

Research in Exercise Physiology - a few examples

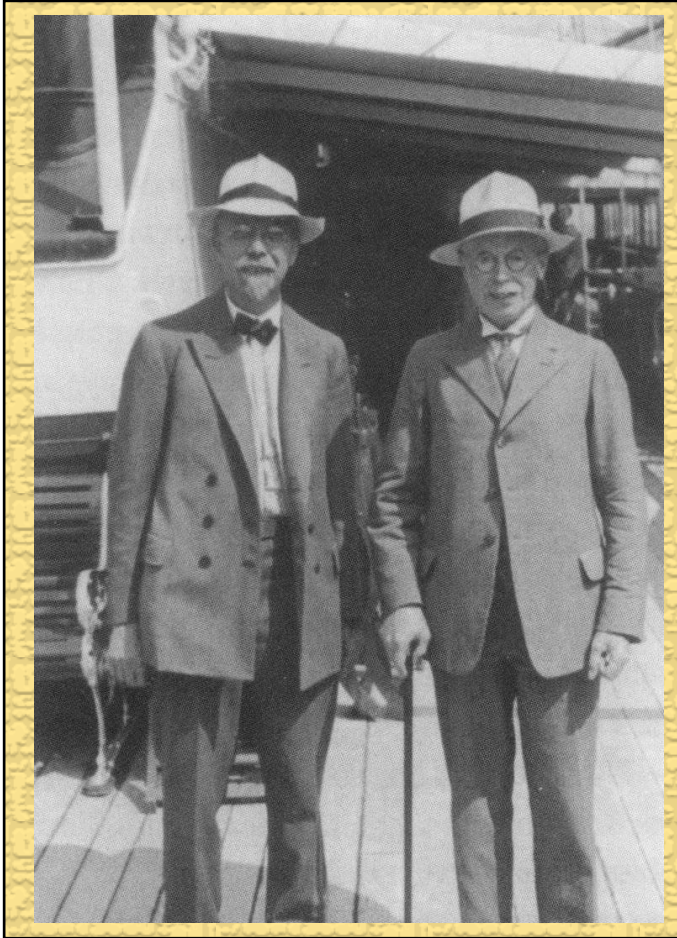
Magni Mohr

**Sport and Health Sciences, University of Exeter,
UK**

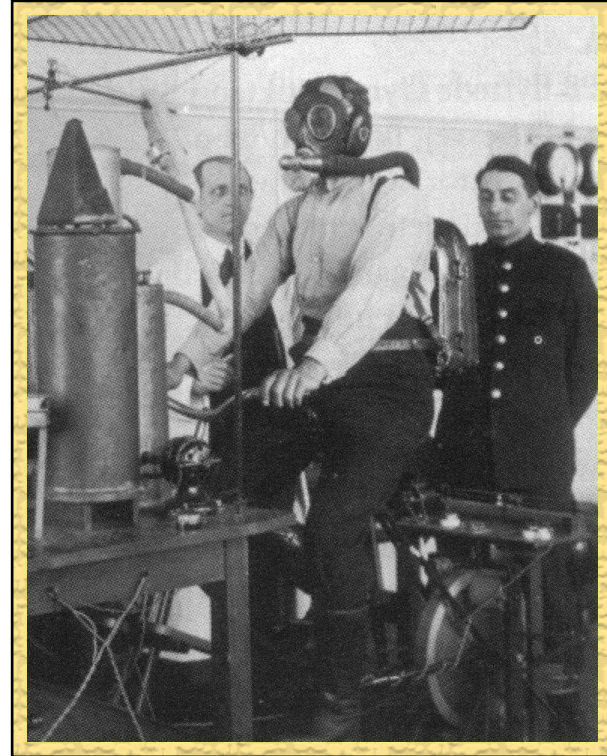
**Department of Nutrition, Exercise and Sport
Sciences,
University of Copenhagen, DK**



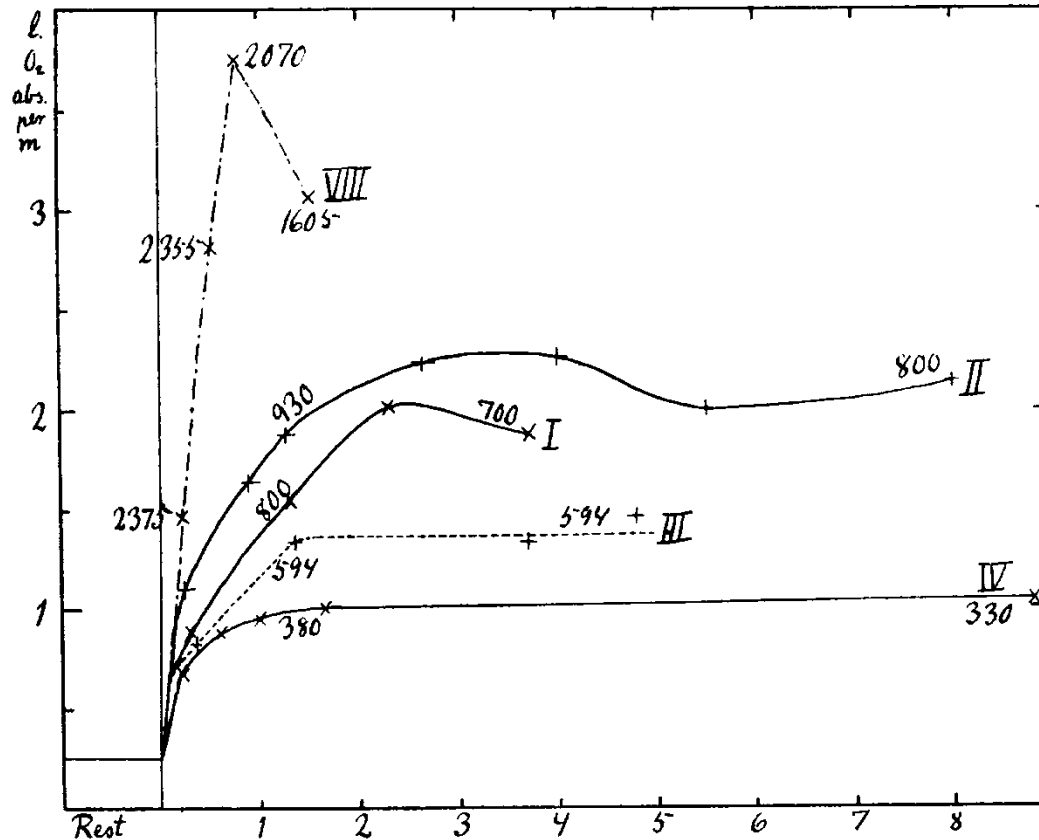
The Pioners of Exercise Physiology



**August Krogh &
Johannes Lindhard**



Pulmonary oxygen uptake during cycle exercise (100 yrs ago)

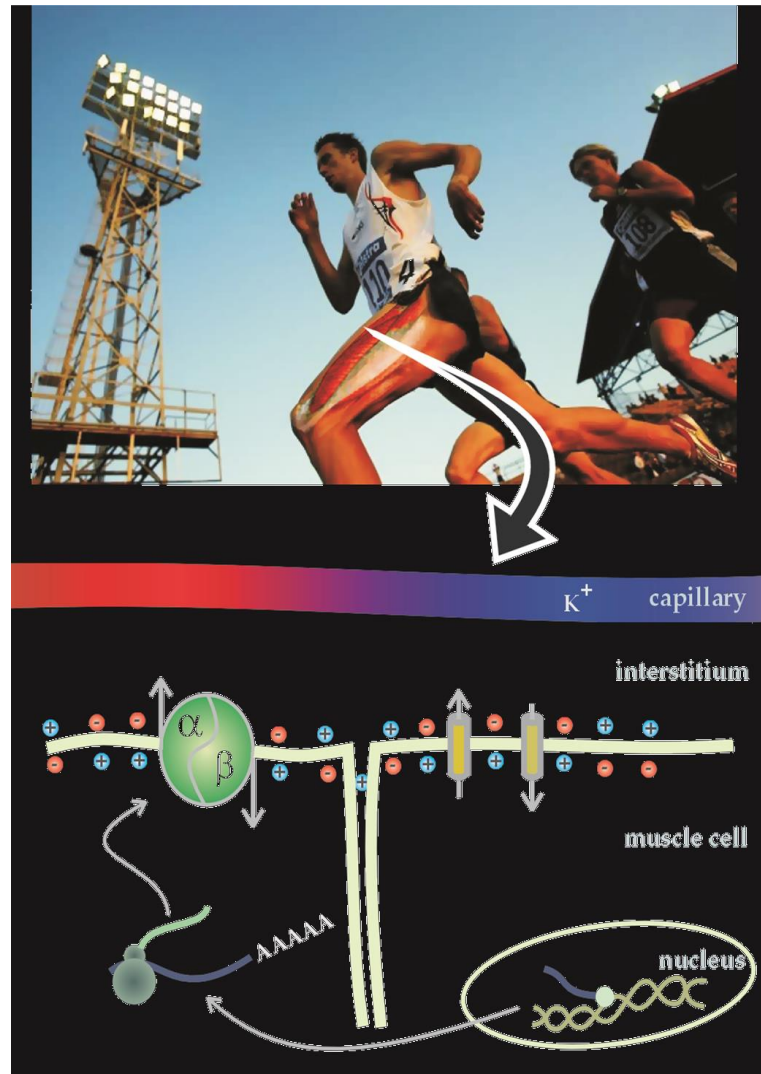


Krogh &
Lindhard (1913)

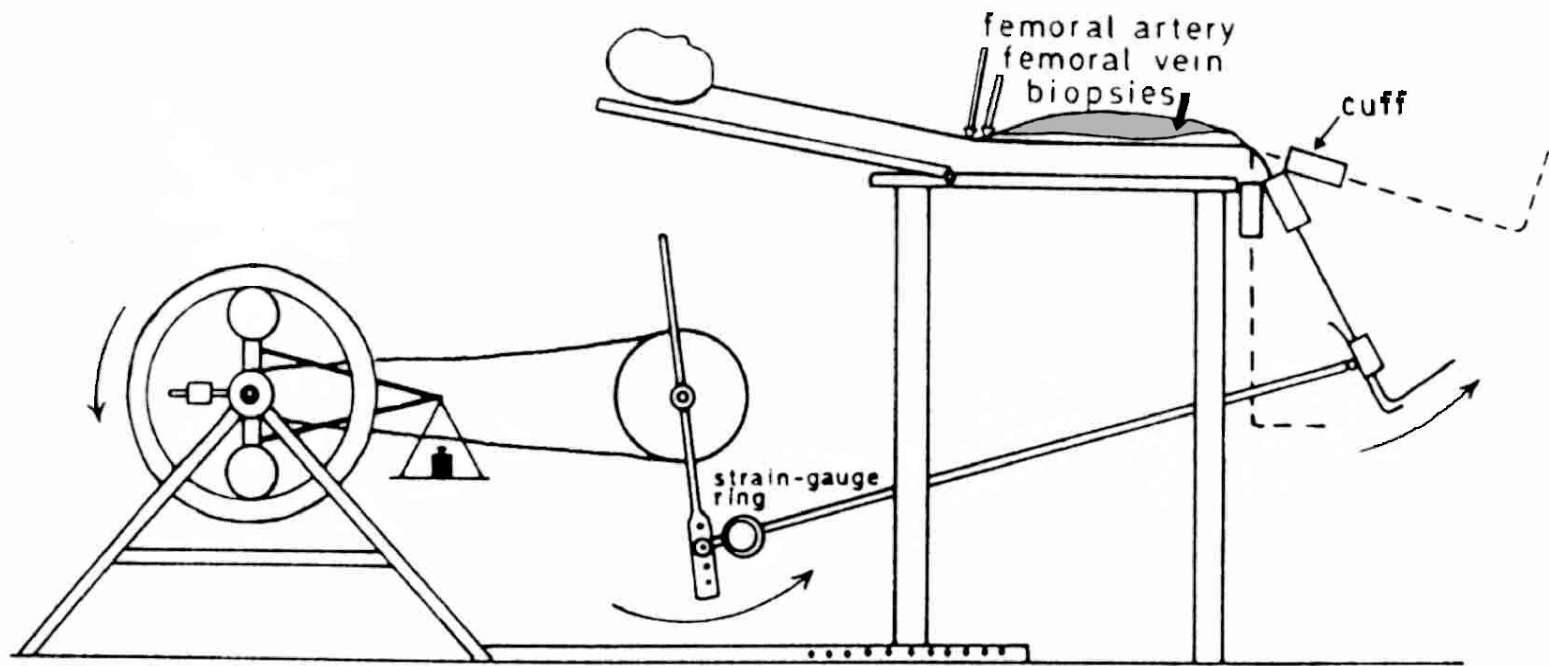
Curves showing oxygen absorption before and during work.
Figures along curves kg. m. per min.

We have pointed out(1) that at the transition from rest to work the oxygen intake does not rise instantaneously though certainly very rapidly to a level corresponding to the amount of work performed.

