

ENERGY EXPENDITURE AND BODY COMPOSITION CHANGES IN SUBJECTS GIVEN CONTROLLED ENERGY INTAKES TO MATCH THOSE FROM SELF-REPORTED DIARIES

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The basal, or resting metabolic rate is the major component of energy requirement and accounts on average for about 75% of the total energy expenditure. Thus, variations in the resting metabolic rate (RMR) could account for substantial differences in daily energy needs. During a long term study of the role of variations in the RMR on the daily energy needs of 'small-eaters' and 'large-eaters' diet and activity diaries were used to select those individuals with relatively high or low energy intakes. Among 'small-eaters', who restrict food intake in order not to gain weight, the diaries of many subjects indicated a large negative energy balance which was not evident from the observed body weight changes. This discrepancy prompted further studies of the energy balance of these groups.

Energy expenditure over a period of several weeks can be measured using the doubly labelled water ($^2\text{H}_2^{18}\text{O}$) technique (Schoeller 1988). Body composition measurements over the same period allows an estimate of the net energy balance and thus the average daily energy intake can be calculated.

Two 'small-eating' female subjects were placed on a diet which provided an energy intake equal to that calculated from their respective diaries. At the commencement of this controlled intake period, and again 4 weeks later, each subject received a dose of $^2\text{H}_2^{18}\text{O}$. Body composition was also determined at these times by both deuterium dilution and densitometry methods. The customary diet was then recommenced and body composition was again determined 4 weeks later. The results show that each of the subjects lost body weight during the period of controlled intake (see table).

Experimental design			Weight changes(kg)		Energy balance measures (kJ/d)		
Subject	Period	Diet (kJ/d)	Body	Fat*	Expenditure	Balance	Intake
C.G.	1	4956	-3.55	-2.51	9577	-3328	6249
	2	N/A [†]	-0.85	-1.20	10565	-1393	9172
C.D.	1	4914	-2.20	-2.16	7399	-3118	4281
	2	N/A [†]	+0.40	-0.23	6418	-384	6024

*Calculated from densitometric data. †Customary diet, uncontrolled.

These data show that the diet diary technique leads to under-estimation of energy intake by persons who feel they must restrict their intake in order not to gain weight ('small-eaters') and cannot be used as evidence for a relatively low RMR in these subjects. Estimates of body fat from deuterium dilution gave similar results but calculated intakes were up to 50% lower.

This study also demonstrates the value of a non-invasive technique for the measurement of energy expenditure in the free-living state over several weeks. However, calculation of energy intakes is critically dependent on the accuracy of the estimation of changes in the body composition.

SCHOELLER, D.A. (1988). *J. Nutr.* 118: 1278.

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