

How to Evaluate Resting and Walking Energy Expenditures of Individuals with Different Body Mass Index

Authors : Zeynep Altinkaya, Ugur Dal, Figen Dag, Dilan D. Koyuncu, Merve Turkegun

Abstract : Obesity is defined as abnormal fat-tissue accumulation as a result of imbalance between energy intake and expenditure. Since 50-70% daily energy expenditure of sedantary individuals is consumed as resting energy expenditure (REE), it takes an important place in the evaluation of new methods for obesity treatment. Also, it is known that walking is a prevalent activity in the prevention of obesity. The primary purpose of this study is to evaluate and compare the resting and walking energy expenditures of individuals with different body mass index (BMI). In this research, 4 groups are formed as underweight (BMI < 18,5 kg/m²), normal (BMI=18,5-24,9 kg/m²), overweight (BMI=25-29,9 kg/m²), and obese (BMI ≥ 30) according to BMI of individuals. 64 healthy young adults (8 man and 8 woman per group, age 18-30 years) with no known gait disabilities were recruited in this study. The body compositions of all participants were measured via bioelectric empedance analysis method. The energy expenditure of individuals was measured with indirect calorimeter method as inspired and expired gas samples are collected breath-by-breath through a special facemask. The preferred walking speed (PWS) of each subject was determined by using infrared sensors placed in 2nd and 12th meters of 14 m walkway. The REE was measured for 15 min while subjects were lying, and walking energy expenditure was measured during subjects walk in their PWS on treadmill. The gross REE was significantly higher in obese subjects compared to underweight and normal subjects (p < 0,0001). When REE was normalized to body weight, it was higher in underweight and normal groups than overweight and obese groups (p < 0,0001). However, when REE was normalized to fat-free mass, it did not differ significantly between groups. The gross walking energy expenditure in PWS was higher in obese and overweight groups than underweight and normal groups (p < 0,0001). The regression coefficient between gross walking energy expenditure and body weight was significiant among normal and obese groups (p < 0.05). It accounted for 70,5% of gross walking energy expenditure in normal group, and 57,9% of gross walking energy expenditure in obese group. It is known that obese individuals have more metabolically inactive fat-tissue compared to other groups. While excess fat-tissue increases total body weight, it does not contribute much to REE. Therefore, REE results normalized to body weight could lead to misleading results. In order to eliminate fat-mass effect on REE of obese individuals, REE normalized to fat-free mass should be used to acquire more accurate results. On the other hand, the fat-mass increasement raises energy requirement while walking to retain the body balance. Thus, gross walking energy expenditure should be taken into consideration for the evaluating energy expenditure of walking.

Keywords : body composition, obesity, resting energy expenditure, walking energy expenditure

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