Exercise-induced fatigue development – physiological models



The one-legged knee extensor model



Experimental set-up



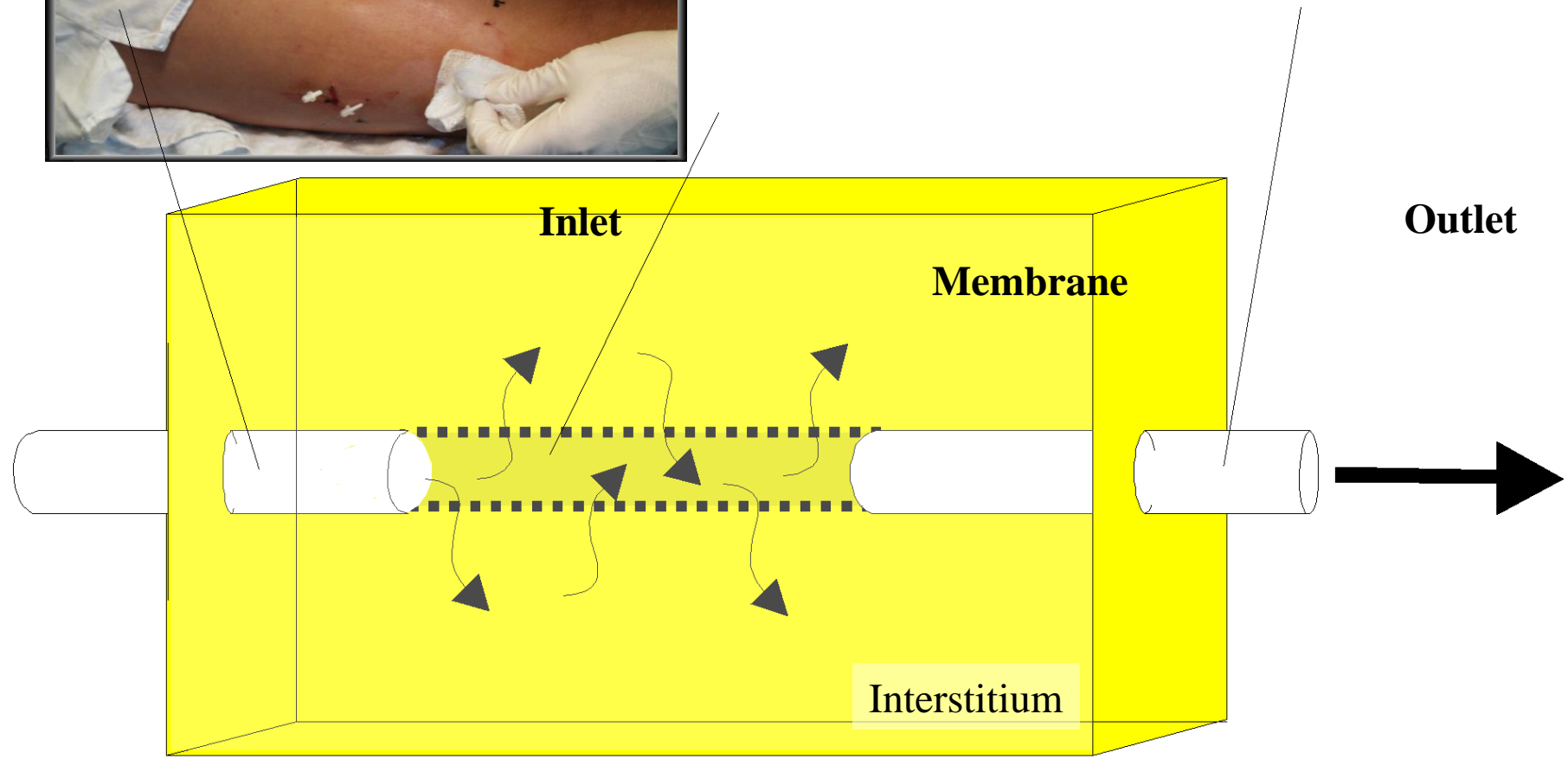
Femoral artery and vein blood sampling



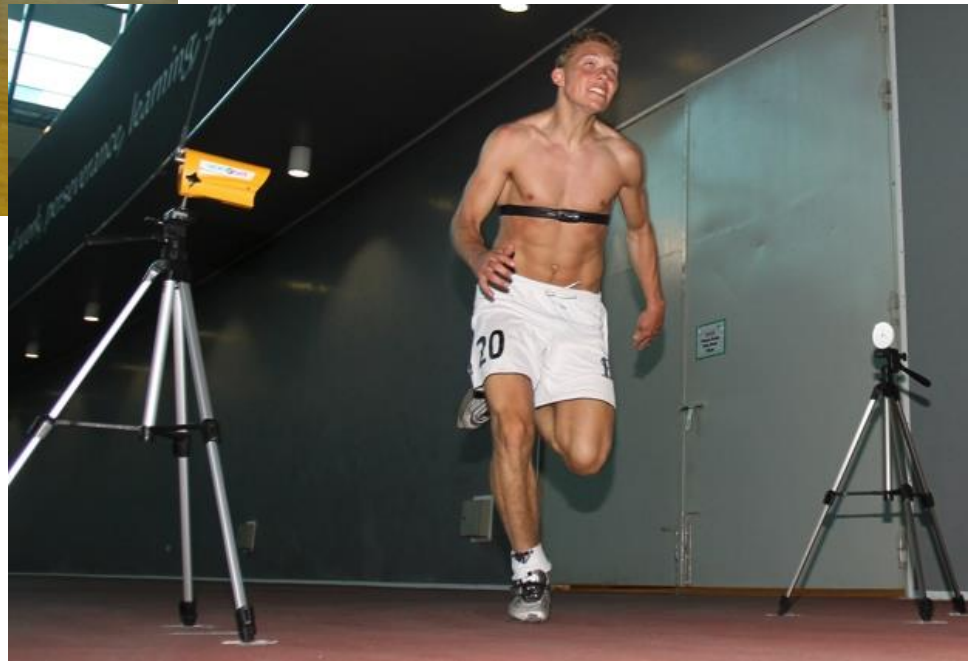
Microdialysis in human skeletal muscle



Microdialysis principal



Performance measurements – whole body exercise

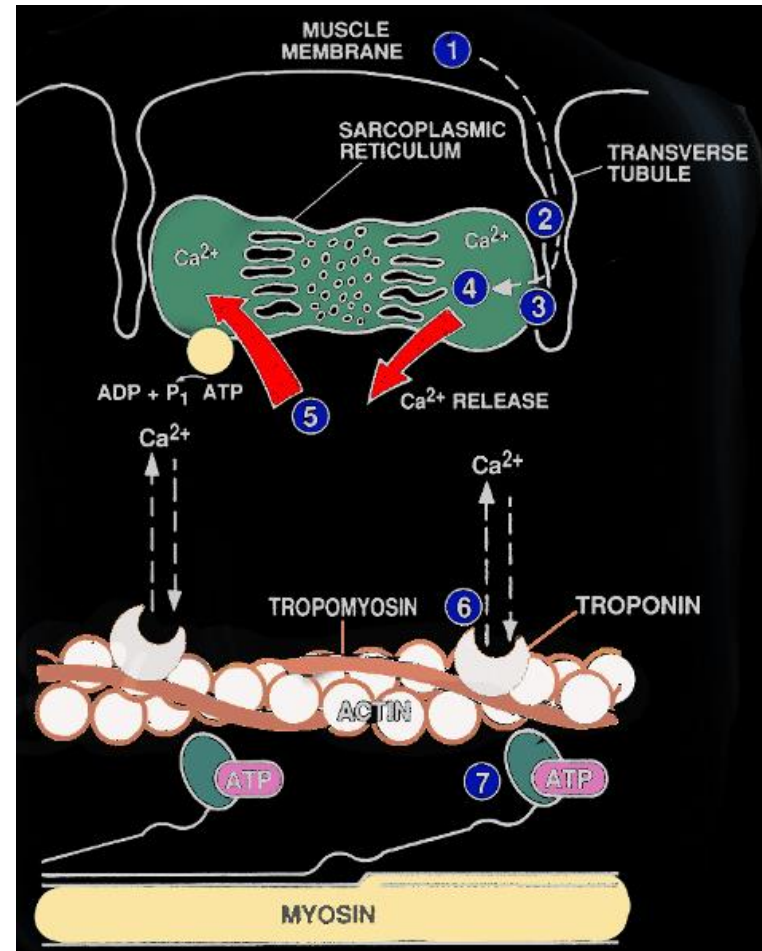
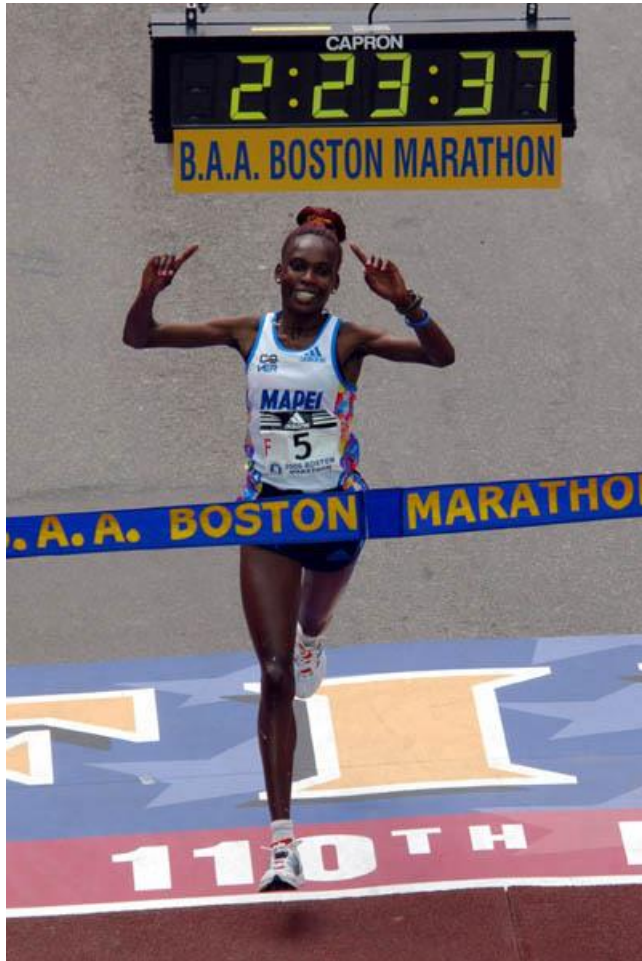


Elektrisk stimulering av nervum og heila

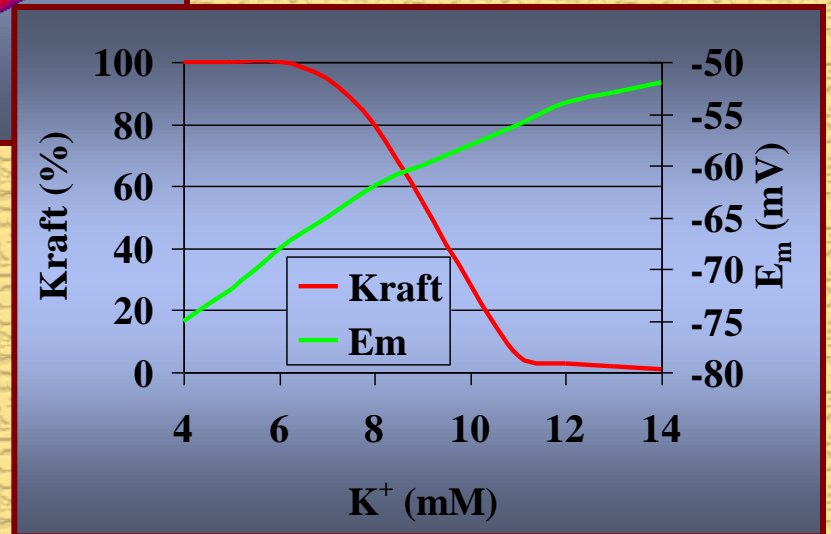
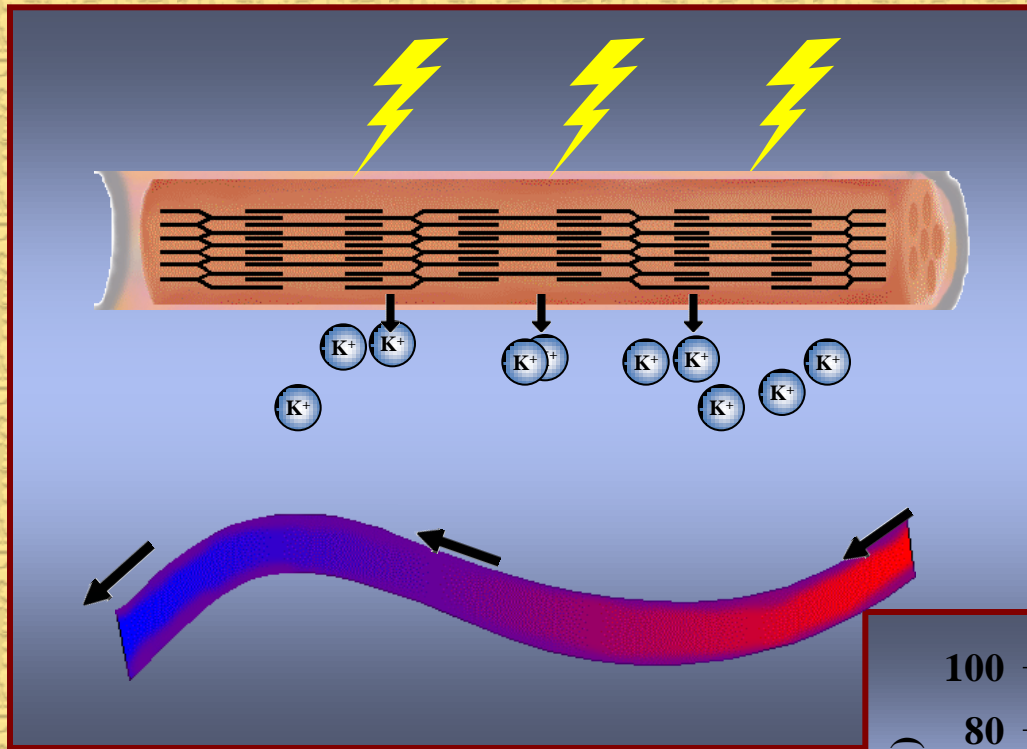


Fatigue during exercise

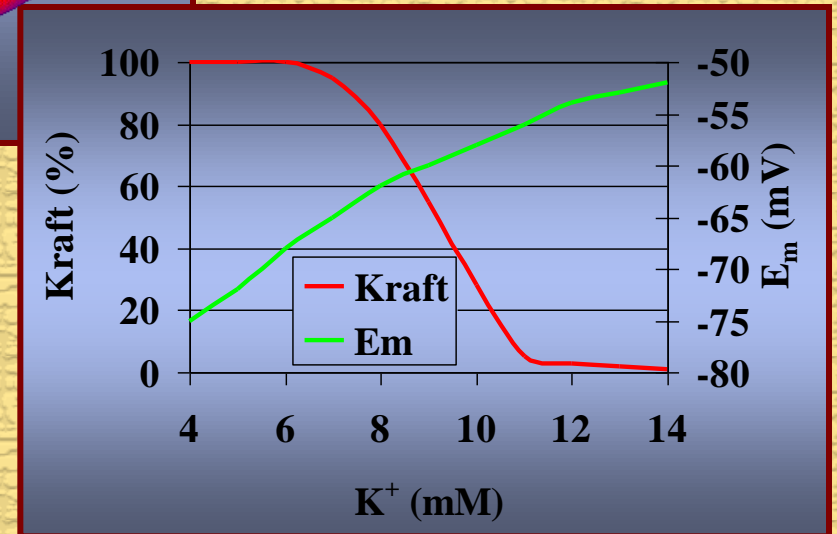
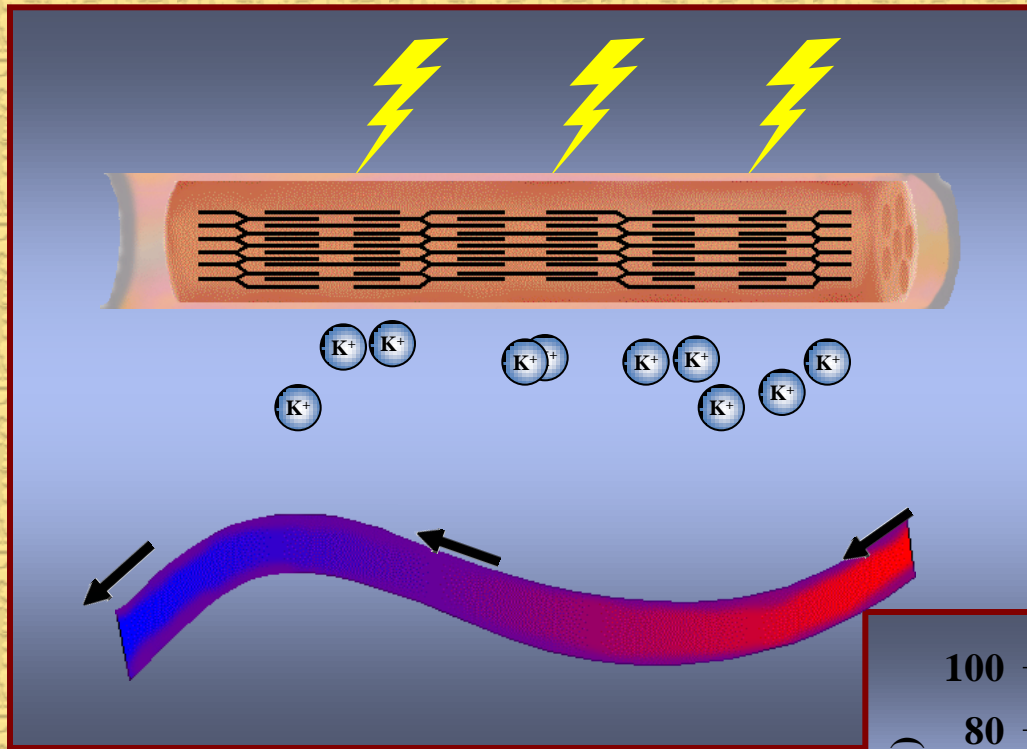
- muscle fatigue/peripheral fatigue



