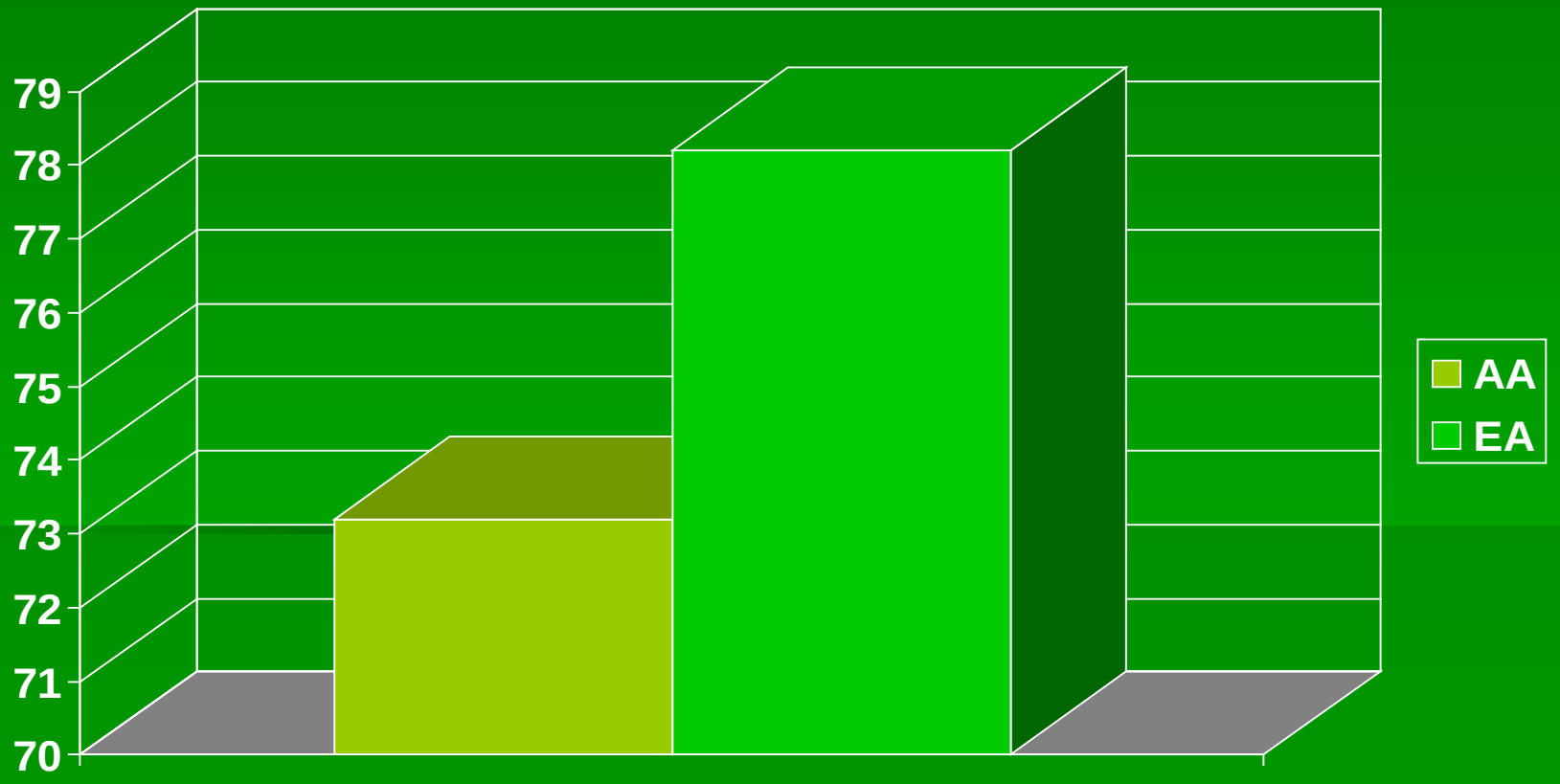
Ethnic Differences: Are they important?

