

FIGHTING FATS -

why some may have it easier than others

GRANTS AND RESEARCH
ADVANCEMENT



Figure 1. Measuring the resting metabolic rate underneath a ventilated hood. Expired air moves from the hood into a metabolic cart for analysis.

Cardiometabolic diseases, such as heart disease and type 2 diabetes, are among some of the leading causes of illness and death in Singapore, with Singapore having the second-highest proportion of diabetics among developed nations, based on a 2015 report by the International Diabetes Federation (IDF)¹. While these diseases can be attributed to the diet and lifestyle of individuals, previous studies have shown that ethnicity can independently effect cardiorespiratory fitness and fat oxidation, which refers to the fitness of your heart and lungs and how much fat you can burn at rest or during exercise, respectively. In particular, people of South Asian origin appear to have lower fitness and ability to burn fat during exercise than people of Caucasian ethnicity, even when engaging in similar amounts of physical activity each week².

A team of researchers from the National Institute of Education, Nanyang Technological University, Singapore (NIE NTU, Singapore), led by Associate Professor Stephen Burns from the Physical Education and Sports Science Academic Group (PESS AG), embarked on a two-year study to find out whether there were any differences in cardiorespiratory fitness and fat oxidation at rest and during exercise among Asian men with elevated body mass index (BMI) from three ethnicities in Singapore, namely the Chinese, Malay and Indian ethnicities. The team included an existing student, who had assisted in all aspects of the project, including recruiting participants, data collection, data analysis and writing the final report.

With the use of a metabolic cart, the researchers were able to measure gas volumes and exchange, thereby deriving the oxygen consumption and carbon dioxide production levels of the individual. Using this information, they were able to calculate the calories used by the individual at rest (Figure 1) as well as during exercise (Figure 2), hence determining the amount of fat or carbohydrate that is contributing to their energy expenditure.

Associate Professor Burns and his team found that while all three ethnicities had similar levels of cardiorespiratory fitness, Indian and Malay men had a lower maximum fat oxidation level during exercise as compared to Chinese men. This means Indian and Malay men burn less fat during exercise as compared to Chinese men, hence they may have to exercise for a longer duration, in order to burn the same amount of fat as Chinese men. This study has raised an important question of whether a lower ability to burn fat puts Indian and Malay men at a higher risk of developing cardiometabolic diseases.

The study also questioned the effectiveness of a one-size-fits-all exercise programme, such as group exercises and mass workouts, to combat obesity. Through the examination of such physiological differences among people of different ethnicity, Associate Professor Burns highlighted the importance of prescribing physical activity and exercise to individuals based on their individual profile, akin to a personalised prescription, which would help to determine the most effective exercise for different people.

Preliminary findings were published in the International Journal of Sport Nutrition and Exercise Metabolism on 27 March 2020.



Figure 2. Measuring expired gases into a metabolic cart during exercise. A tube and mouthpiece were fixed via a headpiece onto the participant and expired air was collected into a metabolic cart for analysis.

Sources:

- (1) Lai, L. (2016, January 19). Singapore 'has 2nd-highest proportion of diabetics'. *The Straits Times*. <https://www.straitstimes.com/singapore/health/singapore-has-2nd-highest-proportion-of-diabetics>.
 (2) Hall, L. M., Moran, C. N., Milne, G. R., Wilson, J., MacFarlane, N. G., Forouhi, N. G., Hariharan, N., Salt, I. P., Sattar, N., & Gill, J. M. (2010). Fat oxidation, fitness and skeletal muscle expression of oxidative/lipid metabolism genes in South Asians: Implications for insulin resistance? *PLoS ONE*, 5(12). <https://doi.org/10.1371/journal.pone.0014197>