



# Physical activity and well being - utilization of technology?

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# Well being

- Physical vs. mental
- Physical = mental

## Mental stress

- increase in sympathetic activity
- increase in stress hormones

## Measurement technology

- Heart rate variability
- Blood samples

# Purpose

- Are changes in autonomic regulation associated with serum testosterone to cortisol ratio

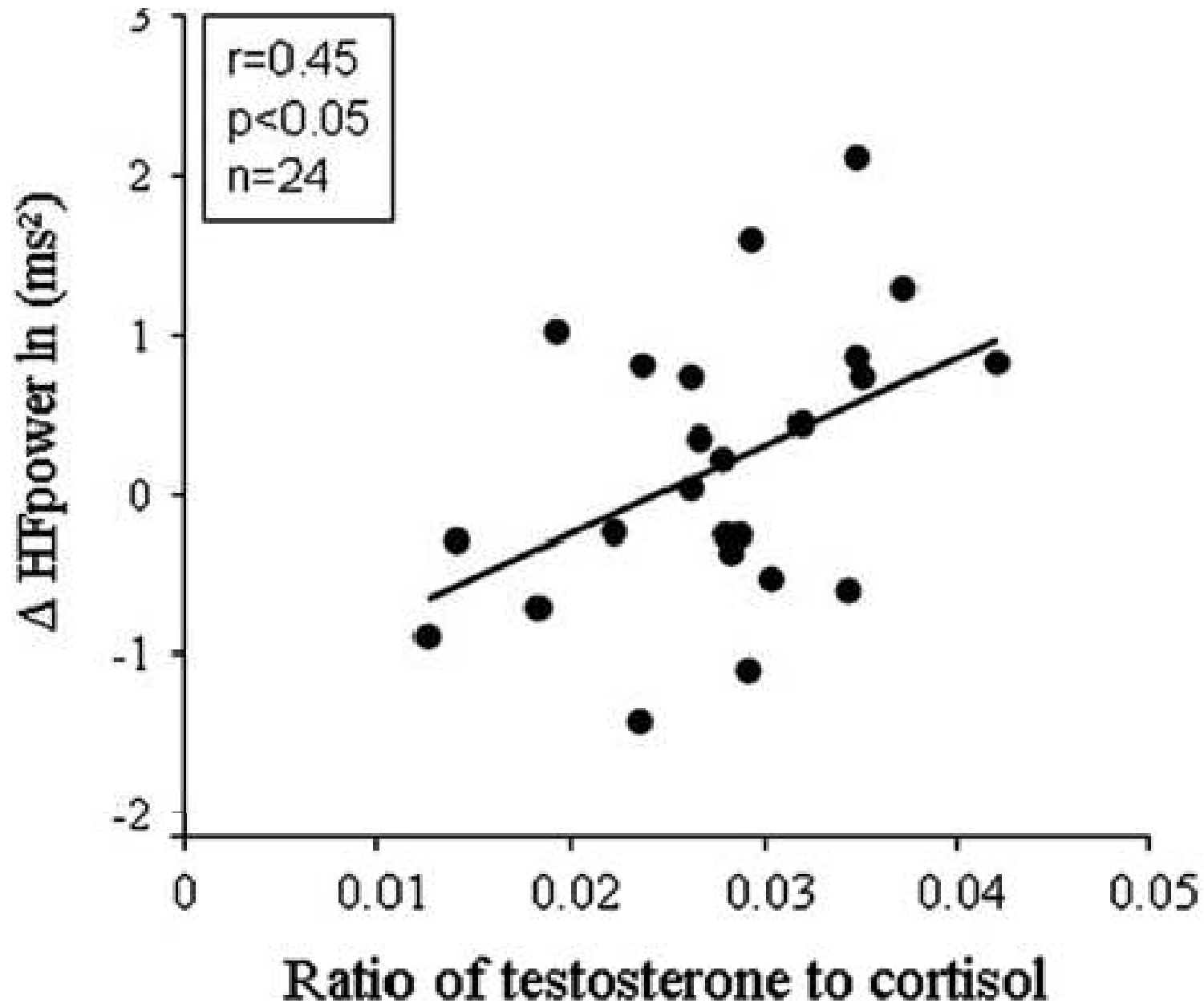
# Methods

## Subjects:

- 60 conscripts,  $19.0 \pm 0.3$  years
- First week of basic training

## Measurements:

- Heart rate variability (Polar s810i) in supine rest and standing; low (LF) – and high frequency (HF) power
- Blood samples for serum testosterone and cortisol



(Huovinen et al . Eur J Sport Sci, 2009)

- **Changes in HF power related to anabolic/  
catabolic state**
- **HF power is correlated with increase in VO2 max  
(Hautala et al 2003)**

**What about school children?**

# Purpose

- Are changes in autonomic regulation associated with the physical performance in junior high school children