Gary R. Hunter

Expectation of life in years (based on 2006 CDC statistics)



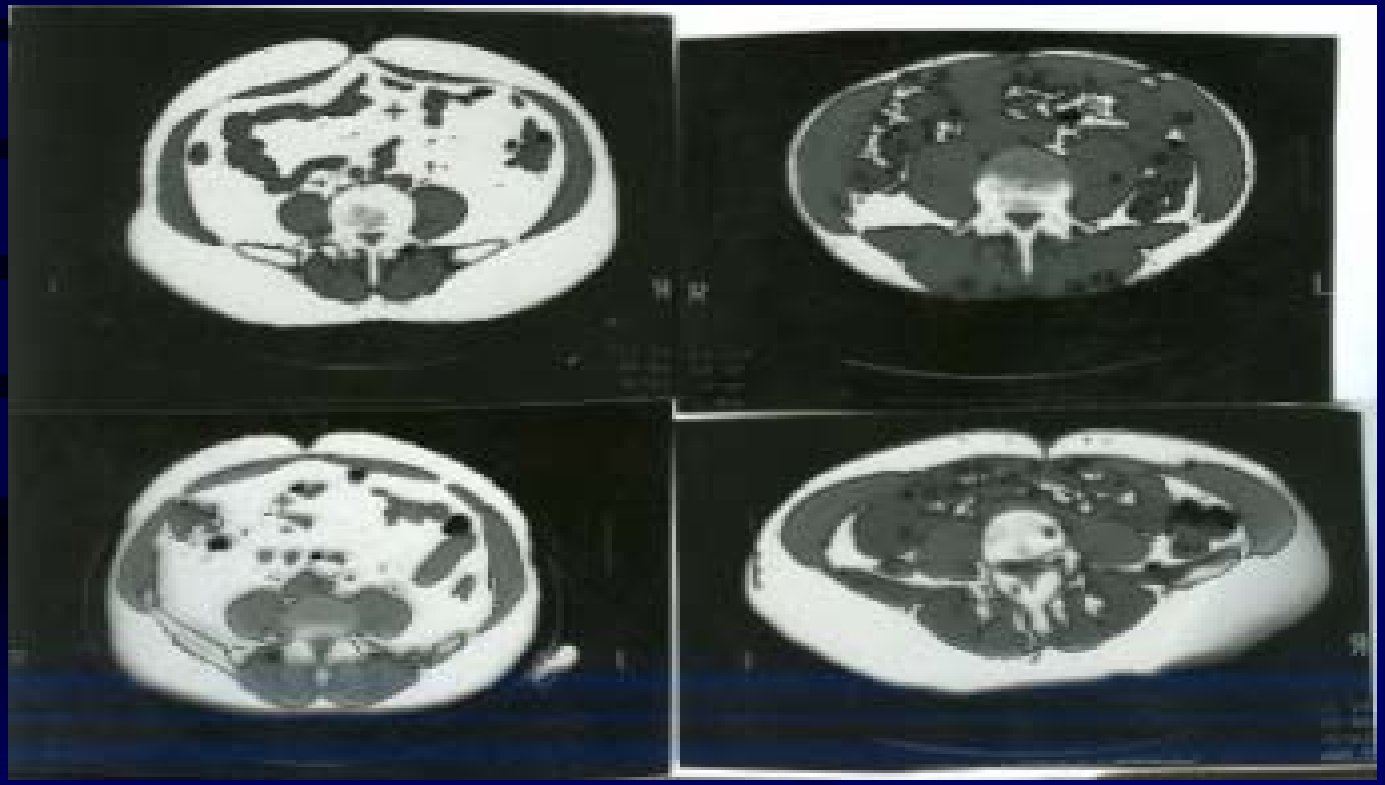
Health Risk

- AA increased risk of developing diabetes
- AA increased risk of developing cardiovascular disease
- AA increased risk of developing several different cancers
- AA increased risk of developing glaucoma

