Validity of predictive equations for estimating resting metabolic rate in women during the different phases of the menstrual cycle

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The assessment of resting metabolic rate (RMR) becomes fundamental when determining energy requirements of individuals. Due to the increased cost of measuring RMR, predictive equations from different populations were formulated to estimate RMR. However, studies have found a lack of agreement between measured (RMRm) and predicted RMR (RMRp)[1]. Moreover, the effect of the menstrual cycle (MC) on the accuracy of these predictions has never been studied before. Some studies have shown that RMRm fluctuates within a MC[2,3].

Eleven healthy women, age 26·6 (SD 5·9) y, BMI 22·7 (SD 2·2) kg/m^2 with regular MC (25–35 days), were tested three times a week during a MC. Subjects attended the laboratory after an overnight fast for the assessment of their RMR and ovarian hormone levels. RMR was measured for 30 min by indirect calorimetry using a ventilated hood system. Plasma ovarian hormones were analysed by an Electrochemiluminescense Immuno-Assay. Averaged RMRm of the entire MC and per phase were compared to RMRp from ten different equations valid for adults [4]. Bias was determined as the mean percentage difference between RMRm and RMRp and accuracy as the percentage of participants with an RMRp within ±10 % of RMRm.

	MC		MPh		FPh		LPh	
	Bias (%)	Accurate (%)	Bias (%)	Accurate (%)	Bias (%)	Accurate (%)	Bias (%)	Accurate (%)
Harris Benedict	13	45	12	55	10	36	15	36
Scholdfield_1	16	45	16	45	13	45	19	27
Scholdfield_2	16	36	15	45	13	45	19	27
Mifflin	18	36	17	27	15	45	20	18
Muller_1	17	45	17	36	14	45	20	36
Muller_2	16	45	15	45	13	45	18	36
Muller_3	18	45	17	36	15	45	21	27
Muller_4	16	45	16	45	13	36	19	36
Henry_1	19	36	19	36	16	45	22	27
Henry_2	19	36	18	27	16	36	22	18

Values are the mean bias and accurate predictions (%) of the different predictive equations from RMRm as an average of MC and the MPh, FPh and LPh (menstrual, follicular and luteal phases, respectively).

RMRp underestimated RMRm (1638 (SE 82) kcal) by ∼17 % in all predictive equations with <50 % of the women having an accurate RMRp. Moreover, the predictive error was magnified in the LPh as the bias and the prevalence of inaccurate predictions increased. Nevertheless, RMRm did not rise significantly in the luteal phase (LPh) compared to the menstrual (MPh) and follicular (FPh) phases, 1674 (SE 82) *vs.* 1627 (SE 93), 1593 (SE 73) kcal/d, respectively (p = 0·178).

To conclude, the selected predictive equations might not be valid in this population and they are more biased in the LPh of the MC.

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