Potassium induced fatigue



Potassium induced fatigue

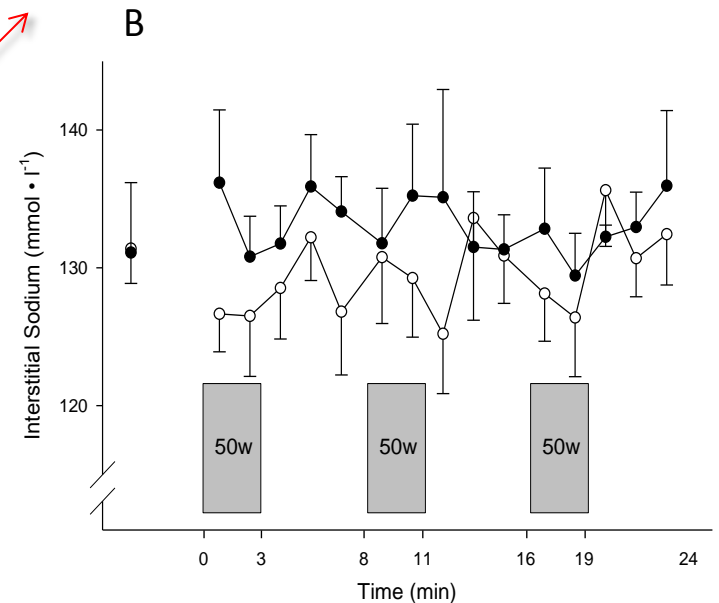
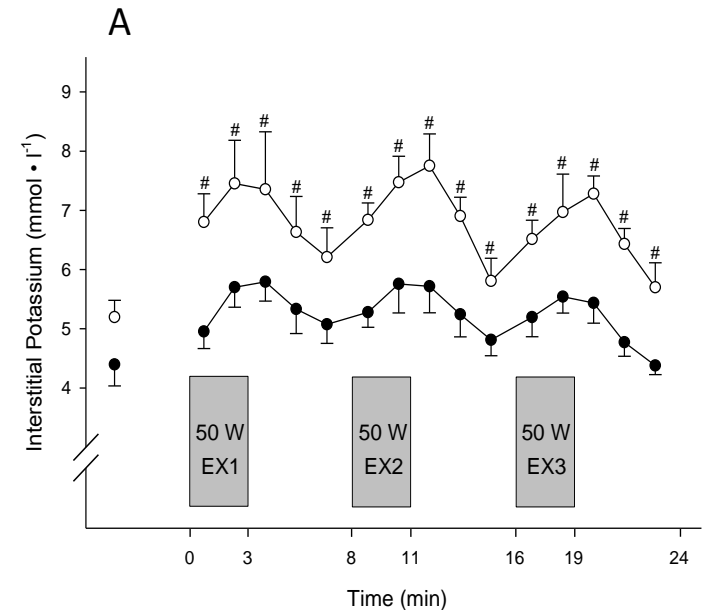


Muscle interstitial K⁺ and Na⁺ during repeated intense exercise

- effect of caffeine intake

- Mohr et al., 2011

- Performance increase of 16%





100 m sprint:

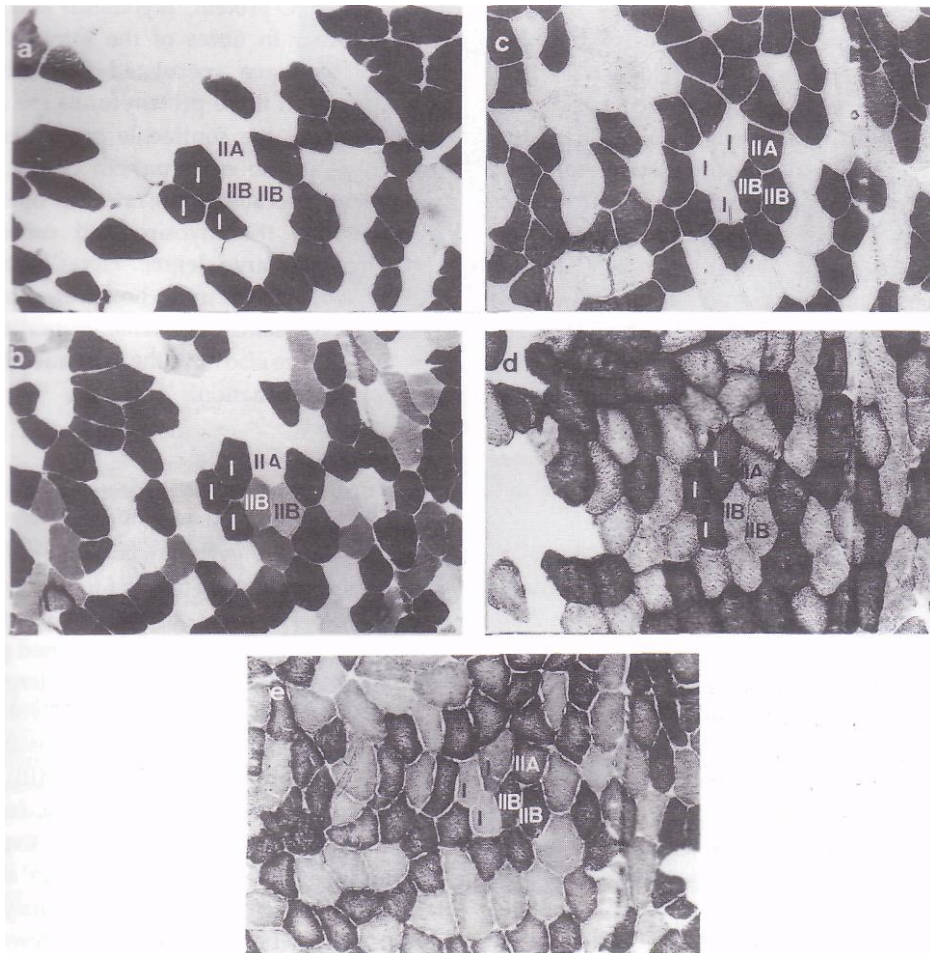
Athletes born in USA or Caribbean Islands have won 10 of the last 13 Olympic titles, every World title since 1983 and have recorded 74 of the 100 times in history!

Marathon:

Athletes of East African origin are present in 87 of the top 100 marathon performances of all time and every top ranked marathoner since 2003!



Muscle fiber types



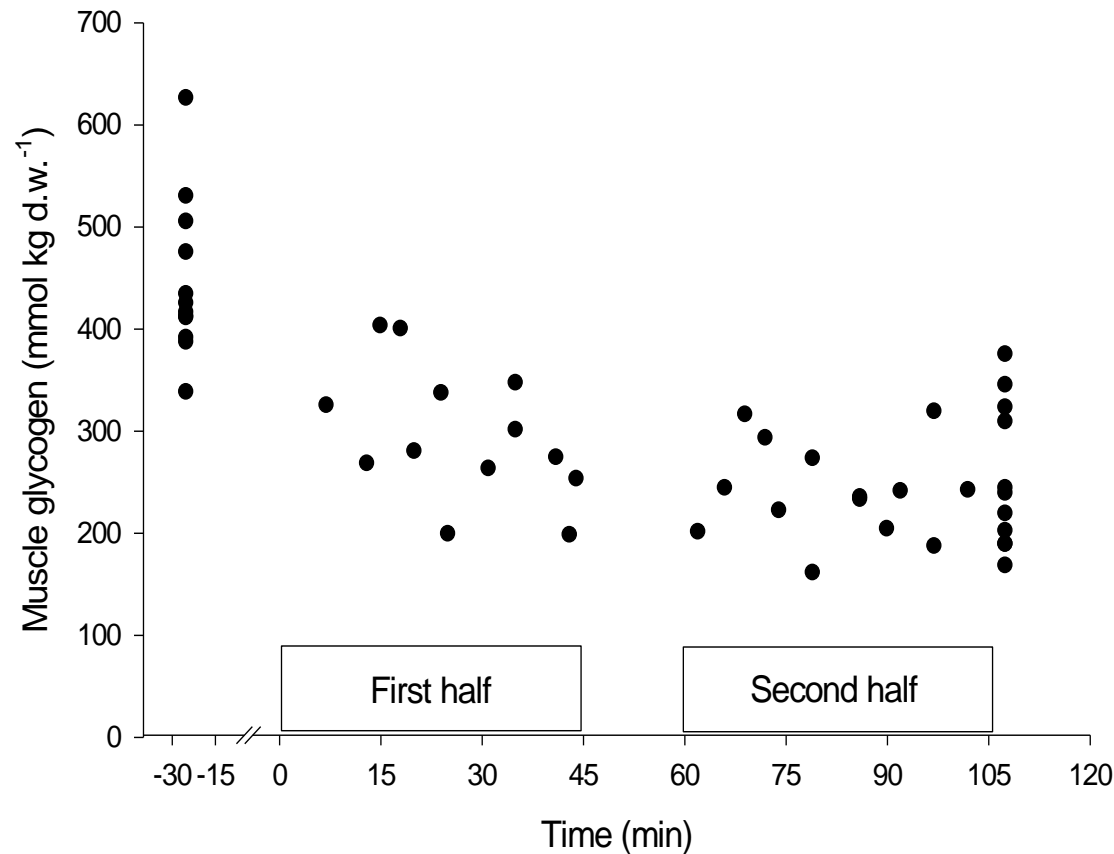


Muscle biopsy of
the vastus lateralis
muscle

Muscle biopsy of the deltoid muscle



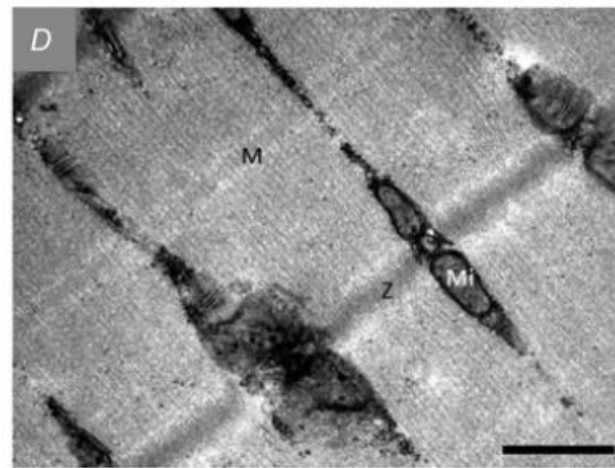
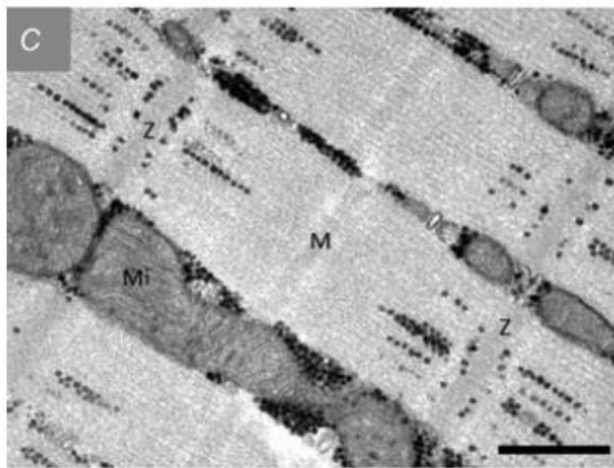
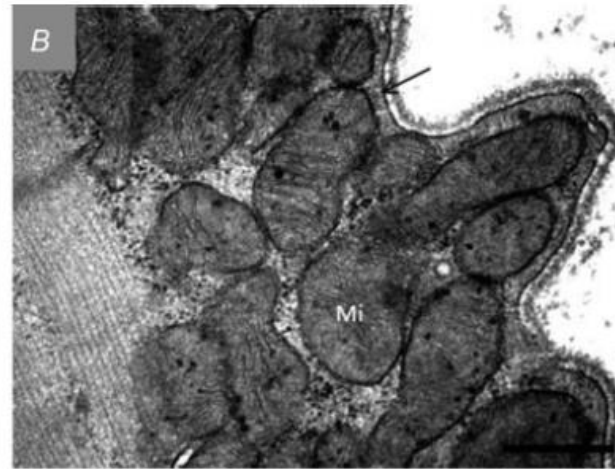
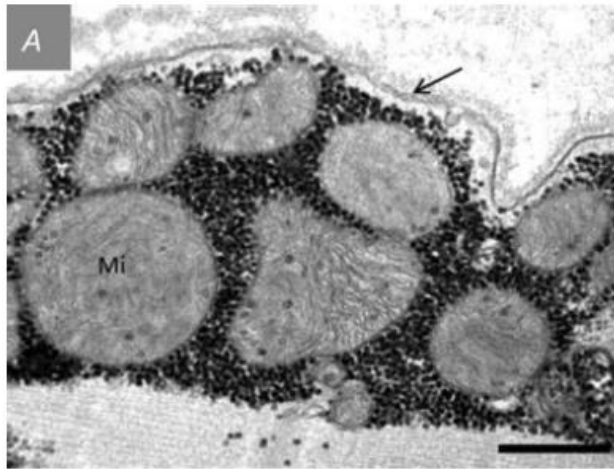
Muscle glycogen during a football game