Fat Distribution

- Major ethnic differences in fat distribution

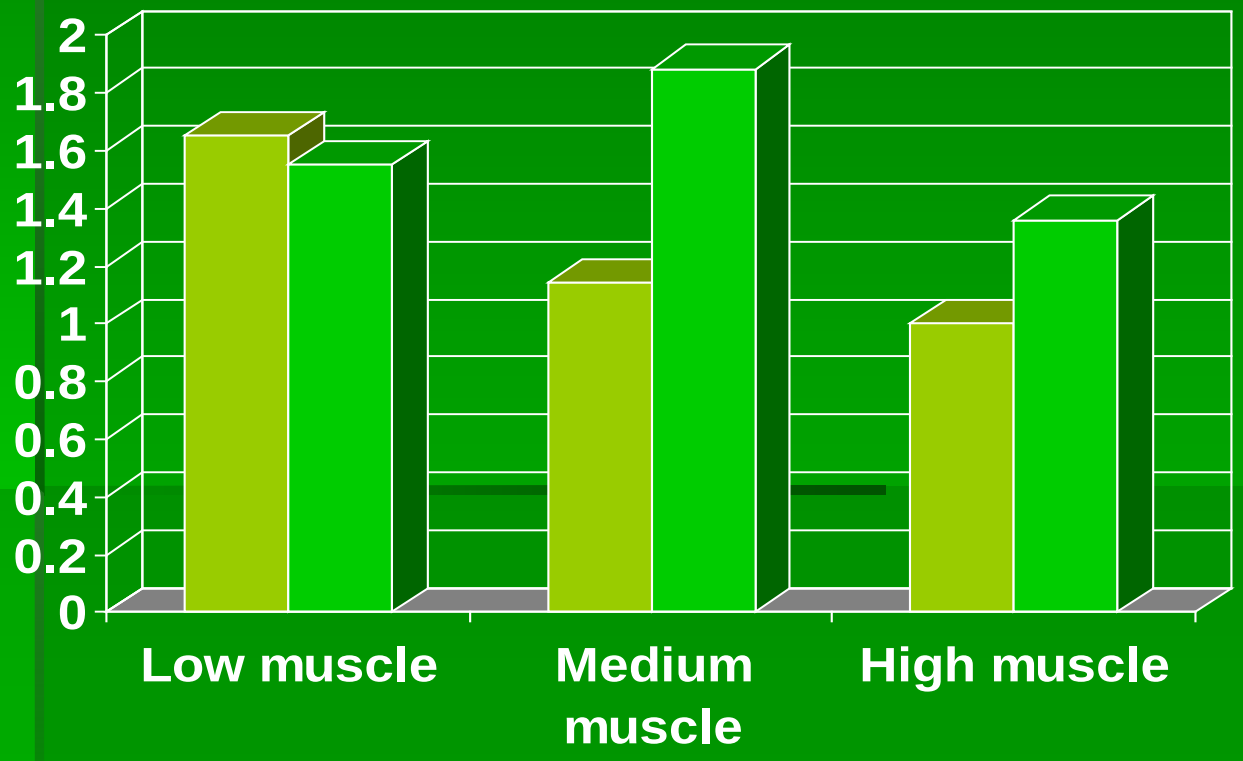
IAAT or visceral fat



Fat distribution

