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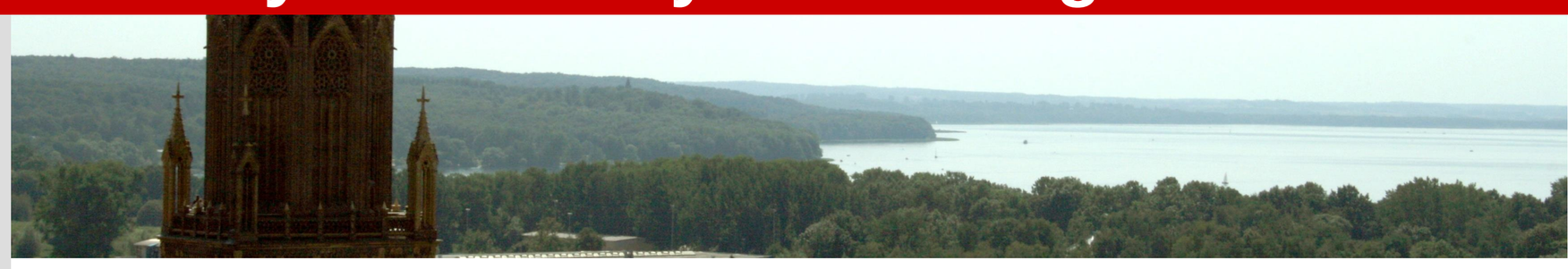
Suitability of the equations by Harris-Benedict and Müller, Scalfi and Schebendach for estimating resting energy expenditure in moderately to severely underweight women



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Rationale

In underweight women conventional equations for estimating resting energy expenditure (REE), such as Harris-Benedict or Müller, are commonly used in clinical practice. Yet, it is unclear if these equations provide reliable results or if special equations should be used.

Objectives

Comparison between the measured and estimated REE according to Scalfi [1], Schebendach [2], Harris-Benedict [3] and Müller 2004 [4].

Methods

REE was measured in 57 underweight women (28 ± 10 years, BMI 15.2 ± 2.2 kg/m²) by indirect calorimetry (IC) (Cosmed, Quark RMR, Rome, Italy) under standardized conditions. Overall, 49 women (86%) were diagnosed with anorexia nervosa, the remaining 8 women were healthy. REE-IC was compared with the equations of Harris Benedict and Müller 2004 (both for the general population), Scalfi (18-30-year-old women with anorexia nervosa) and Schebendach (modified Harris-Benedict formula for anorexia nervosa).

Tab. 1: Subject Characteristics

	< 14 kg/m² (n=16)	14.0-16.4 kg/m² (n=21)	16.5-18.4 kg/m² (n=20)
Age (years)	28.4 ± 8.7	26.4 ± 9.7	28.6 ± 10.9
BW (kg)	34.5 ± 3.9	41.4 ± 4.1	50.2 ± 4.9
BMI (kg/m²)	12.5 ± 1.1	15.0 ± 0.7	17.5 ± 0.6

BW = body weight

Results

Tab. 2: Comparison between measured (IC-REE) and estimated resting energy expenditure (REE)

BMI (kg/m²)	REE-IC (kcal/d)	Scalfi (kcal/d)	Scheben-dach (kcal/d)	Harris-Benedict (kcal/d)	Müller 2004 (kcal/d)
< 14.0 (n=16)	900 ± 210	794 ± 90*	695 ± 126**	1158 ± 69***	614 ± 88***
14.0-16.4 (n=21)	980 ± 146	951 ± 94	837 ± 133**	1235 ± 72***	743 ± 90***
16.5-18.4 (n=20)	1155 ± 142	1154 ± 113	983 ± 120***	1314 ± 65***	905 ± 137***

paired t- test versus REE-IC, *p< 0.001, **p< 0.01, ***p< 0.05

Deviation of equations from measured resting energy expenditure (IC-REE)

