

## Investigation into gender differences in the effects of feeding around exercise on energy expenditure and substrate utilization

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Nutritional advice to optimise athletic performance is often not applicable for the majority of people who exercise for health or weight maintenance. A common perception by laypersons is that exercising on an empty stomach (fasted) increases fat oxidation, hence aids fat loss<sup>(1)</sup>. However research on feeding around exercise mainly focuses on performance in trained or semi-trained individuals<sup>(2)</sup>. Furthermore, research is most commonly undertaken on males, despite accepted gender difference in substrate metabolism and energy expenditure (EE)<sup>(3)</sup>. This study aimed to investigate the impact of CHO consumption before and after treadmill exercise on substrate utilization and total EE in untrained men and women.

Fifteen healthy, untrained subjects (7 male, 8 female) aged 21–33 years undertook a randomised crossover study. Subjects completed 2 treatments, separated by a washout period ( $\geq 3$  days), following an overnight fast. At each treatment subjects exercised for  $\leq 30$  min on a treadmill at approximately 70% VO<sub>2</sub> max, with 30 g of maltodextrin or placebo ingested either before or after exercise. EE (kJ/min), and Fat and CHO utilization (g/hr) during and over 3 hours post exercise were estimated by indirect calorimetry. This study was approved by the University of Surrey Faculty of Health and Medical Sciences Ethics Committee.

Fat oxidation rates between CHO and placebo were only significantly different during exercise for males (placebo>CHO), and during recovery for females (placebo>CHO). Over the whole study a significant difference in total fat oxidation (g) between the two feeding regimes was observed in females ( $P = 0.034$ ) but not males (see Table 1). Males had a significantly greater difference in total fat oxidation (g) ( $P = 0.018$ ) and % EE from fat oxidation ( $P = 0.037$ ) compared with females between treatments. Significant gender differences in EE (kcal/d/kg) were observed during recovery following CHO intake only with males expended 160 kcal/d/kg more than females ( $P = 0.05$ ).

	Males (n = 7)				Females (n = 8)			
	CHO post exercise		CHO pre exercise		CHO post exercise		CHO pre exercise	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Total fat oxidation (g)	17.20	1.79*	15.20	1.46	12.00	0.72†*	13.10	0.59†
% EE (kcal) derived from fat oxidation	47	3.32*	40	2.27	36	3.36 *	37	2.74

\* Significant difference between genders:  $p \leq 0.05$ ; † Significant difference between treatments:  $p \leq 0.05$ .

This is the first study of its kind which suggests that untrained females may benefit from consuming food prior to exercise and avoid eating during recovery, whereas untrained males may benefit from waiting until recovery to consume food, for maximal fat burning. Significant differences in total fat oxidation differed between genders, reinforcing the risks of generalising advice regarding timing of CHO. Differences in fat oxidation between treatments and genders were small due to the acute nature of the study, but may be clinically relevant when exercising regularly.

This study provides evidence for gender differences in the timing of feeding around exercise and its effects upon substrate utilization in untrained individuals during exercise and recovery. Feeding practices around exercise may therefore be employed as a method of enhancing fat oxidation in untrained individuals.

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3. Tarnopolsky M (2000) *Can J Appl Physiol* **25**, 312–327.