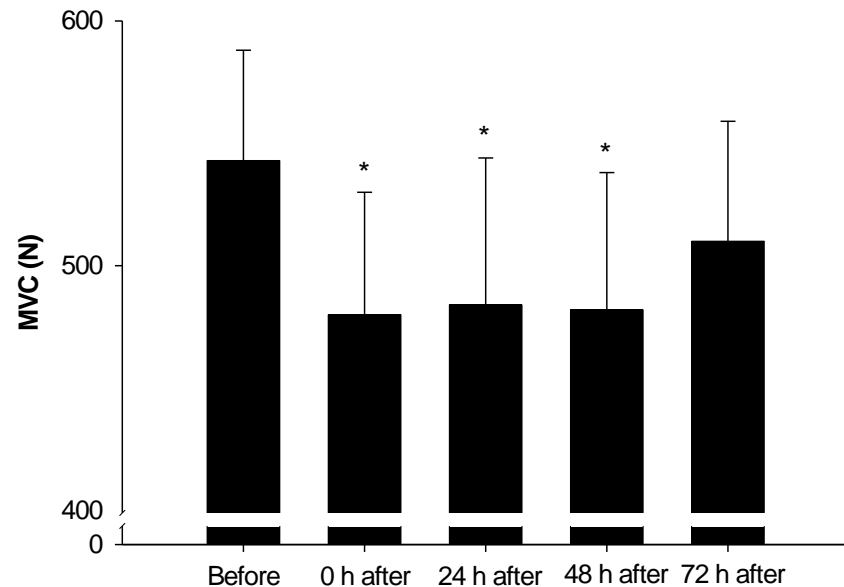
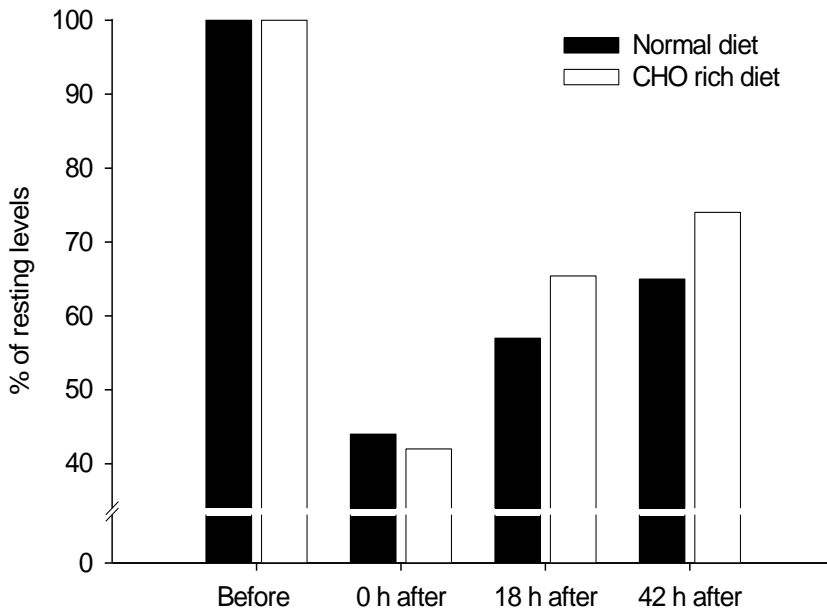
Mohr et al., 2005



Muscle glycogen (intramyofibrillar and subsarcolemmal) before and after prolonged exercise



Muscle glycogen before and after a football game as well as 24 and 42 h into recovery

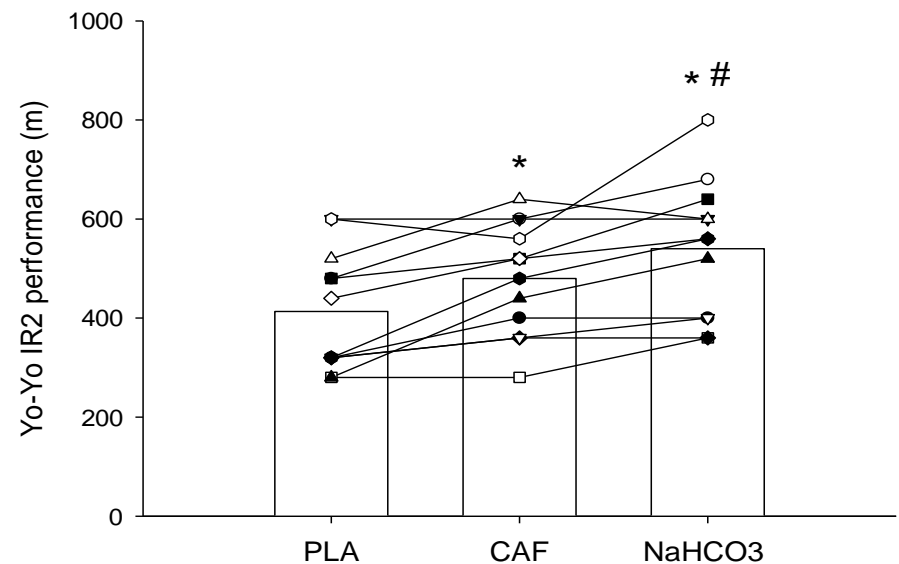


Mohr, 2008



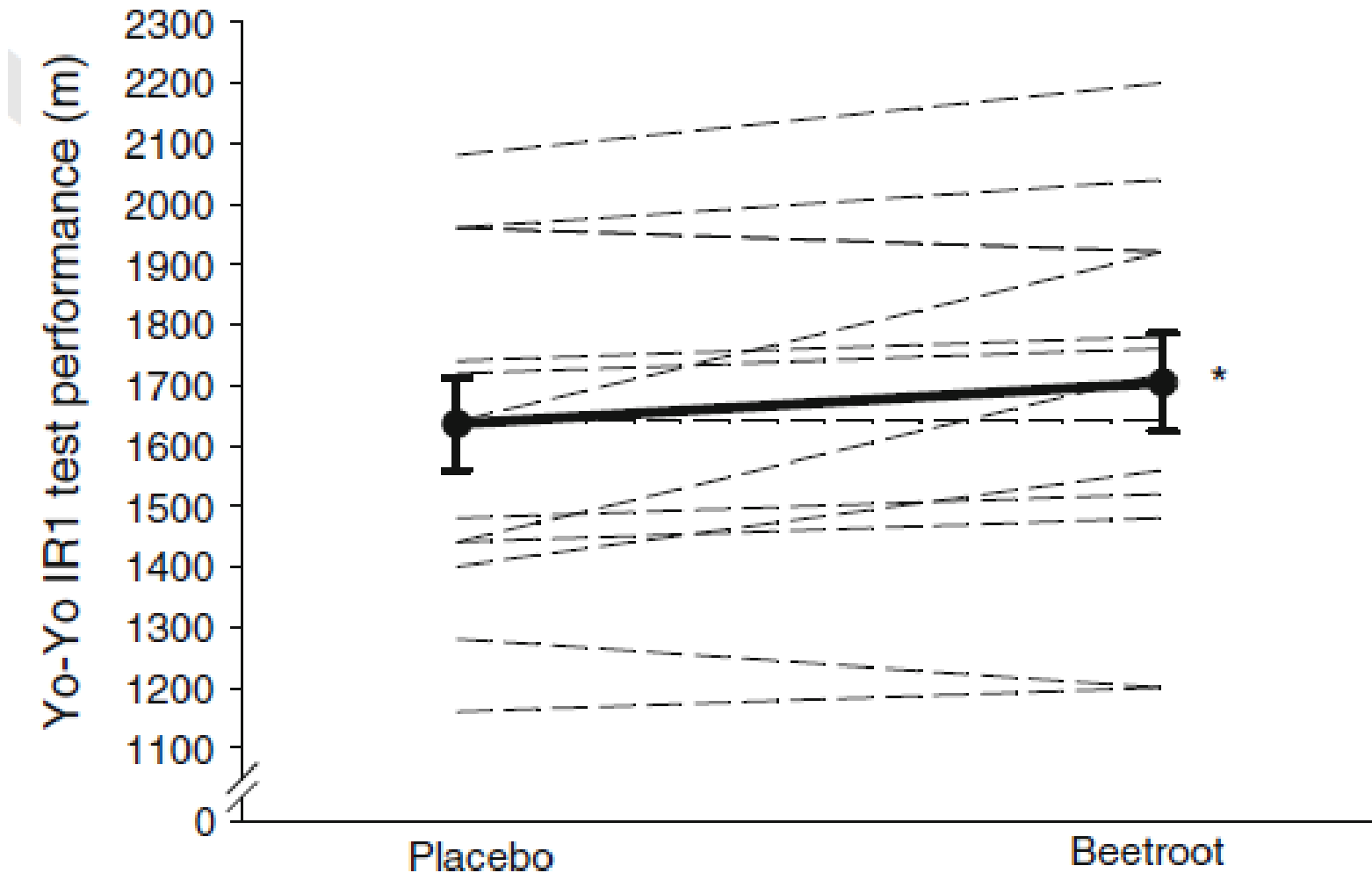
Effect of caffeine and NaHCO₃ supplementation

Mohr et al., 2013



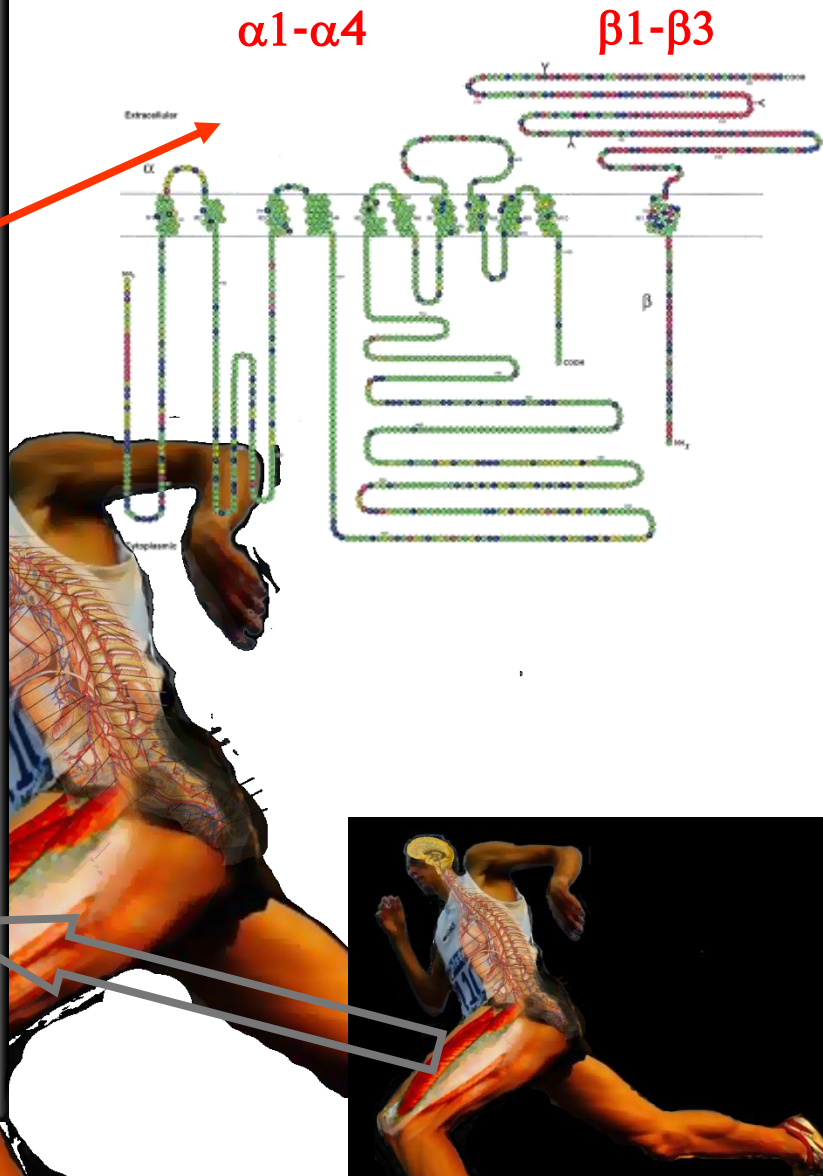
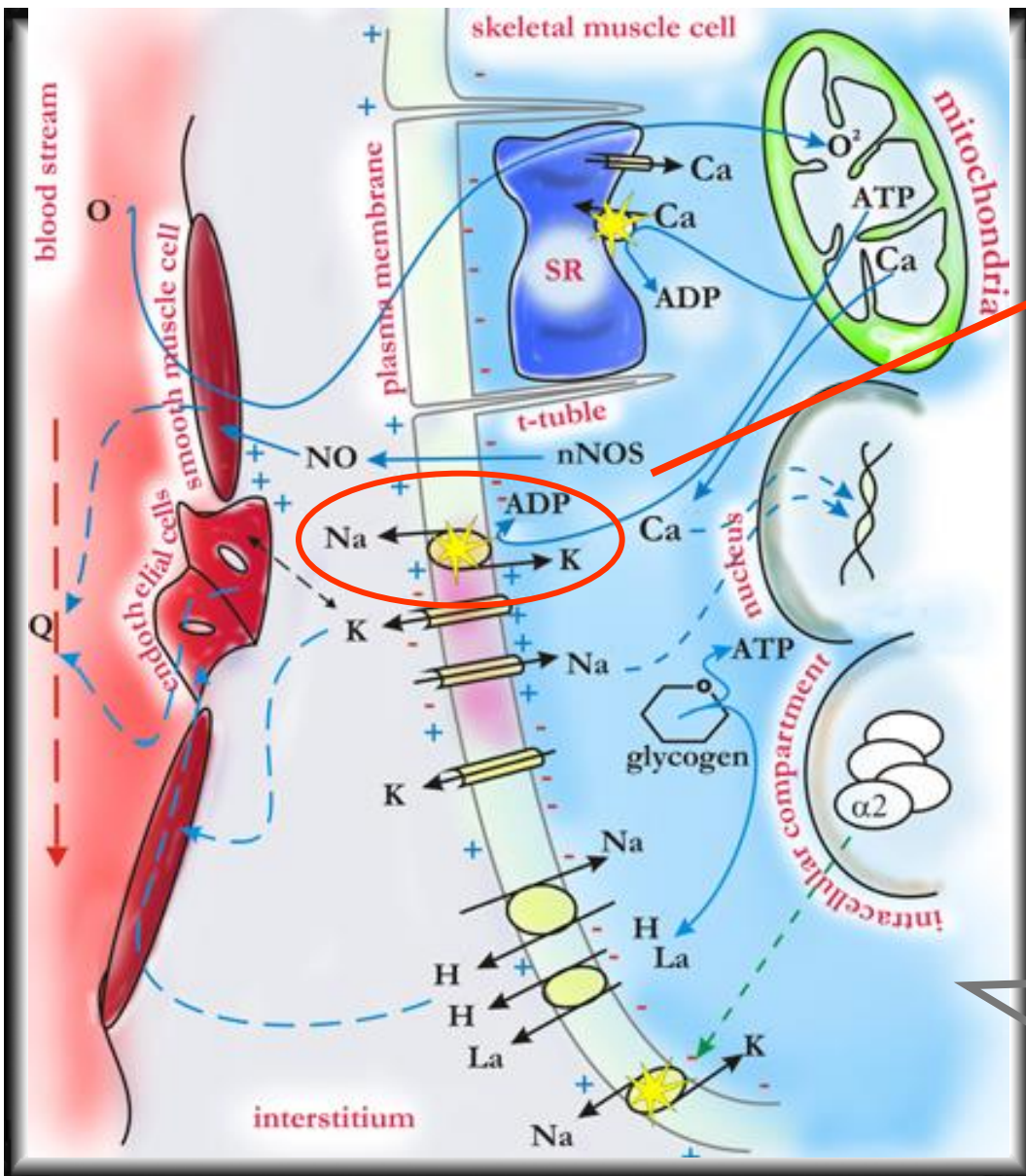
Endurance performance