Fig. 1: Harris-Benedict

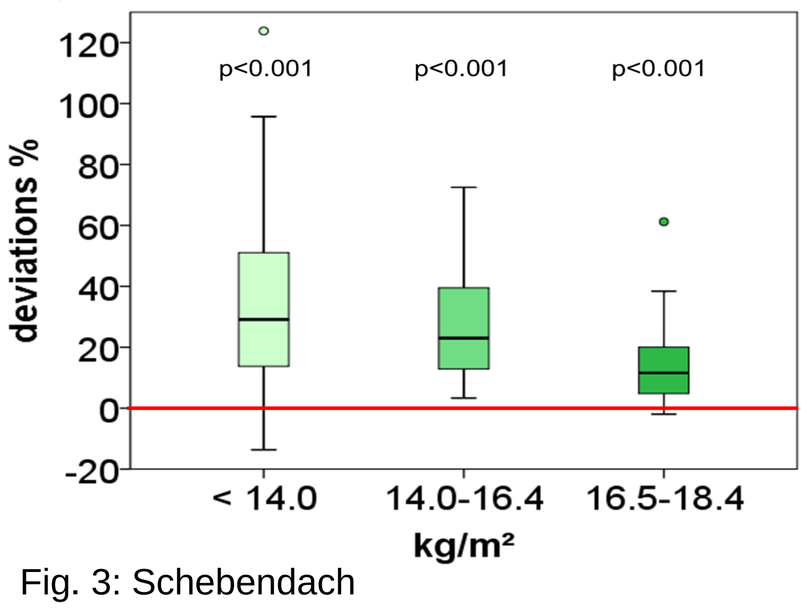


Fig. 2: Müller 2004

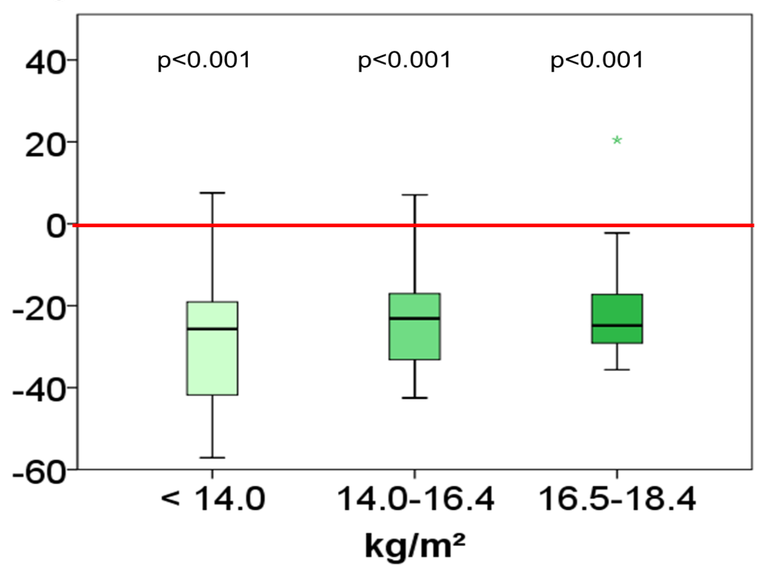


Fig. 3: Schebendach

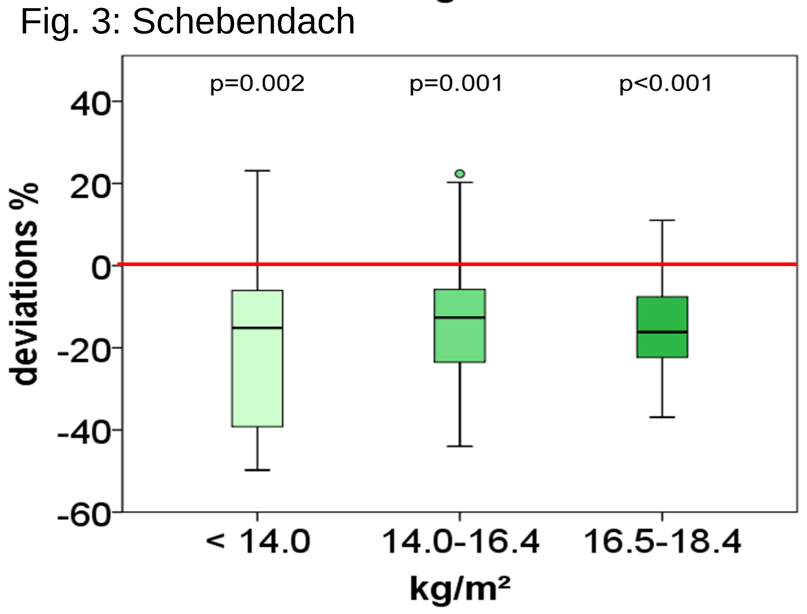
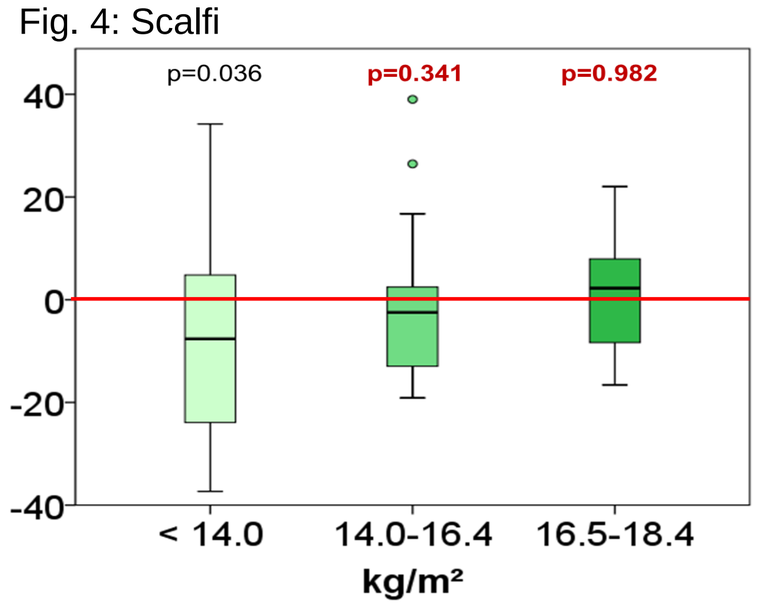


Fig. 4: Scalfi



Conclusion

Universal equations for estimating REE (Harris-Benedict, Müller) are unreliable for underweight women, even in moderate underweight. Only the simple equation of Scalfi (REE= 96.3 x body weight) seems suitable for underweight women, at least for BMIs equal or higher than 14 kg/m².

References

[1] Scalfi L, et al. Int J Obes Relat Metab Disord 2001, 25(3)
[2] Schebendach J, et al. Int J Eat Disord 1995, 17(1)
[3] Harris JA, Benedict FG. Proc Natl Acad Sci U S A. 1918
[4] Müller MJ, et al. Am J Clin Nutr. 2004, 80(5)

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