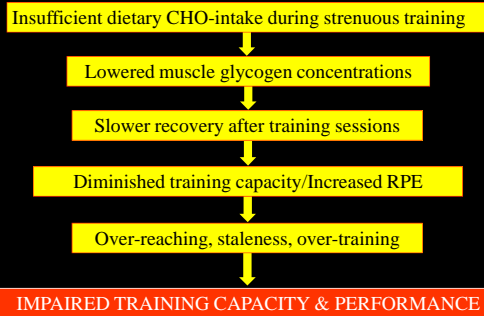
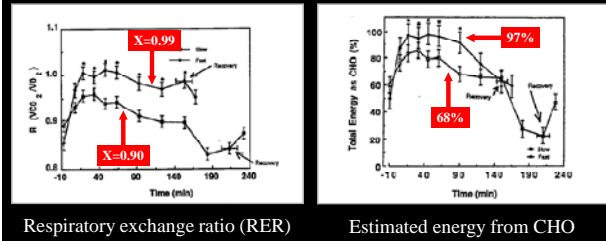




### The effect of inadequate dietary carbohydrate intake on training capacity



### Carbohydrate dependence during a simulated marathon race in 'fast' and 'slow' runners



Respiratory exchange ratio (RER) Estimated energy from CHO

O'Brien MJ et al. *Med Sci Sports Exerc* 25: 1009-1017, 1993.

### Are there differences in carbohydrate requirements for fast and slow marathon runners?



Paula Radcliffe (Runner)  
2 hr 23 min 8 sec

Katie Holmes (Actress?)  
5 hr 49 min 8 sec

### Is carbohydrate the only fuel oxidised by elite marathon runners?

"Elite runners run a marathon race at speeds requiring between 80-90% of  $VO_{2max}$ . While no direct measurements of their respiratory exchange ratios have been published, it seems possible that these athletes could complete the marathon using only carbohydrate as a fuel."



Spriet LL. *Sports Med* 37: 332-336, 2007.

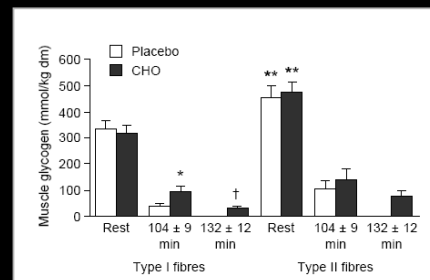
### Carbohydrate dependence during marathon running

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- 12 male subjects (18-35 yr) assigned to 'fast' (2 hr 45 min) or 'slow' (3:45 min) running groups
- 24 hr prior to simulated marathon, subjects rested and ate their normal diet (i.e. not carbohydrate-loaded)
- Subjects overnight fasted
- Subjects ingested 500 mL of  $H_2O$  15 min before and each 30 min during marathon
- Sub-optimal dietary practices!

O'Brien MJ et al. *Med Sci Sports Exerc* 25: 1009-1017, 1993.

### Muscle glycogen levels after running to exhaustion while ingesting either water or a carbohydrate-electrolyte drink



Tsintzas K et al. *J Appl Physiol* 81: 810-819, 1996.

Practical recommendations:  
Training issues

- High energy and CHO intake to meet training load (periodization)

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- *High energy and CHO intake to meet training load (periodization)*
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- *Adequate fuel and fluid intake during key training sessions*
- No evidence for 'train-low' paradigm

Practical recommendations:  
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- *High energy and CHO intake to meet training load (periodization)*
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- *Adequate fuel and fluid intake during key training sessions*
- *No evidence for 'train-low' paradigm*
- Risk of low iron status in females and vegetarians

Practical recommendations:  
Training issues

- *High energy and CHO intake to meet training load (periodization)*
- *Adequate refuelling between important training sessions*
- Adequate fuel and fluid intake *during* key training sessions

Practical recommendations:  
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- *Optimal fuel stores for race: Carbohydrate-loading and taper*
- *Pre-event nutrition: 'topping up' fuel and fluid levels*
- Fluid and fuel replacement during competition
  - Practical considerations (Aid stations)
  - Environmental considerations (Fluid versus fuel trade-off)
  - Physiological considerations (Gastrointestinal discomfort)