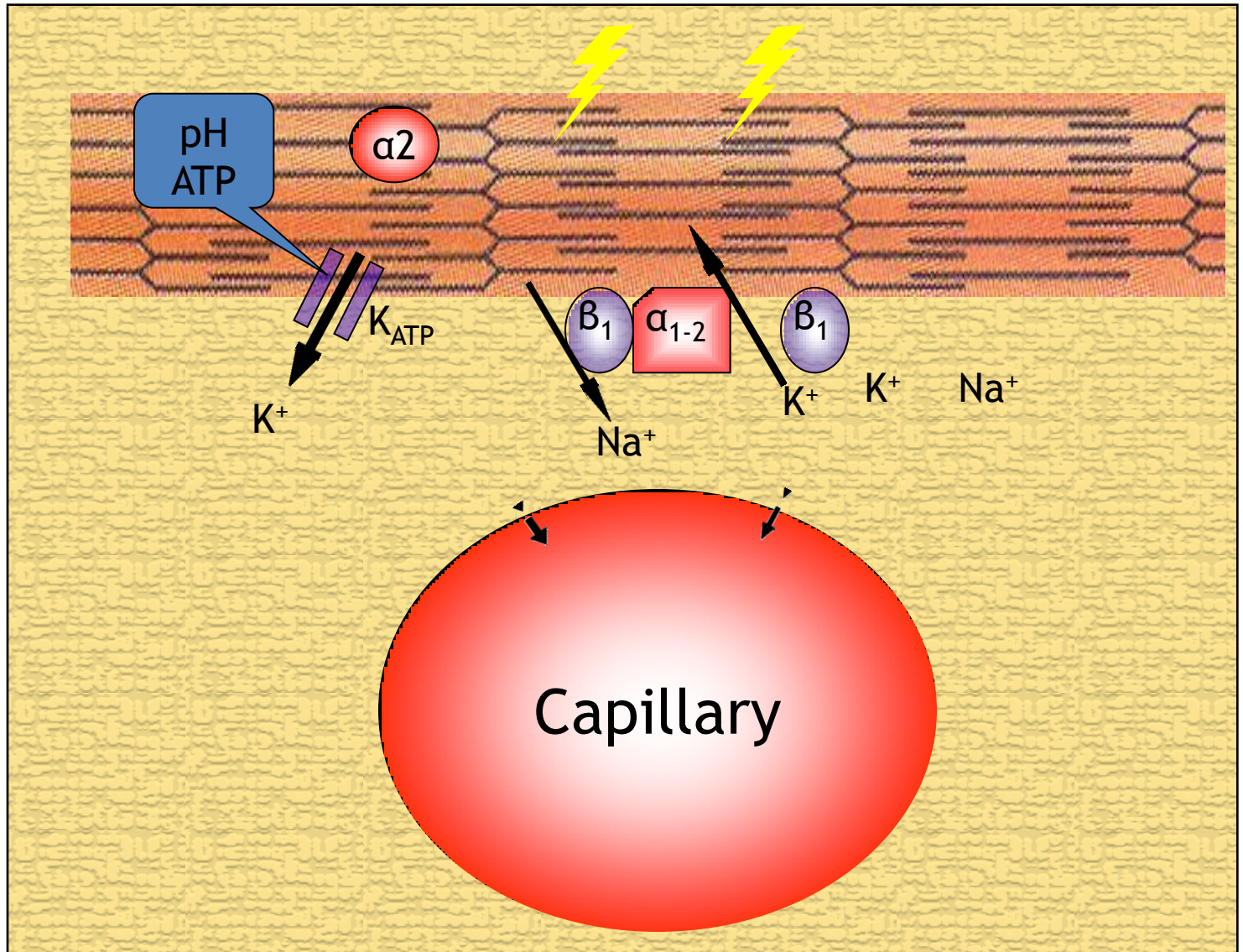
- effect of beetroot supplementation



Wylie et al., 2012

Exercise training and muscle fatigue





Western blotting – protein analysis of sarcolemmal transporters

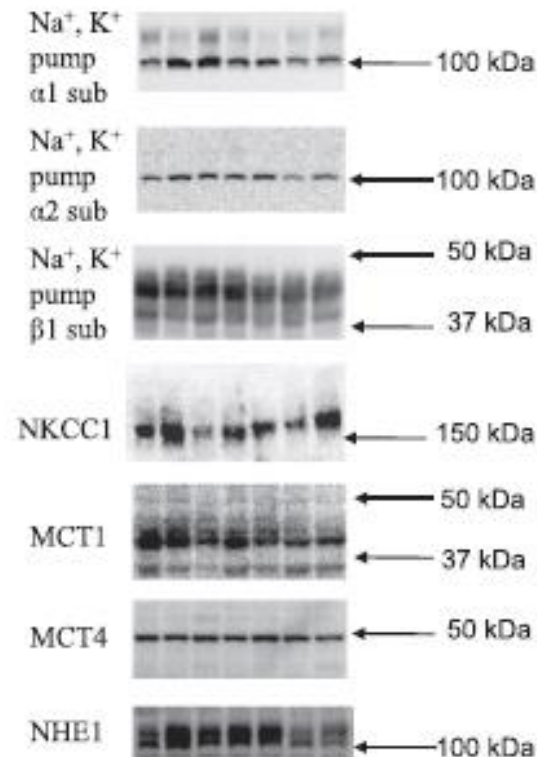
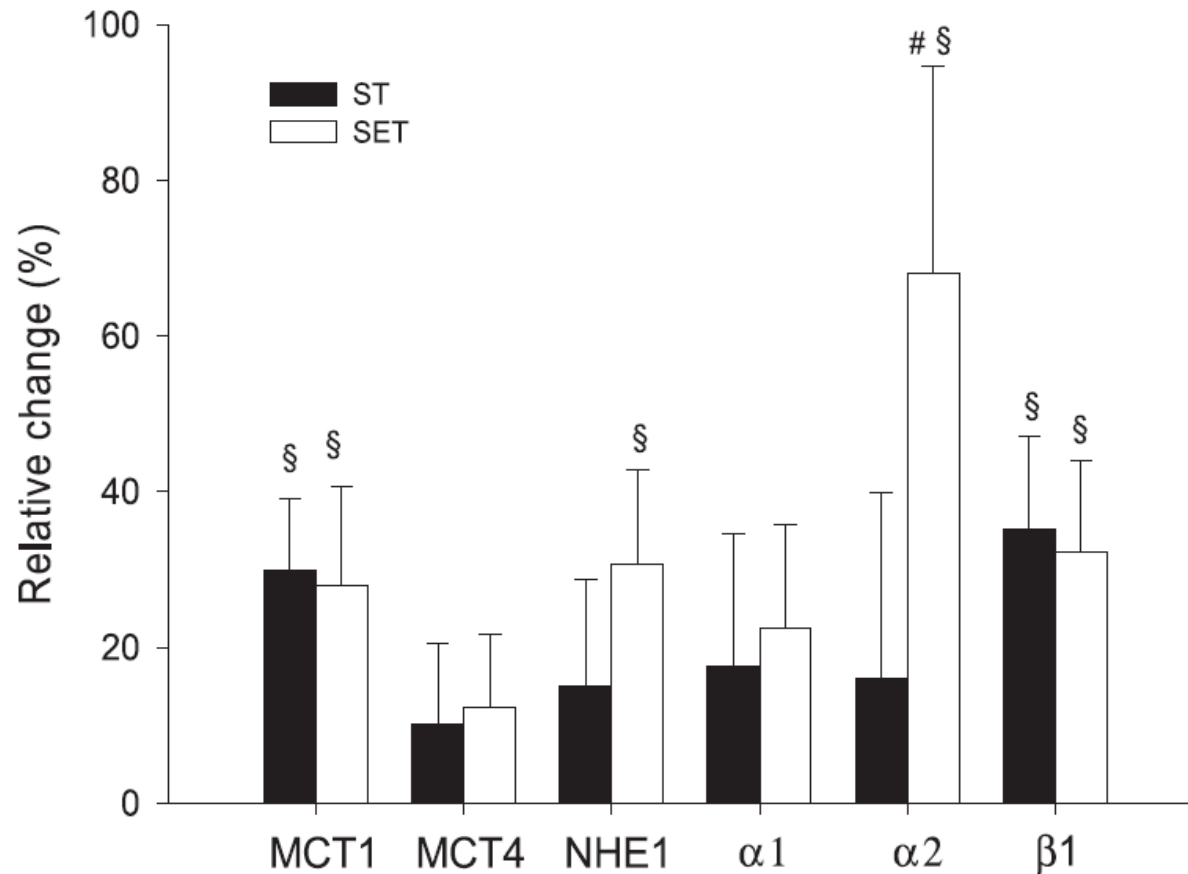


Fig. 1. Representative Western blots for the muscle membrane transport proteins. MCT, monocarboxylate transporters; NHE1, Na⁺/H⁺ exchanger isoform 1; NKCC1, Na⁺-K⁺-2Cl⁻ 1 protein cotransporters; sub, subunit. Arrows indicate the molecular mass of the detected proteins determined by the Precision Plus Protein Standards All Blue and Dual Color (Bio Rad).

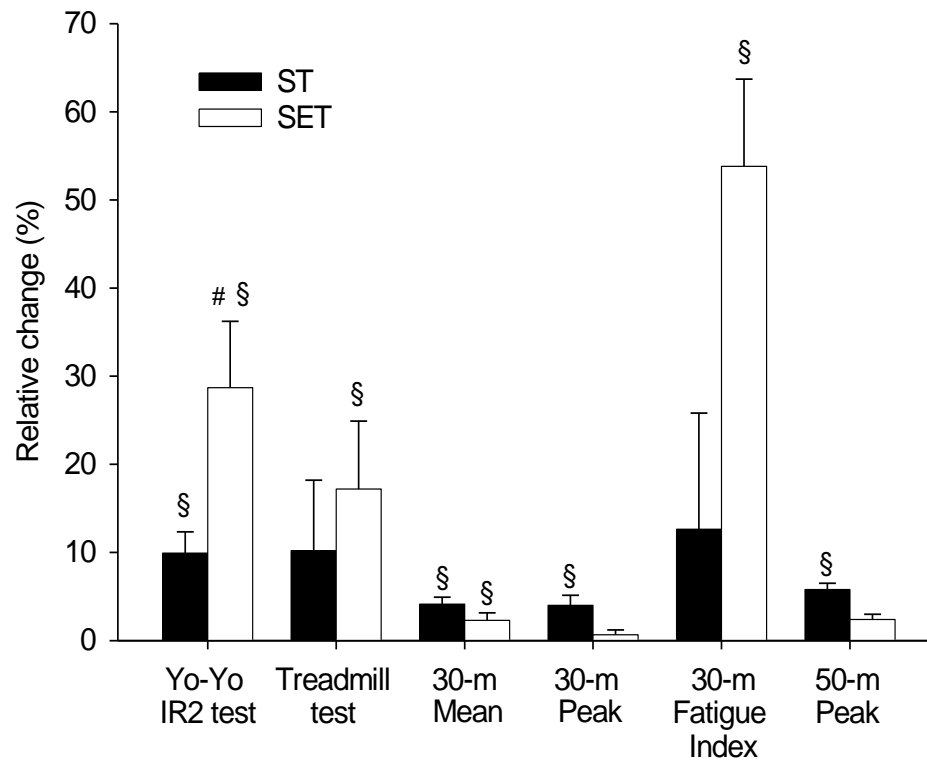
Muscle ion transporter adaptations with ST and SET training