# Methods

## Subjects:

- Training group 12 girls and 12 boys
- Control group 7 girls and 7 boys

# Methods

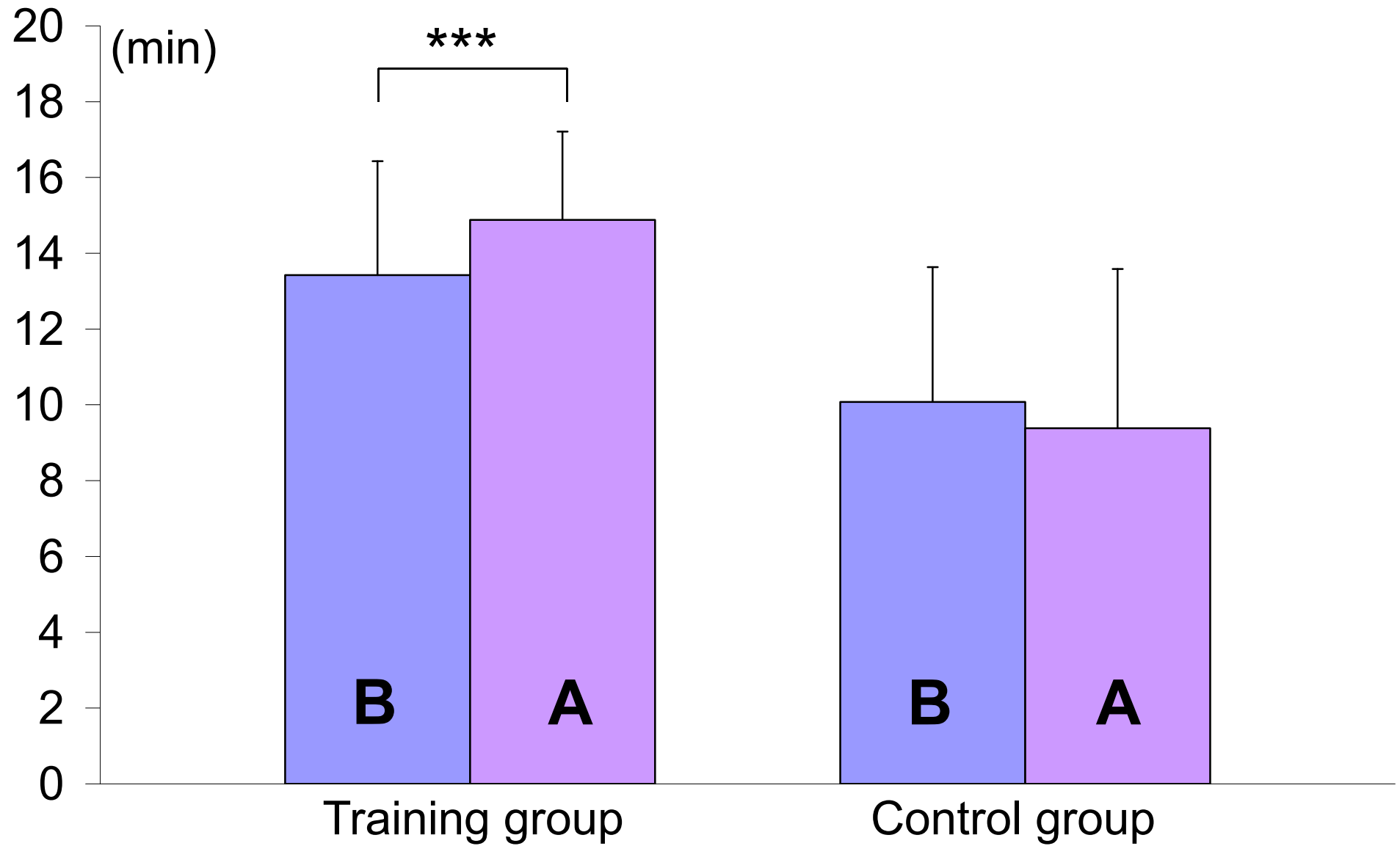
## Measurements:

- Heart rate variability (Polar s810i) in supine rest and standing; low (LF) – and high frequency (HF) power
- Endurance test; 20 m shuttle run, 7 km/h with an increase of 0.20 km/h each 30s
- Flexibility, speed and power tests