Hunter et al Obesity 2010

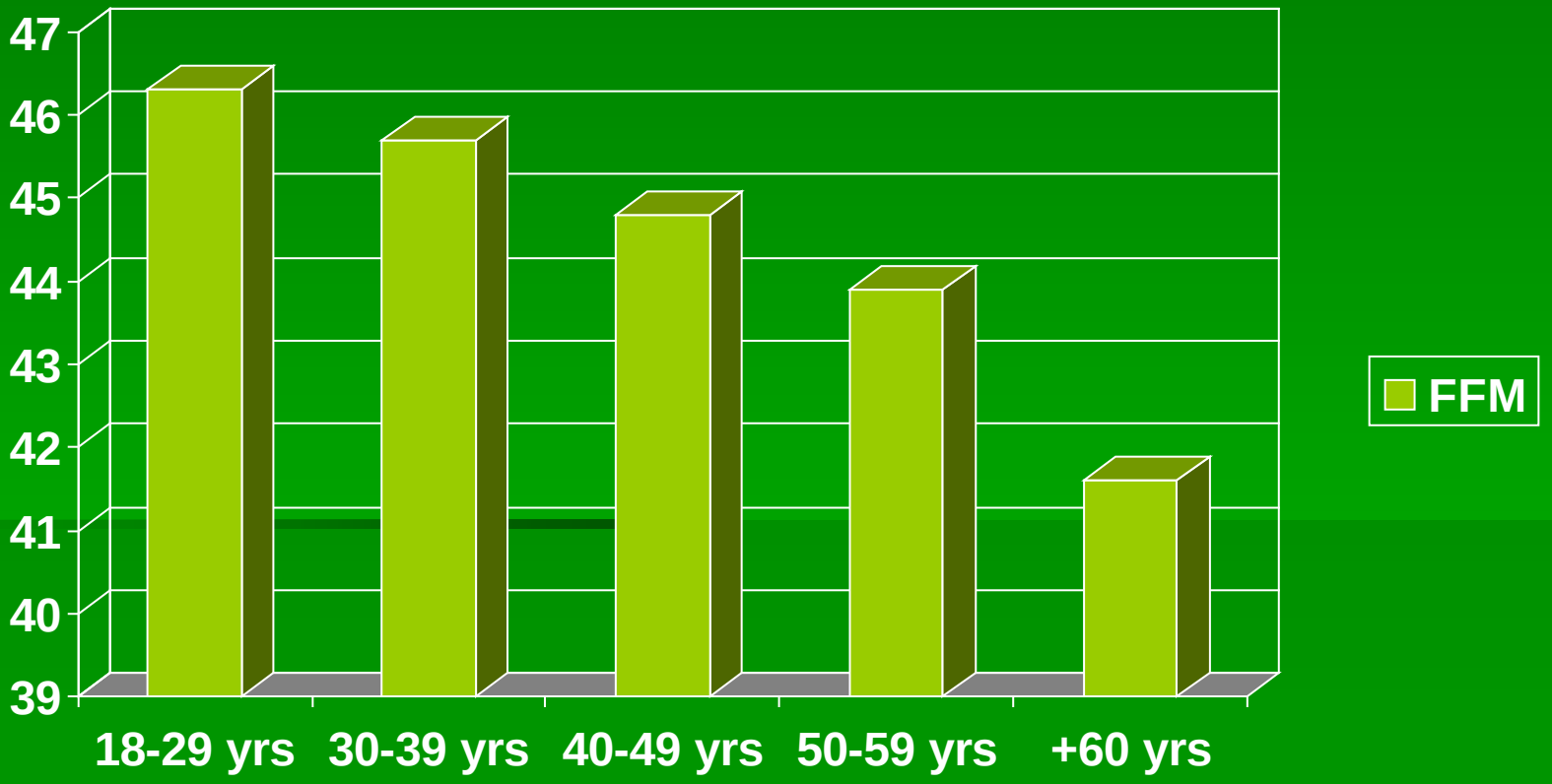
Effect of arm and waist circumference on mortality in older men



