

Peter Harrison Centre

for Disability Sport

Energy Expenditure in Disabled Athletes

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The average daily energy intake is ≈ 2900 kcal (for men) and ≈ 2200 kcal (for women) (McArdle, Katch and Katch, 2001). Interestingly, certain disabled ambulatory individuals have been shown to expend more energy than able bodied persons. For example, bilateral, below knee amputees expend 41% more energy when walking at a given speed compared to controls (Fisher and Gullickson, 1978). On the other hand, individuals who use a wheelchair use a smaller muscle mass when exercising compared to ambulatory, able-bodied individuals, wheelchair athletes may require less energy for exercise. The importance of understanding energy expenditure in athletes with different disabilities is therefore paramount to obtain data that can help with nutritional strategies associated with both training and daily living.

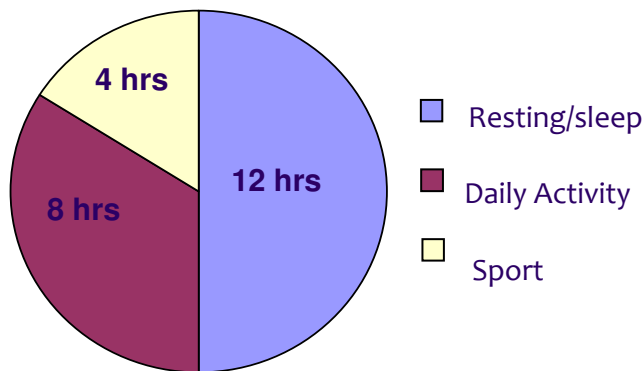


Figure 1. Energy expenditure guesstimate of a proposed average day of a disabled athlete taking part in 4 hours sports training.

Figure 1 shown above, demonstrates that a large part of an athlete's day will be taken up by daily activities. As the energy expenditure is divided into these different components then it is important to measure resting/daily energy expenditure and

energy expenditure during specific sporting activities so that an athlete can obtain an individual picture of their overall energy expenditure during a day/week.

What does my study involve?

My first study requires the athlete to attend the laboratory in the morning after an overnight fast. This present study involves both individuals who use a wheelchair and amputee athletes.

- Participants are asked to lie on a bed for 30 minutes whilst expired air is collected using the portable K4b² system which involves wearing a face mask. Participants are instructed to lie still but not to fall asleep! This resting energy expenditure measure is also known as the 'resting metabolic rate'.
- The next part of the testing involves collecting energy expenditure at various walking or everyday wheelchair pushing speeds on a treadmill. This lab based location provides a repeatable and standardised setting for gaining energy



expenditure data at certain speeds. The expired air samples are collected using the Douglas Bag technique, which involves the athlete using a mouth piece and nose clip whilst exercising (see Figure 2 shown below).

Figure 2. Louise Croft collects the expired air samples from an athlete using the Douglas Bag technique.

- Finally, the athlete completes a VO_2 peak test in their sports wheelchair on the treadmill. For the ambulant athletes, they complete the test using their preferred exercise mode. This test is a measure of how well an individual can take in and utilise oxygen at the muscles. It also helps us understand the daily energy expenditure values - taking into consideration aerobic fitness levels!

Data collected:

- Energy expenditure is then calculated from the expired air (Frayn, 1983). The information gained from the sub-maximal treadmill speeds will give the athlete an idea of how much energy they produce at a given speed and a given heart rate per hour. By gaining a measure of resting metabolic rate and daily pushing/walking energy expenditure, we can start to understand the energy requirements of wheelchair and amputee athletes on a day to day basis.

Future studies:

- We hope to extend the work of Abel and colleagues (2008) who have reported the energy expenditure of wheelchair sports. We hope to derive individual HR- VO_2 data collected in the lab and extrapolate to a competitive environment so that the sporting energy expenditure can be understood further. It is envisaged that this data collection will be collected at the Paralympic World Cup later this year with the Women's GB wheelchair basketball team.
- Future studies will hopefully include data for individuals with a wider range of disabilities. If you are interested in this research programme then please contact Louise. Her contact details can be found below.

References:

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