## Training:

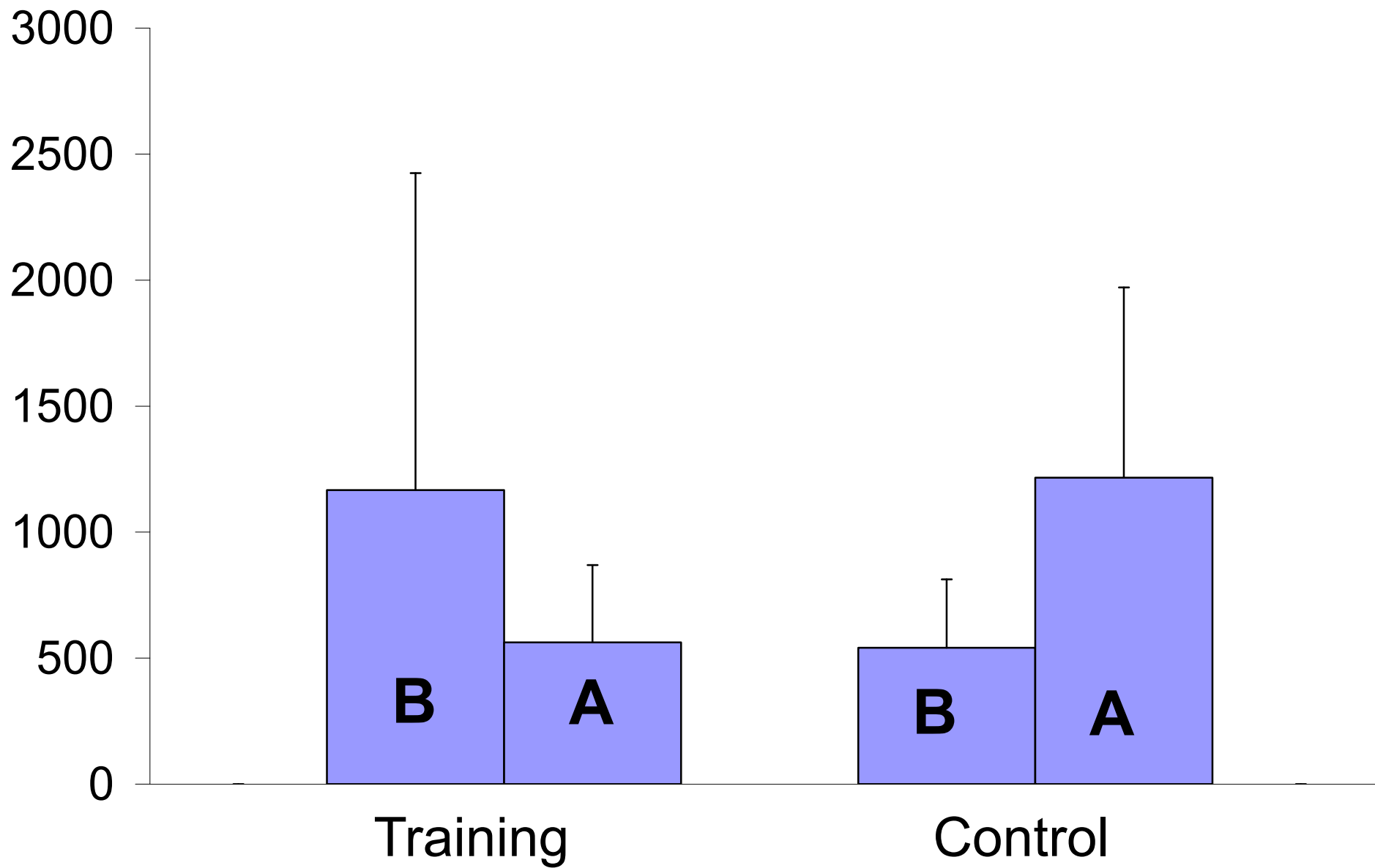
- 3 x per week for 8 weeks, 70-90min
- intensity 70-75% of individual max heart rate

# Endurance time



(Yague et al. 2009, in preparation)

# LF/HF



# Ageing

- Decreased muscle mass
- Decreased muscle strength and **power**
  - Loss of fast motor units
- Impaired balance control
  - related to force production
  - spinal excitability?
  - static vs. **dynamic** balance

# Purpose

- Age-related differences in static and dynamic balance control
  - new dynamic balance measurement device
- Connections of balance control to the neuromuscular system

# Methods

Subjects:

**10 Young,  $26.8 \pm 2.7$  years**

**20 OLD,  $64.2 \pm 2.7$  years**

Static balance:

- 5s, Maximal anterior-posterior (y) and medial-lateral (x) COP swaying distance (HurLabs, Finland)