Mohr et al., 2007



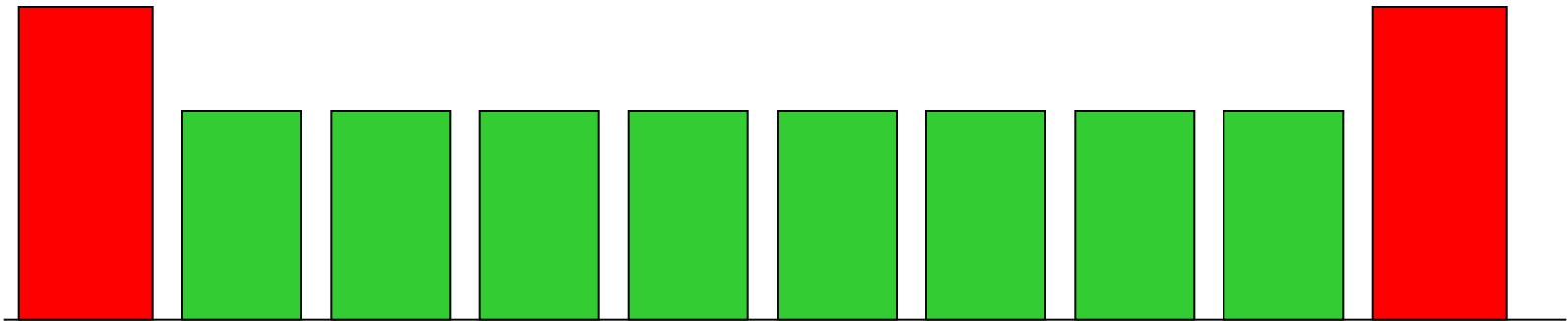
Performance changes



Mohr et al., 2007



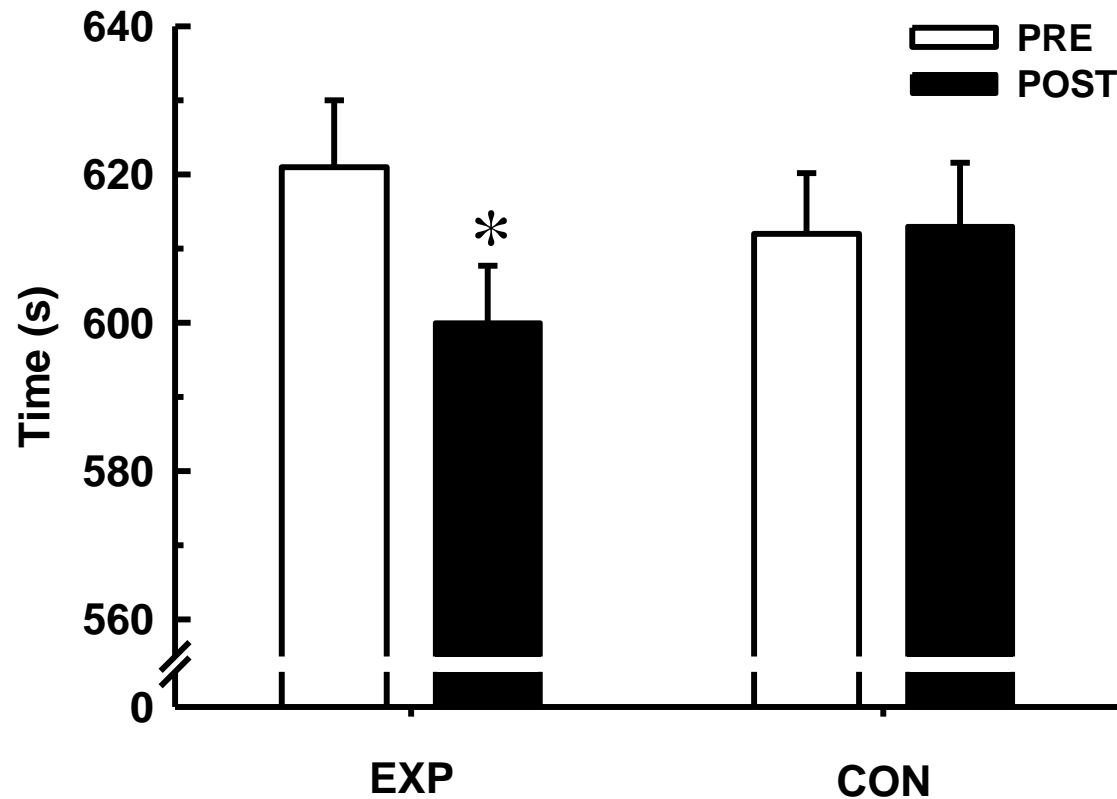
Study design



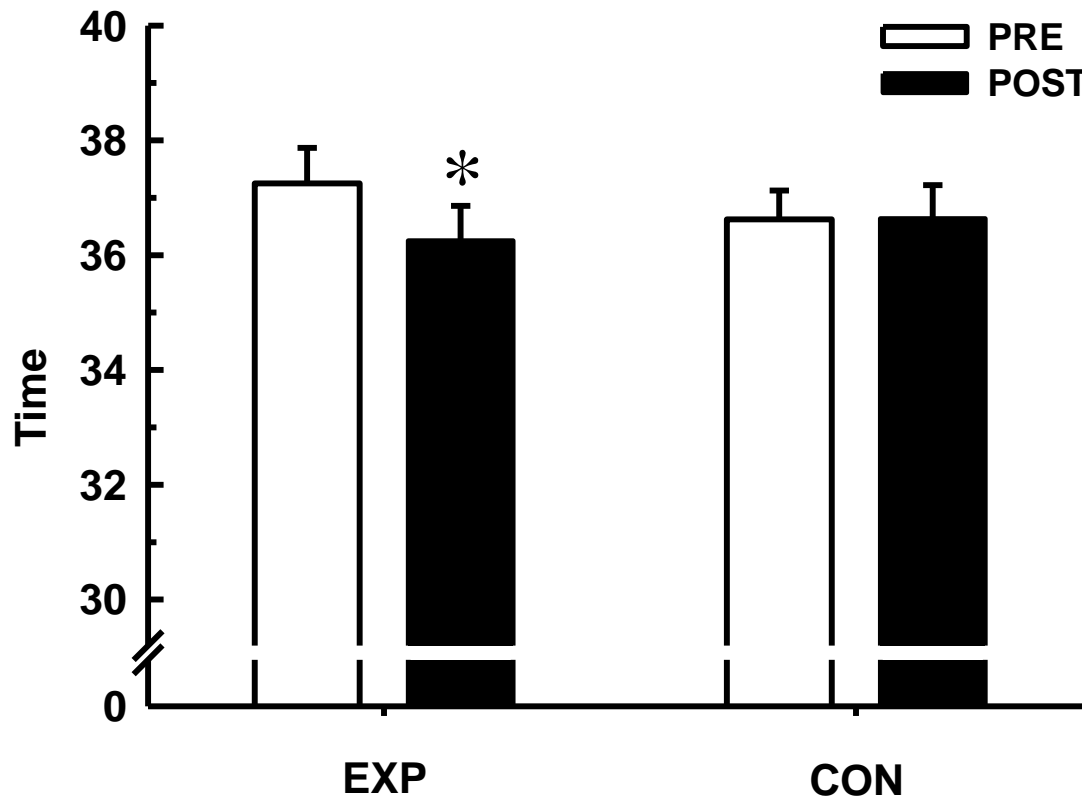
Sessions per week:

2-3 x AnT, 1 x AH, 1 x AL, 1 x AM

3,000-m performance



10,000-m performance





SPORT SCIENCE AND MEDICINE AT MANCHESTER UNITED

TECHNICAL AND TACTICAL (n= 4)

- Manager
- Assistant Manager
- First Team Coach
- Goalkeeper Coach

PERFORMANCE ANALYSIS (n=3)

- Chief Scout
- Match Analyst
- Scouting Analyst (reports to chief scout)

SPORTS MEDICINE (n=9)

- Head of Sports Medicine and Sports Science
- Head Physiotherapist
- Assistant Physiotherapists x 3
- Masseur x 3
- Vision Consultant

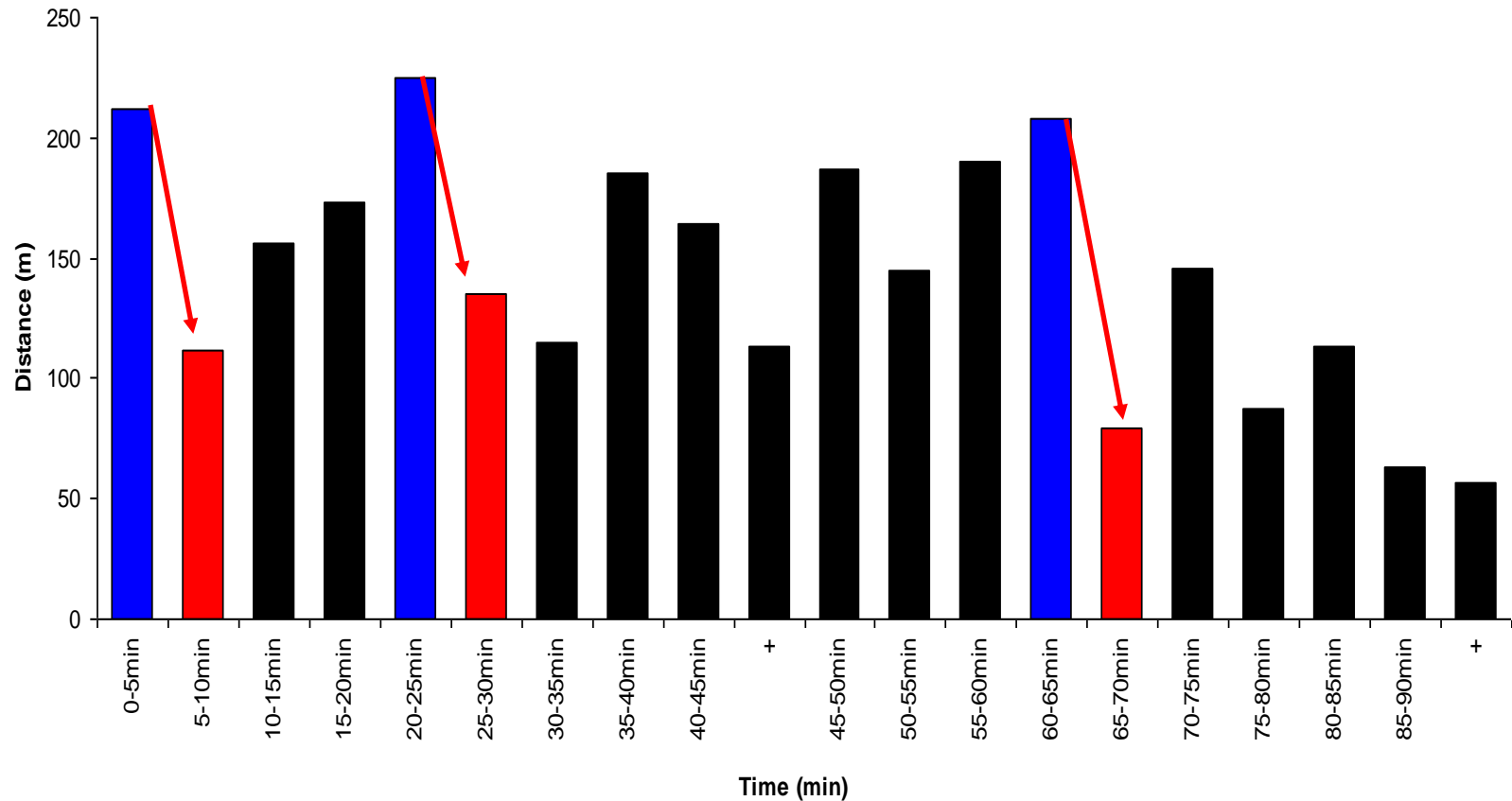
SPORTS SCIENCE (n=8)

- Head of Sports Science (1ST Team Fitness Coach)
- 2nd Team Fitness Coach
- Human Performance Manager
- Strength & Conditioner
- Sport Science Students x 2 (Research – PhD)
- Nutritionist
- University Consultant

