New Equations, and Comparison to Previous Models / R. J. Reale et al. International Journal of Sport Nutrition and Exercise Metabolism. 2020. Vol. 30, no. 4. P. 249–257. URL: https://doi.org/10.1123/ijsnem.2019-0323 (date of access: 04.04.2024).