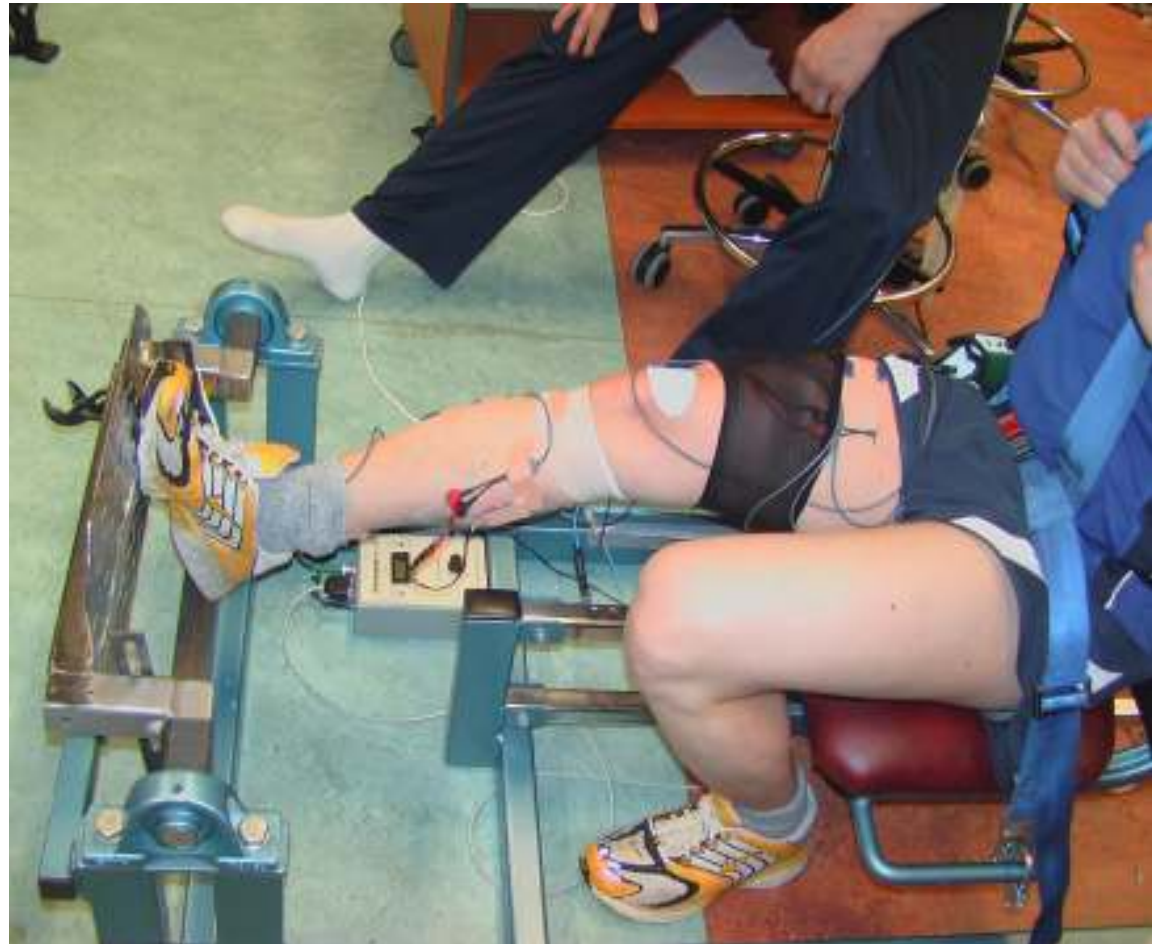


## Dynamic balance:

- one side of the plate dropped 12.5 cm (180ms) in each direction
- Maximal anterior- posterior (y) and medial-lateral (x) COP swaying distance during 1s in tilted position

