Factorial estimates of energy expenditure using six or fifteen activity categories

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Daily energy expenditure (EE) is often estimated from factorial methods in which EE is computed from time spent in activities and their energy costs. Previous studies have shown no differences in non-smokers between daily EE measured using a factorial method based on six activity categories (6AC), and daily EE measured using a whole body respiration chamber (1,2) or the intake balance method (2,3). A factorial method based on fifteen activity categories (15AC) has also shown results similar to those obtained using a crude intake balance method (4). Because the 15AC method is more tedious for subjects to follow than the 6AC method, the aim of this study was to investigate any differences in daily EE between the two methods.

The study was carried out using 450 seven-day activity records kept by internal and external nutrition students of this University. All records were kept between 1988 and 1996 using the 15AC method as previously described (4). All records were also analysed using the 6AC method in which the activity categories and their energy costs expressed as multiples of basal metabolic rate (BMR) were: asleep or lying quietly between 2330 and 0730, 1.0 x BMR; lying or sitting quietly during the day, 1.2 x BMR; sitting busy, 1.5 x BMR; standing activities, 2.5 x BMR; walking, 3.0 x BMR; and exercising, 5.0 x BMR (3). In both methods, lying quietly and sitting quietly were considered as one category. The results are shown in the table.

	All[1] students	All[1] females	All[1] males	All[1] internals	All[1] externals
Number	450	370	80	211	239
6AC method[2]	1.63 ± 0.12	1.63 ± 0.12	1.66 ± 0.14	1.61 ± 0.13	1.66 ± 0.12
15AC method[2]	1.57 ± 0.15	1.56 ± 0.13	1.63 ± 0.18	1.56 ± 0.15	1.59 ± 0.14
% diff[3]	3.6 ± 5.3	4.1 ± 4.5	1.6 ± 7.9	3.2 ± 4.8	4.0 ± 5.7
p[4]	<0.001	<0.001	<0.08	<0.001	<0.001

[1] mean ± SD; [2] daily EE as multiples of BMR using 6AC and 15AC methods; [3] percentage difference between the two methods; [4] statistical significance of difference between the two methods

This study shows that factorial estimates of daily EE are lower with a method based on fifteen activity categories than with a method based on six activity categories, particularly in females, although no information is available about which of the methods is most accurate.

1. Warwick P, Edmundson H, Thomson E. Prediction of energy expenditure: simplified FAO/WHO/UNU factorial method vs continuous respirometry and habitual energy intake. Am J Clin Nutr 1988;48:1188-96.
2. Warwick P, Busby R. Prediction of twenty-four-hour energy expenditure in a respiration chamber in smokers and non-smokers. Br J Nutr 1993;47:600-3.
3. Warwick P, Baines J. Energy expenditure in free-living smokers and nonsmokers: comparison between factorial, intake-balance and doubly labelled water measures. Am J Clin Nutr 1996;63:15-21.
4. Warwick P, Busby R. Factorial estimation of daily energy expenditure in university students. Aust J Nutr Diet 1991;48:95-9.