

BETWEEN SUBJECT AND WITHIN SUBJECT VARIABILITY IN ENERGY EXPENDITURE (EE)

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Accurate measurement of EE is important for precise exercise prescription. The purpose of this study was to measure the intra and inter-individual variations in EE of walking at 3km/h and 6km/h, and running at 9km/h.

Healthy male subjects between 18 and 45 years old were tested at three time points one week apart. Subjects were requested to avoid all drinks containing caffeine from 8.00pm the previous night and not to have eaten from 8.00pm the previous night to reduce the influence of food and stimulants on EE. Water was freely available. Each participant visited the exercise laboratory in the Trinity Centre for Health Sciences on three mornings, for approximately 90 minutes. EE was measured using an Oxycon Mobile indirect calorimeter. Each test consisted of 30 minutes quiet lying, followed by 5 minutes walking on a treadmill at 3 km/hr, 6 km/hr and finally 5 minutes jogging at 9km/h with a ten minute rest between activities. Subjects were retested at the same time of day 7 and 14 days later.

To analyse the repeatability of the measurements across the three tests, the differences between measurements were plotted against the mean of the measurements according to the method of Bland and Altman (1986)¹. Energy expenditure is expressed as Metabolic equivalents (METs) which are multiples of the subject's basal metabolic rate. Average METs at rest, 3km.h, 6km.h, and 9km.h were 0.99 ± 0.12 , 2.83 ± 0.26 , 4.70 ± 0.39 , and 9.38 ± 0.69 respectively. No significant difference was found at any test condition between days ($p > 0.05$). Inter-individual variation was low ($CV < 1$) over all test conditions. The range between individuals was largest at 9km/h varying by over 3 METs. Within subject METs coefficient of variation ranged from 3.91% to 8.56%.

Both inter and intra-individual variation was shown to be small. This gives the clinician greater confidence in prescribing exercise intensities from tests carried out on the individual in question or indeed on a similar sample population.

1. Bland, J.M., Altman, D.G.. Statistical methods for assessing agreement between two methods of clinical measurement. *Lancet*, 1986; 8Feb:307-311.