## Neuromuscular measurements:

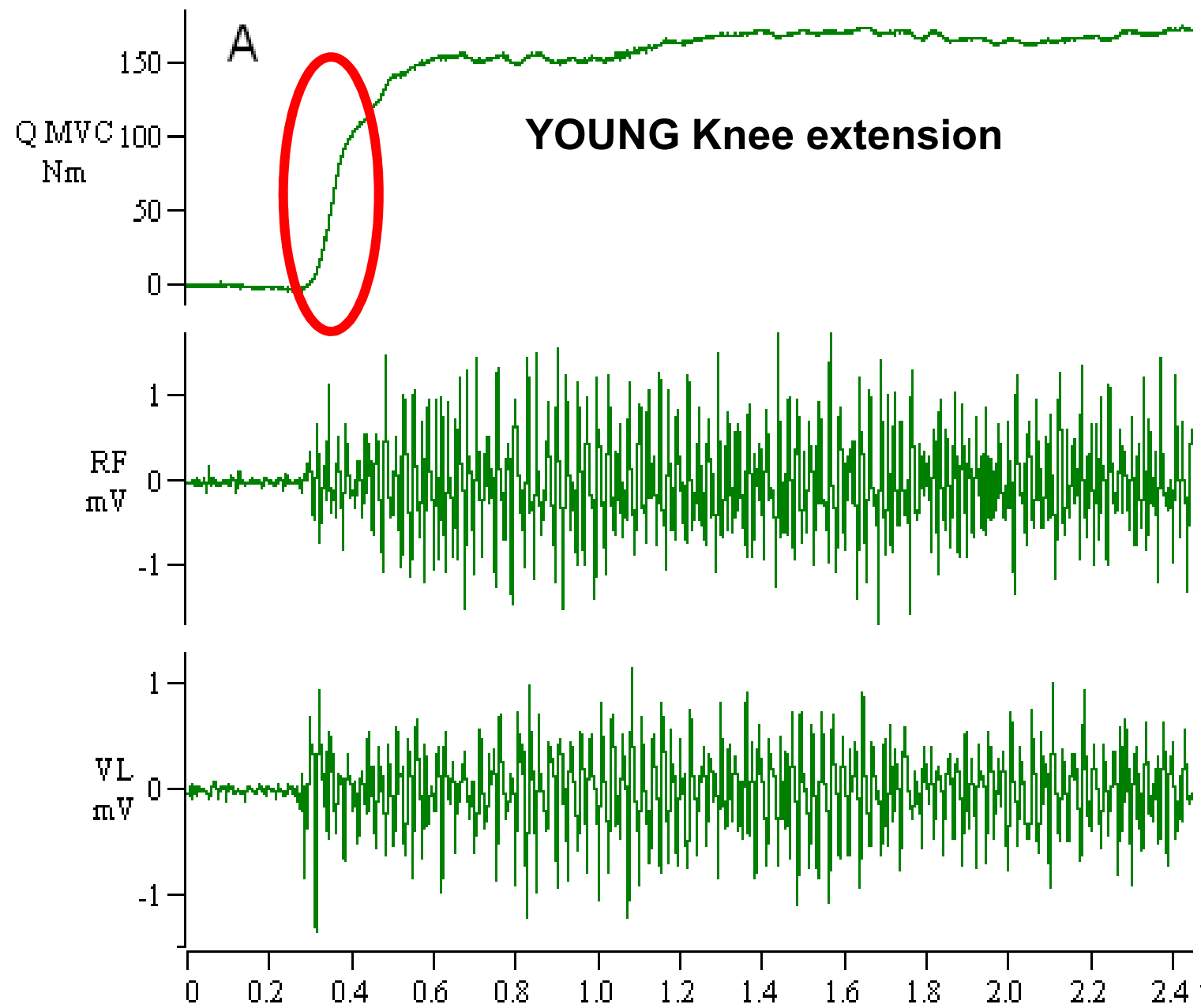
- Maximal plantar flexion force
- Maximal aEMG; soleus, gastrocnemius
- Maximal M-wave (Soleus)