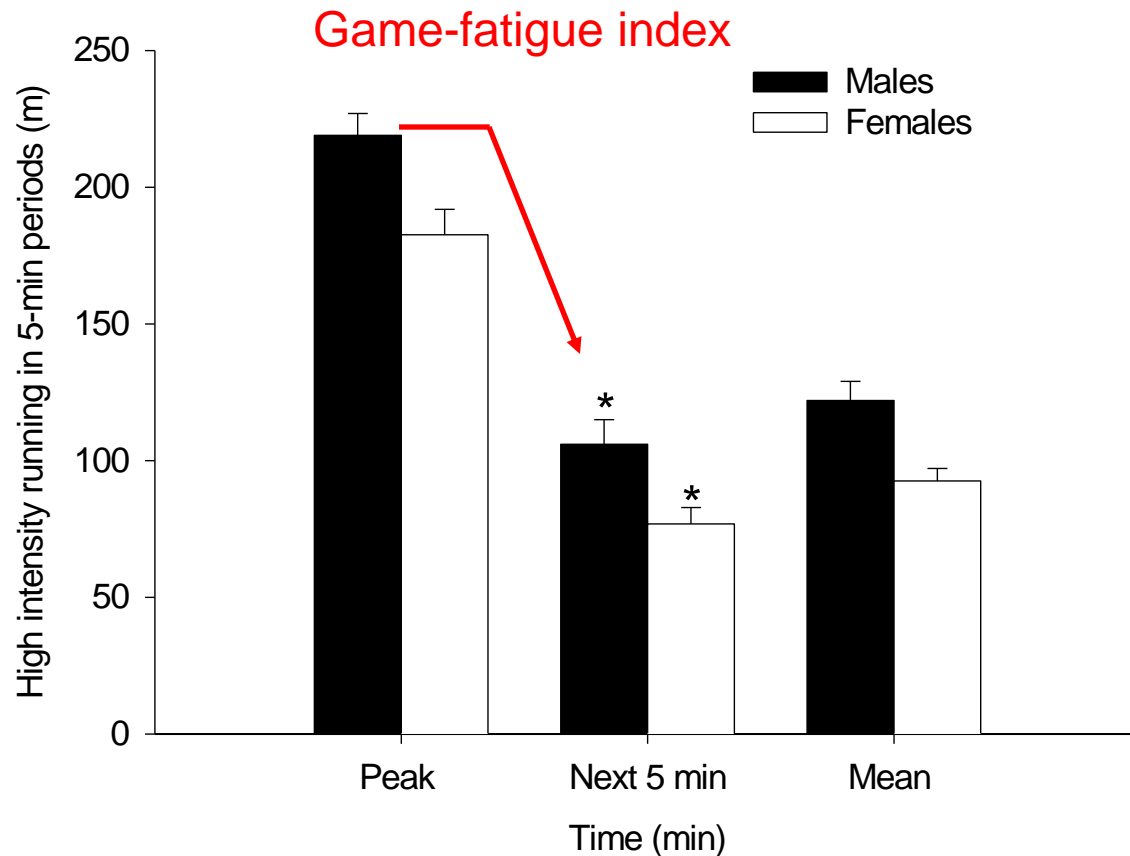
N = 24

Fatigue profile

- one central midfield player



Temporary intensity decrement

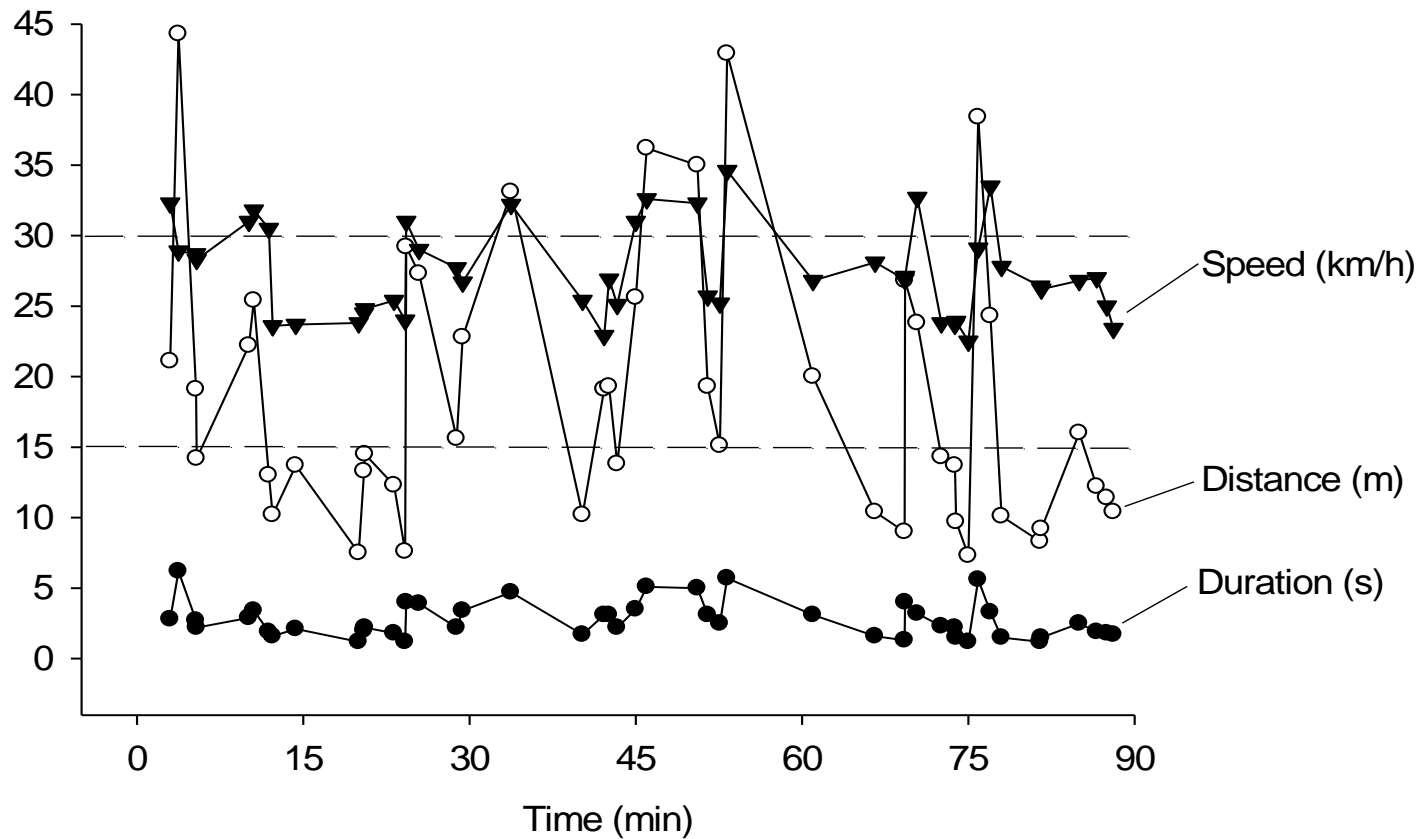


Highest amount of high intensity running in a 5-min interval

Mohr et al., 2003; 2008

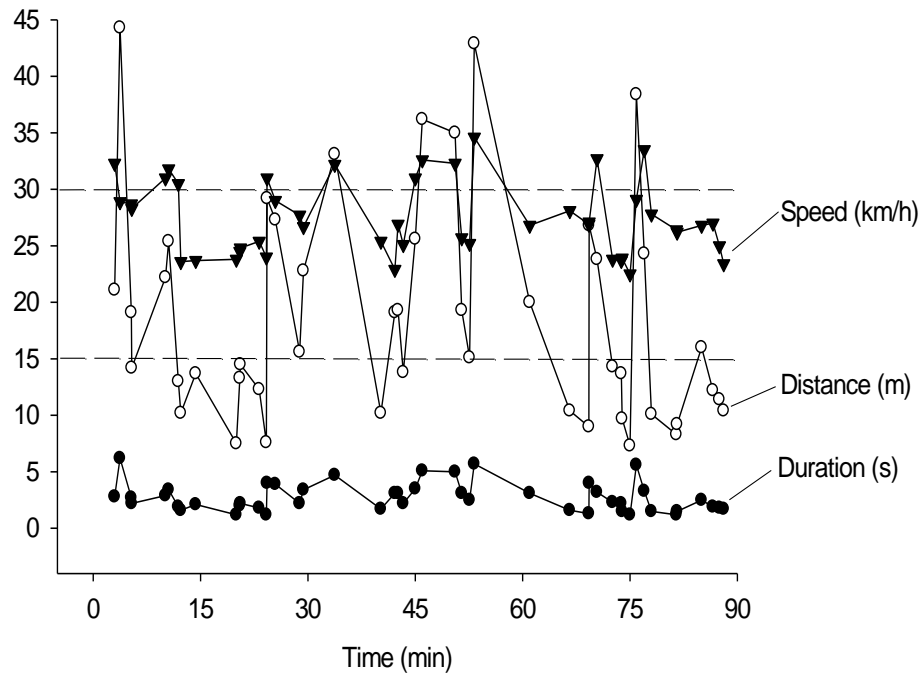


Sprint characteristics – certain sprints provoke fatigue

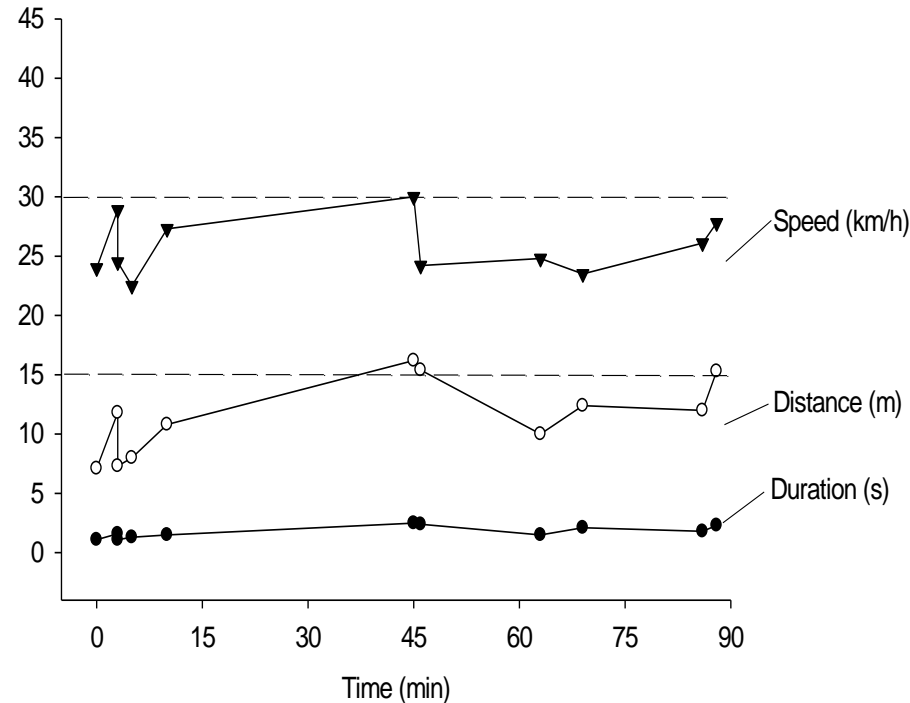


Two different players in the same game

Midfielder



Central defender



INDIVIDUAL TRAINING



Lampard – Speed endurance drill

1: Accelerate, control and diagonal pass to TP

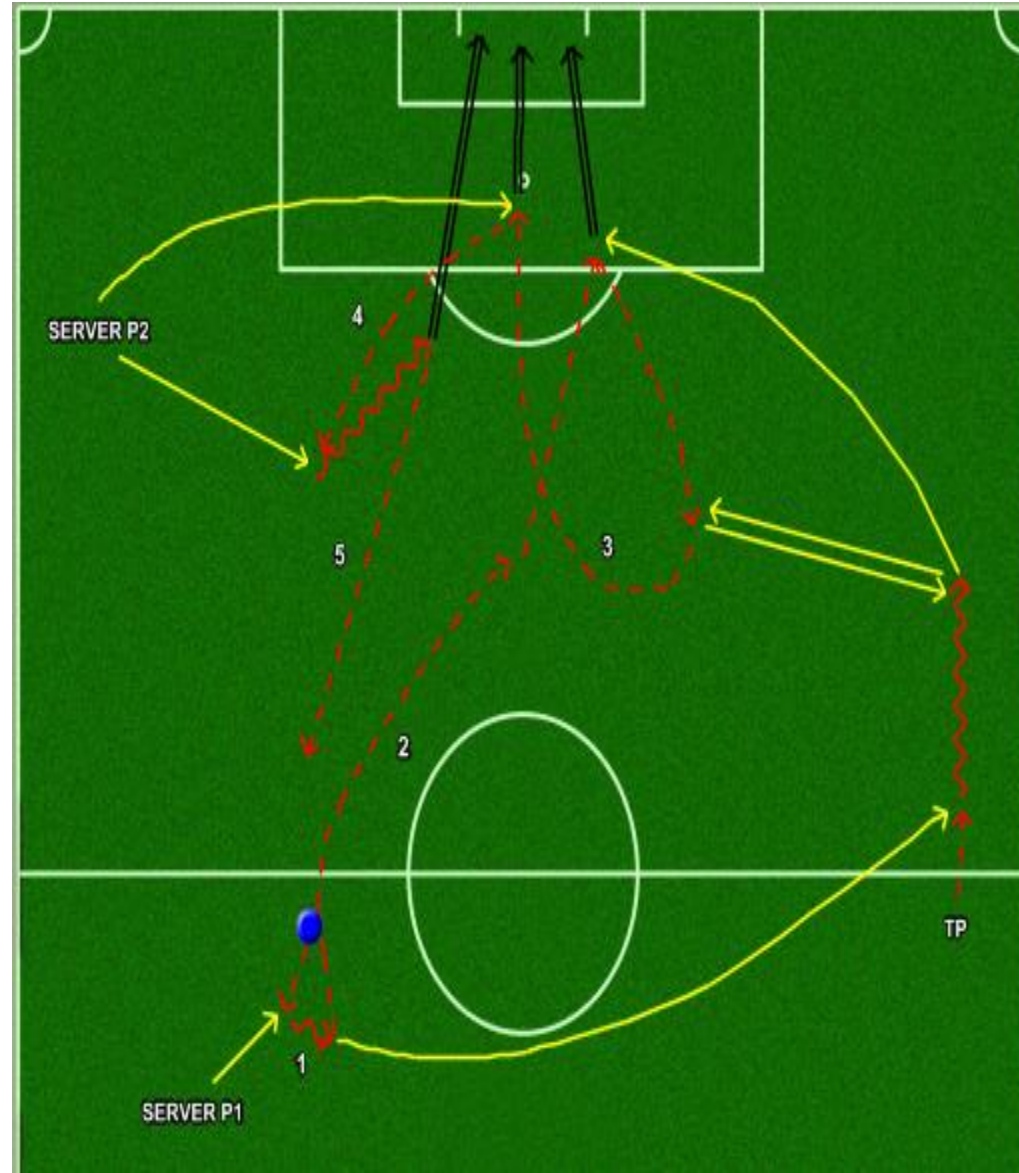
2: Run (>20 km/h) then into box (>27 km/h) to meet cross from TP

3: Run (>17 km/h) and wall-pass with TP(>17 km/h), then curved run into box to meet cross from server (>25 km/h)

4: Run (>21 km/h), turn, dribble and shoot

5: Defensive run (>21 km/h)

~30 s exercise: 120 s recovery x 6 (2 sets separated by 10 min of low intense activity)

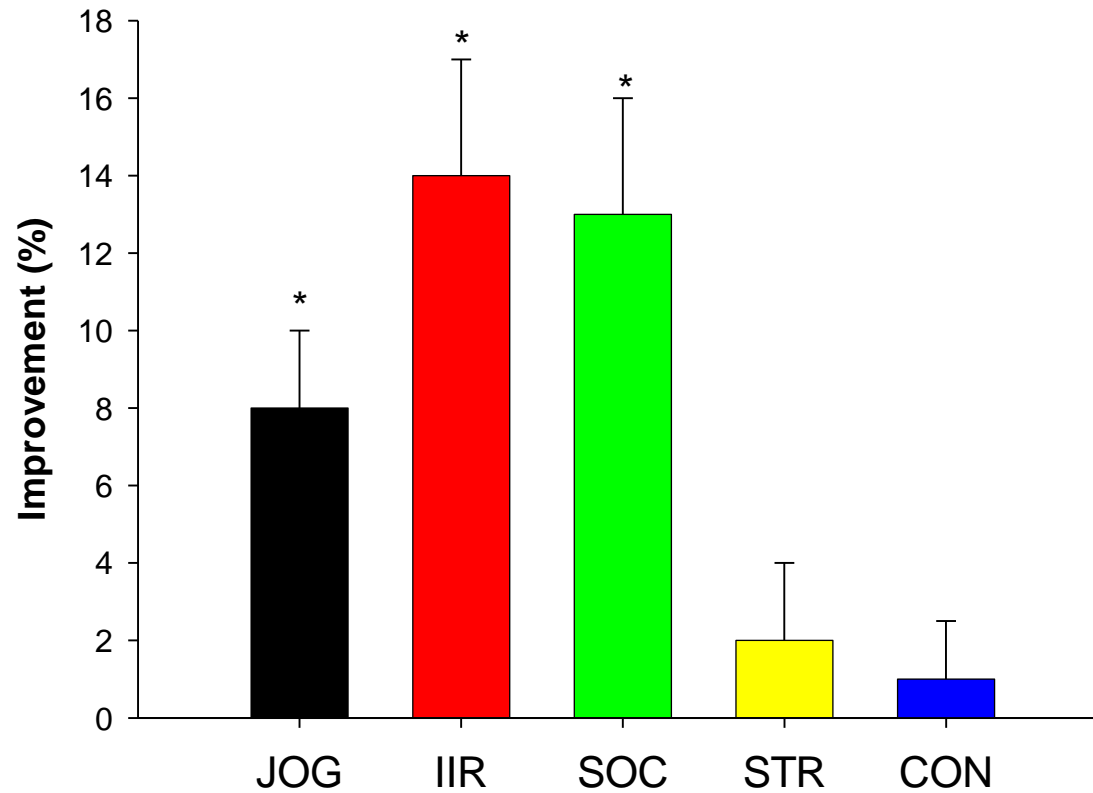




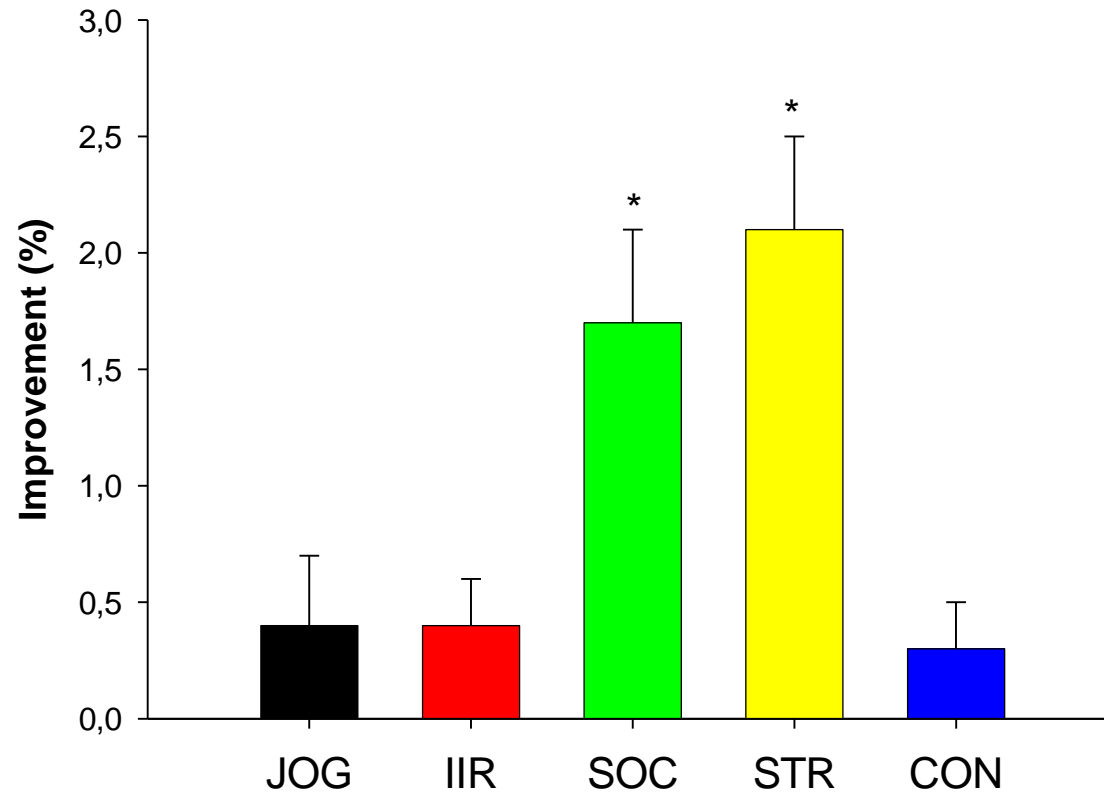
Fitness and Health Effects of Football training