- Maximal H-reflex (Soleus)
- V-wave (Soleus)



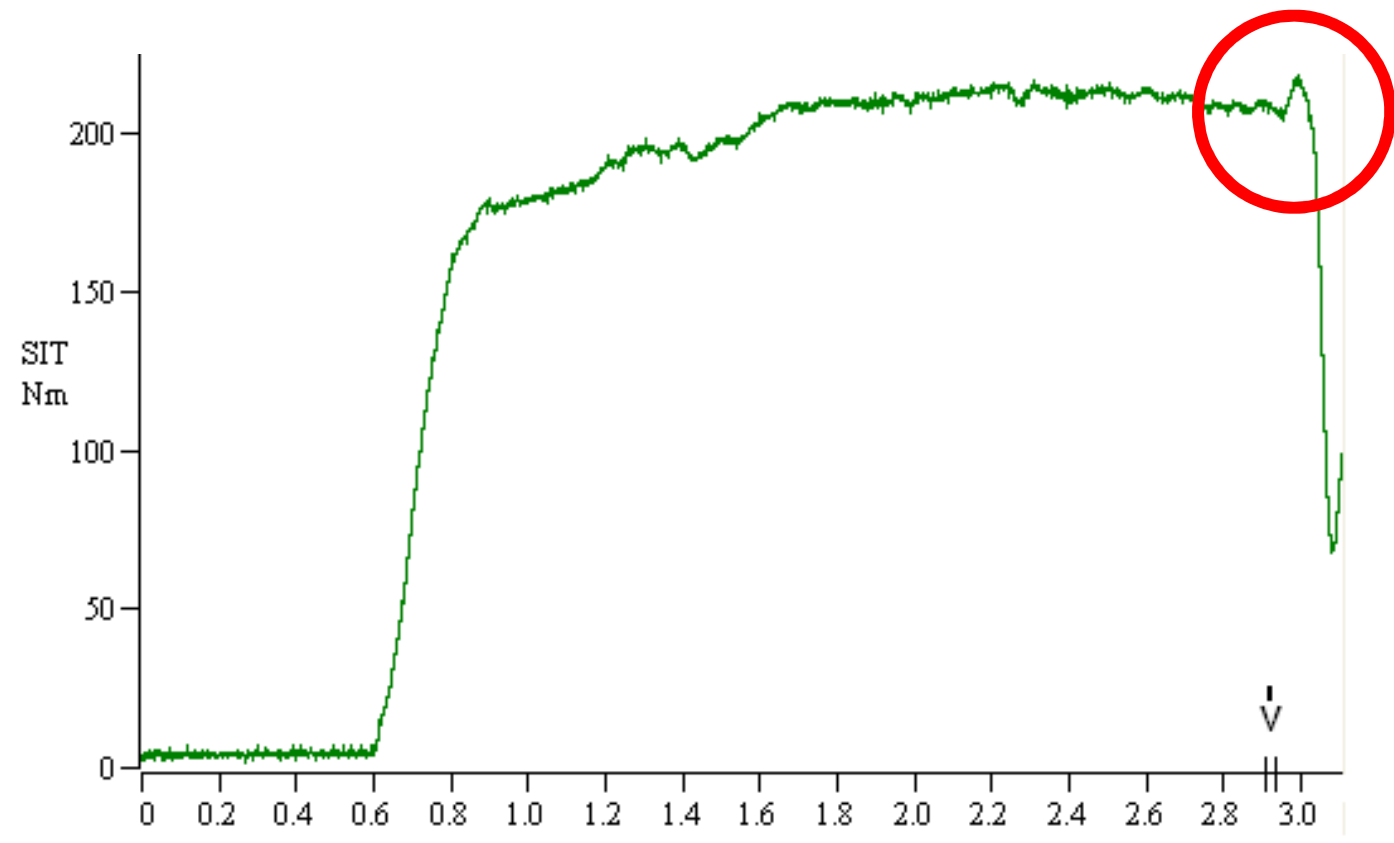
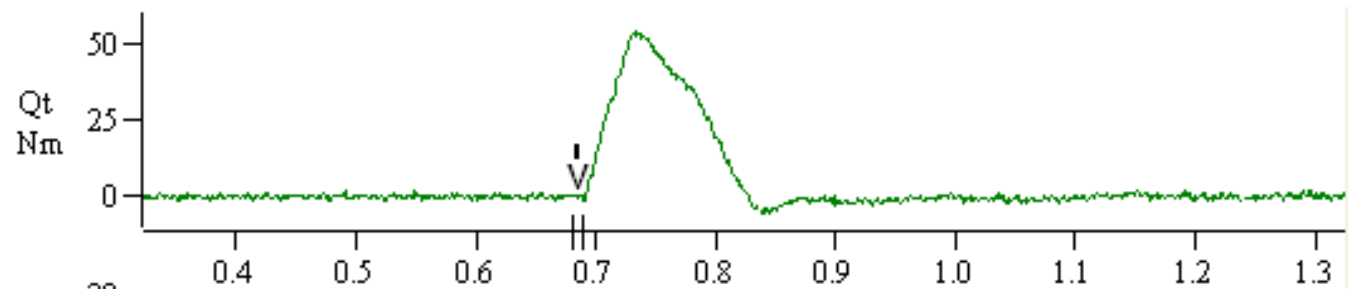
# Neuromuscular measurements:

- Maximal knee extension force
- Maximal aEMG; vastus lateralis, rectus femoris
- Passive twitch
- Activation level  
=  $100 - D * (TDST / TMVC) / TDTW * 100$

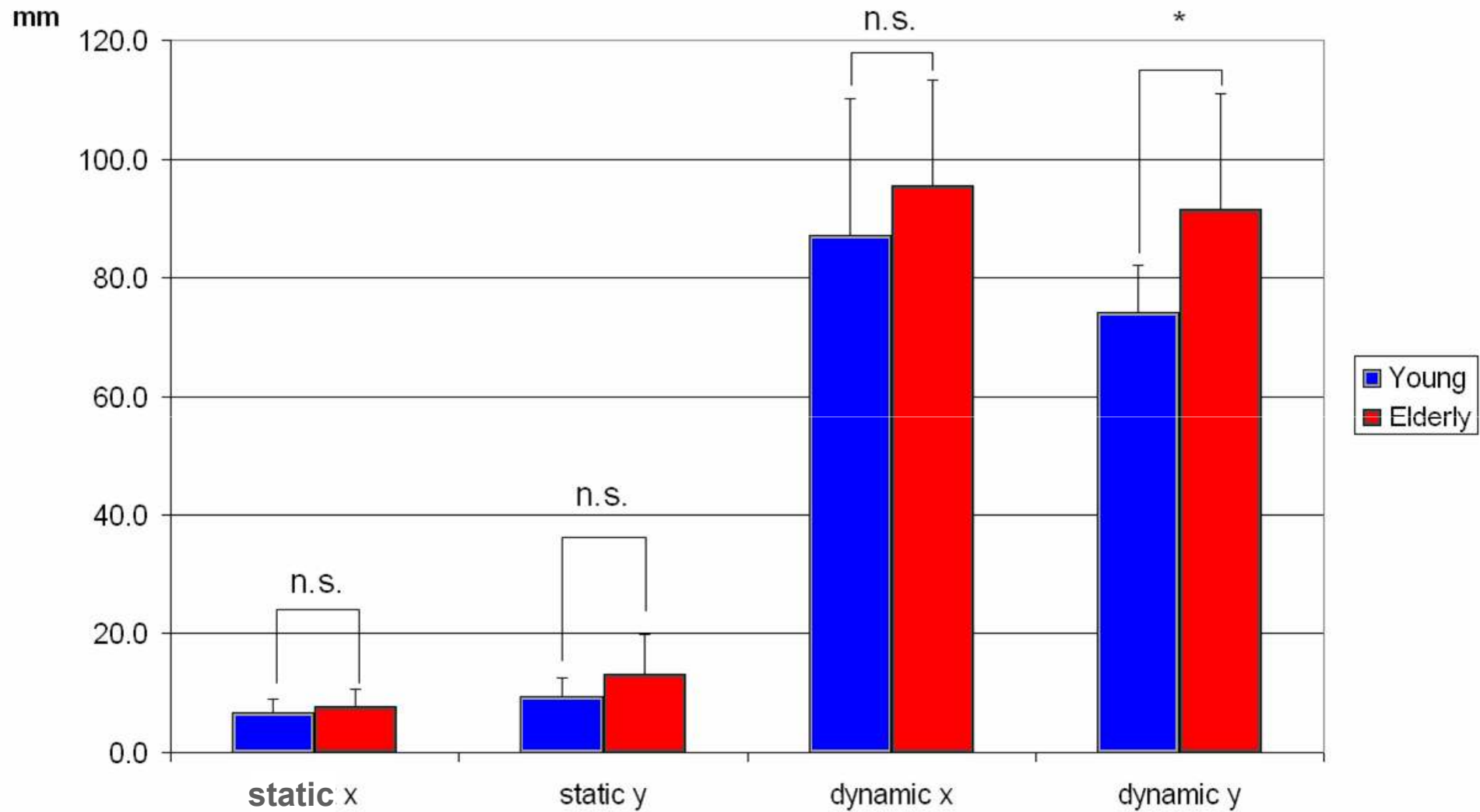






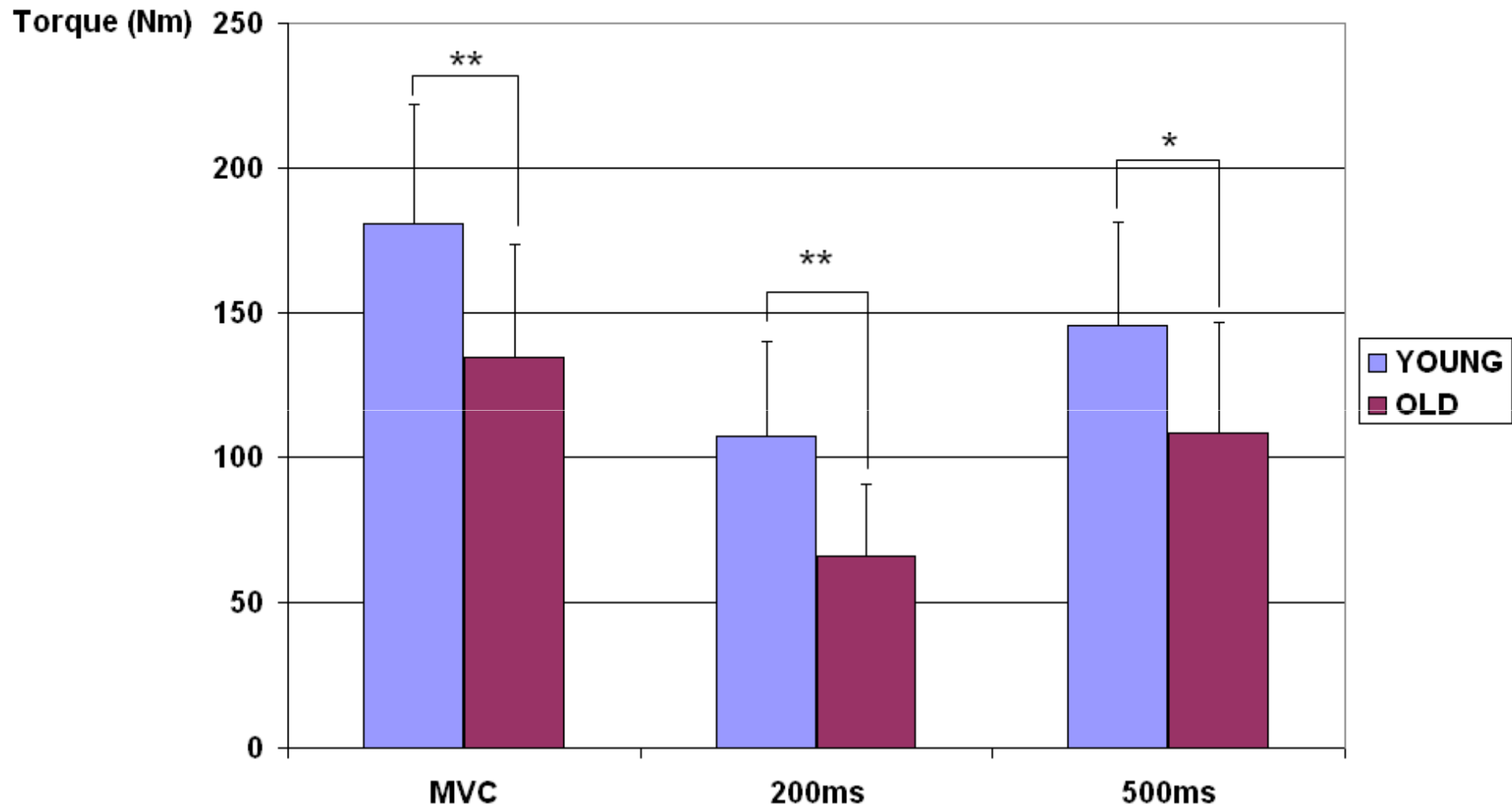