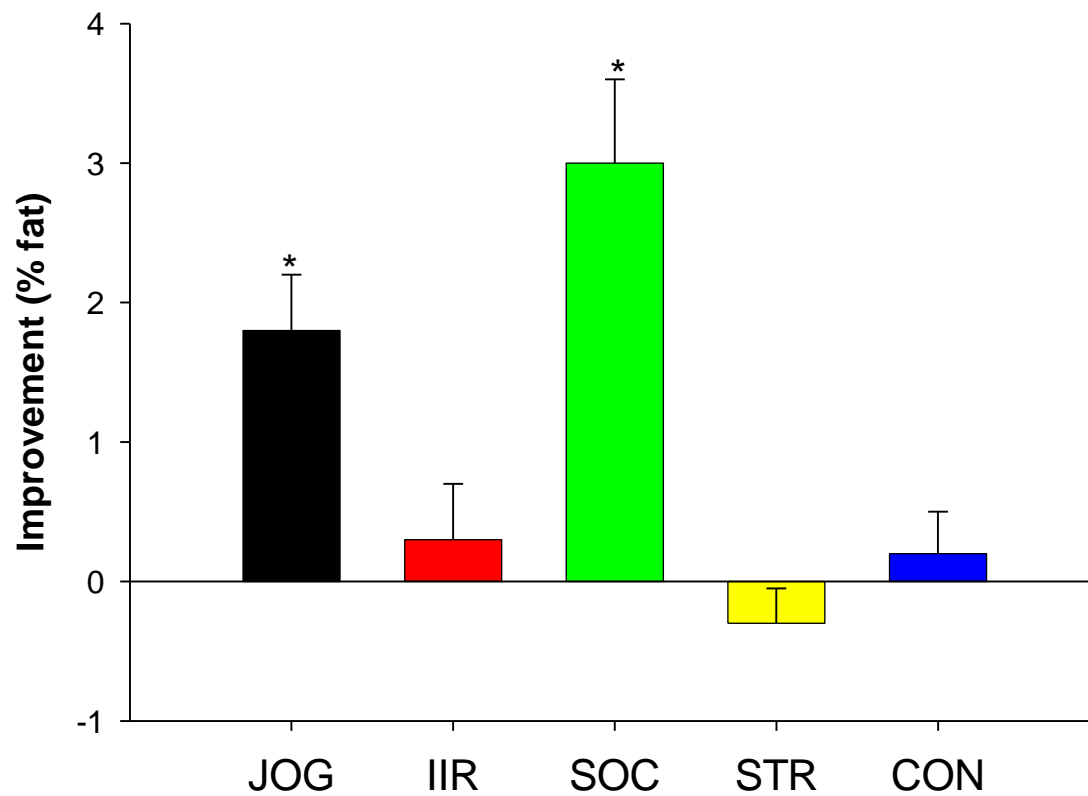
Effect of 12 wks of training on maximal oxygen uptake



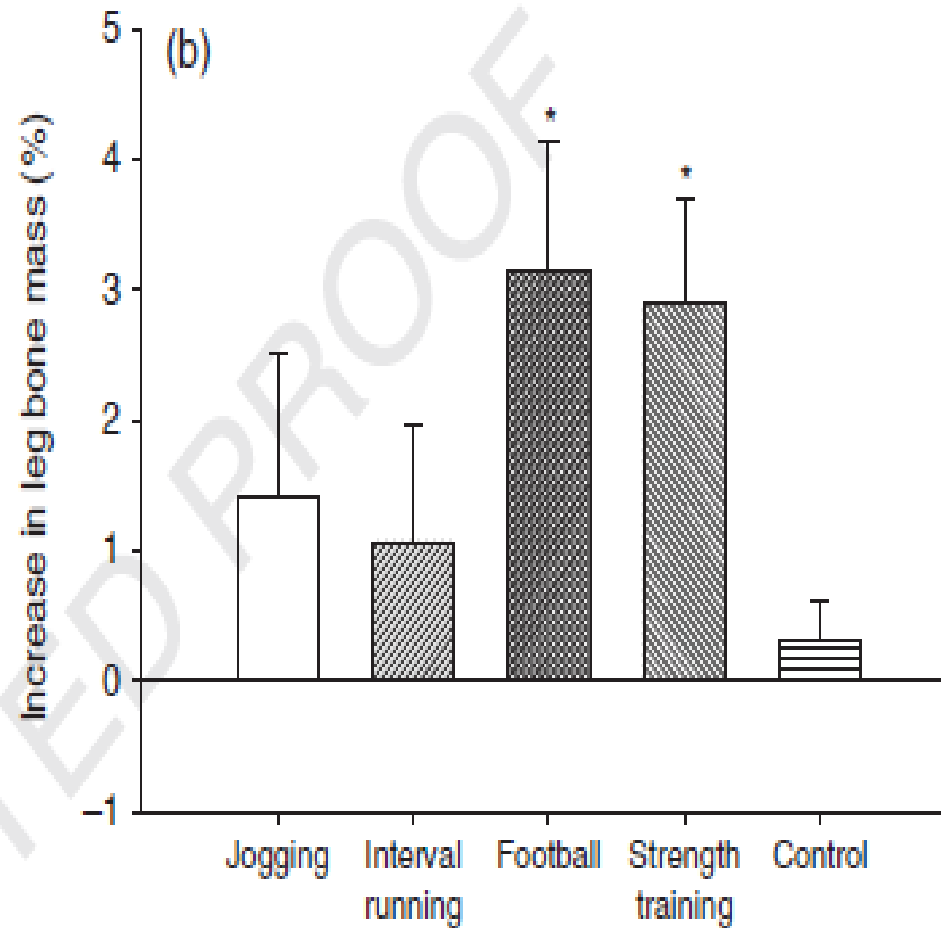
Effect of 12 wks of training on lean body mass



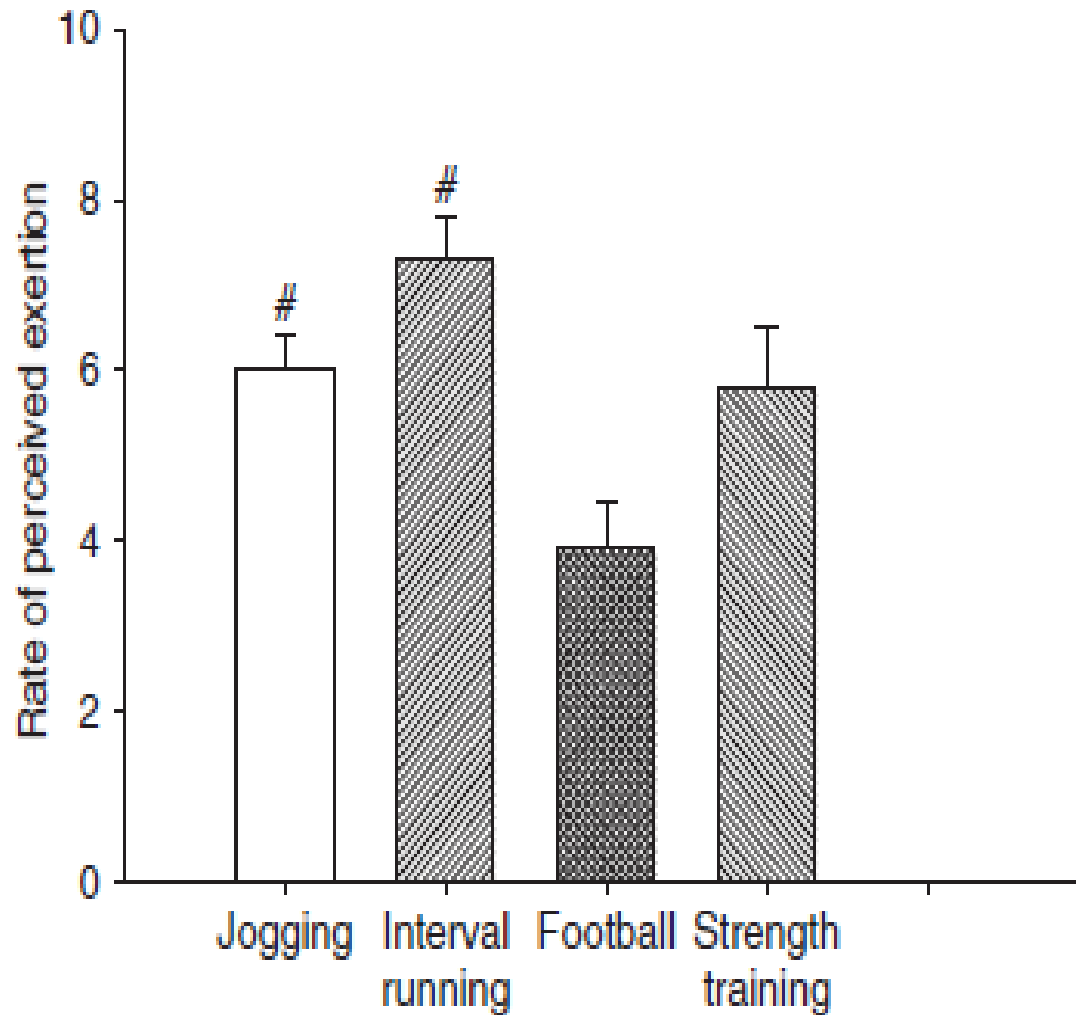
Effect of 12 wks of training on fat percentage



Effect of 12 weeks of training on bone mass



Rate of perceived exertion (RPE) during different training regimes





Intense actions

Fast runs 110

Sprints 14

Tackles 11

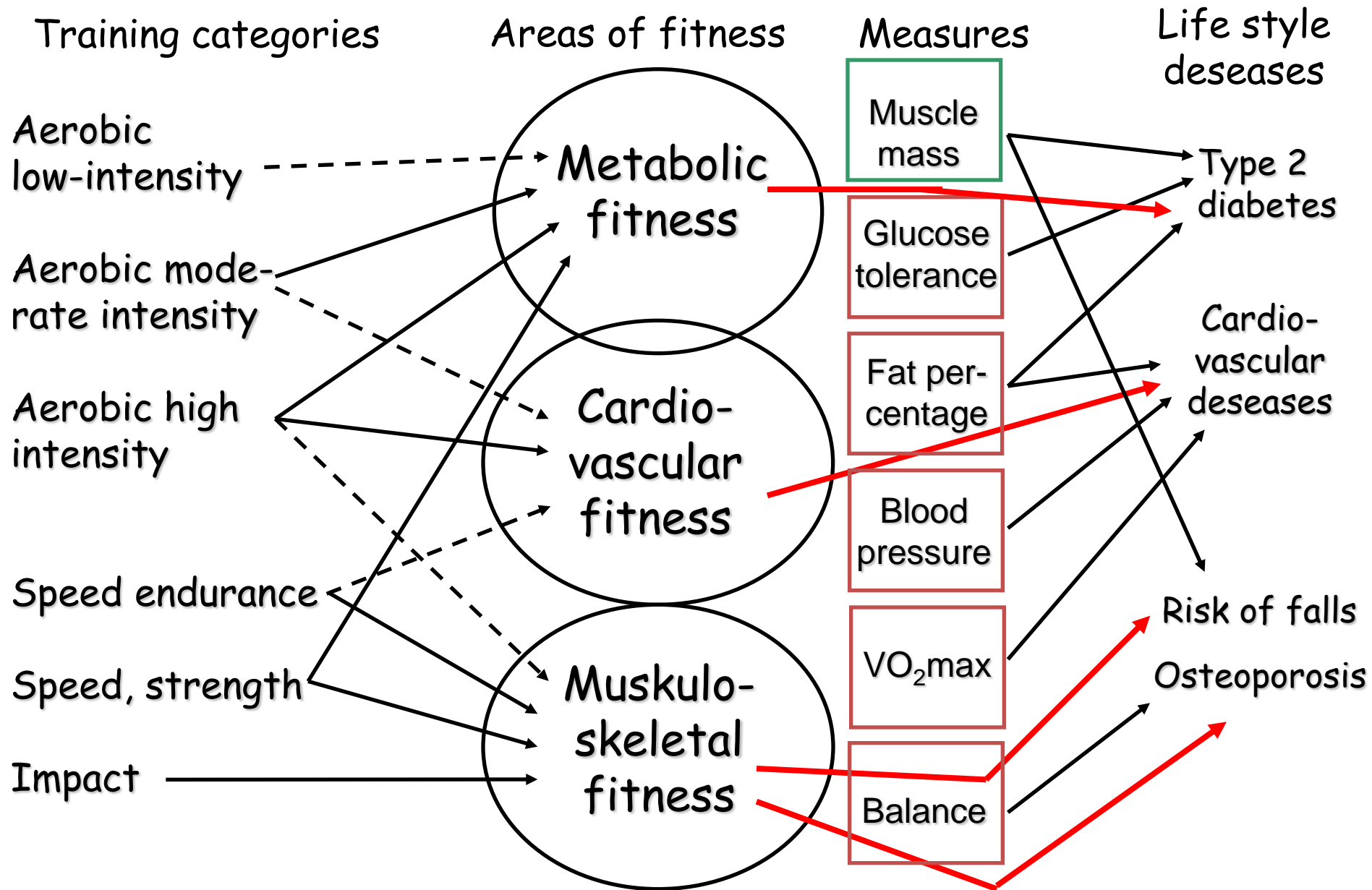
Headers 5

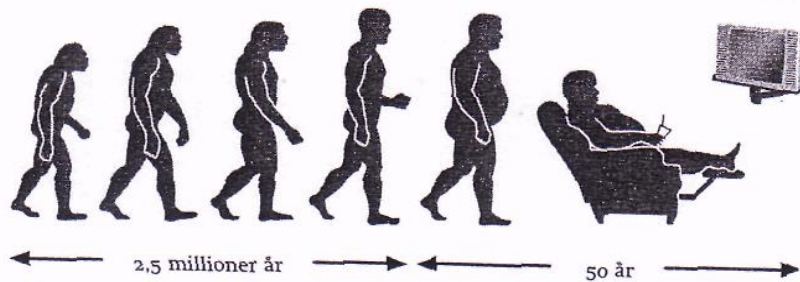
Turns 33

Dribbles 49



Effects of physical training on life-style diseases





Tara Parker-Pope on Health

March 4, 2010, 2:25 pm

Health Gains for Grown Up Soccer Players

By TARA PARKER-POPE



Adults who regularly kick around a soccer ball with friends have better heart and bone health, a new study found. Being a soccer mom usually means carpooling kids to games and watching them play. But new research shows that women who join in the fun and kick around a soccer ball can dramatically improve their bone and heart health.

ines: GDP growth of 3.1 per cent expected this year, says RBC Economics

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Virgin mobile IT'S BETTER TO BE A MEMBER CHECK IT

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Home > Life > Mind and Body

Soccer a great way to kick high blood pressure, study finds

CELIA MILNE
METRO CANADA

February 09, 2010 5:00 a.m.

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Text size

double-click
any word

Exercise reduces high blood pressure. Doctors have known this for a long time. But what kind of exercise is best?

A new study in Copenhagen tells us that doing spurts of high-intensity exercise — namely, playing soccer — is a great way to control high blood pressure.

The study involved 25 men aged 31 to 54 who had mild to moderate hypertension. The men were split into two groups.

One group played soccer (in teams of five or six) for about an hour twice a week and the other group received traditional advice from a physician on reducing heart disease risk and staying active.

When tested three months later, the soccer-playing group had improved their health far more than the other group.

They had lowered blood pressure, reduced heart rate, reduced fat on their body and increased aerobic capacity.



PHOTOS.COM

Burst of high-intensity exercise, like playing soccer, helps to control high blood pressure.



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TODAY THIS WEEK THIS MONTH ALL

- Mom pleads for pedestrian safety on anniversary of daughter's death
- Better security sought after court brawl
- Assault suspect sketch released
- Samsung unveils new 3D TV technology, says Canadian launch coming March 26
- Fewer tickets issued for failing to yield to pedestrians

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Takk fyri!