# Balance disorder in static and dynamic conditions

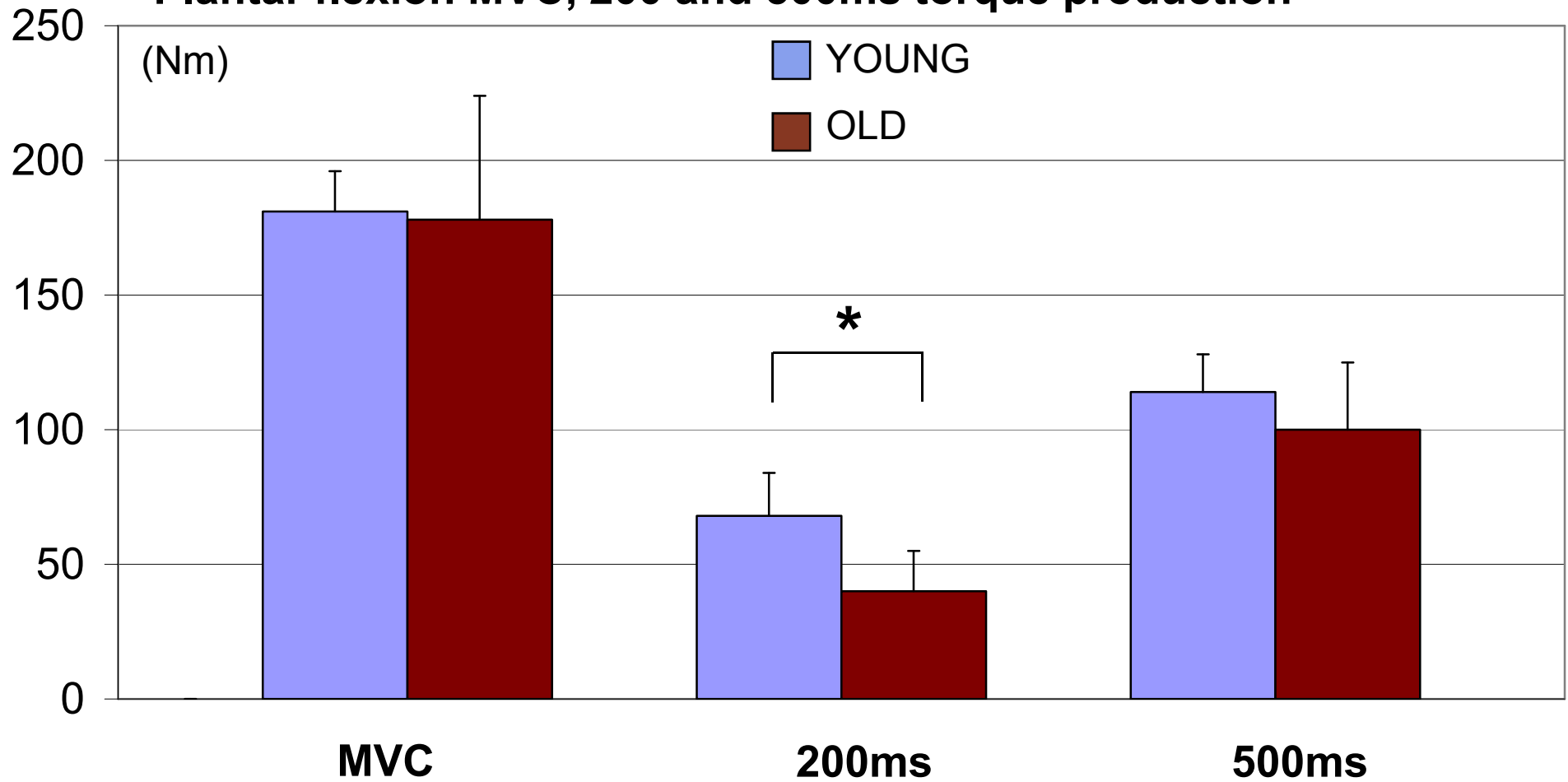


(Piiirainen et al 2009, Eur J Sport Sci, In print)

### Knee extension MVC, 200 and 500ms torque production



### Plantar flexion MVC, 200 and 500ms torque production



### Hmax/Mmax and Vmax/Max ratio and activation level