Adjusted for age, soc class, PA, smoke, alcohol

Wannamethee et al AJCN 07

Fat free mass changes with age



Hunter J Bod Comp Res 2005

Sarcopenia

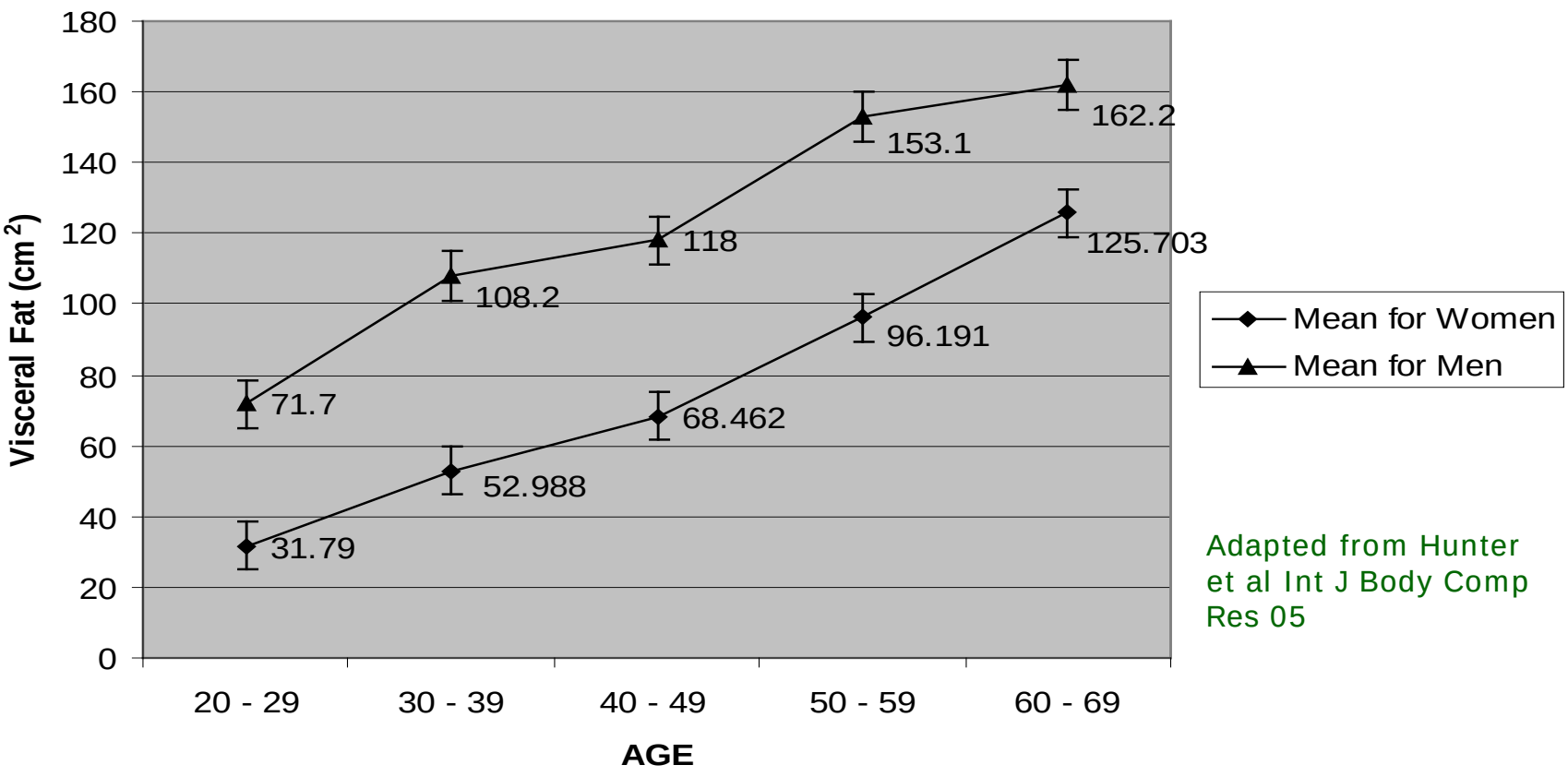
Mid-Thigh CSA

Male Age 25

Male Age 63

Petrella et al.

Visceral fat across different ages for 203 men and 220 women



Ethnic/racial body composition differences

- Although AA have higher BMI and % fat,

At any similar % fat:

- AA are more muscular
- AA distribute less fat in the viscera and more fat on the legs

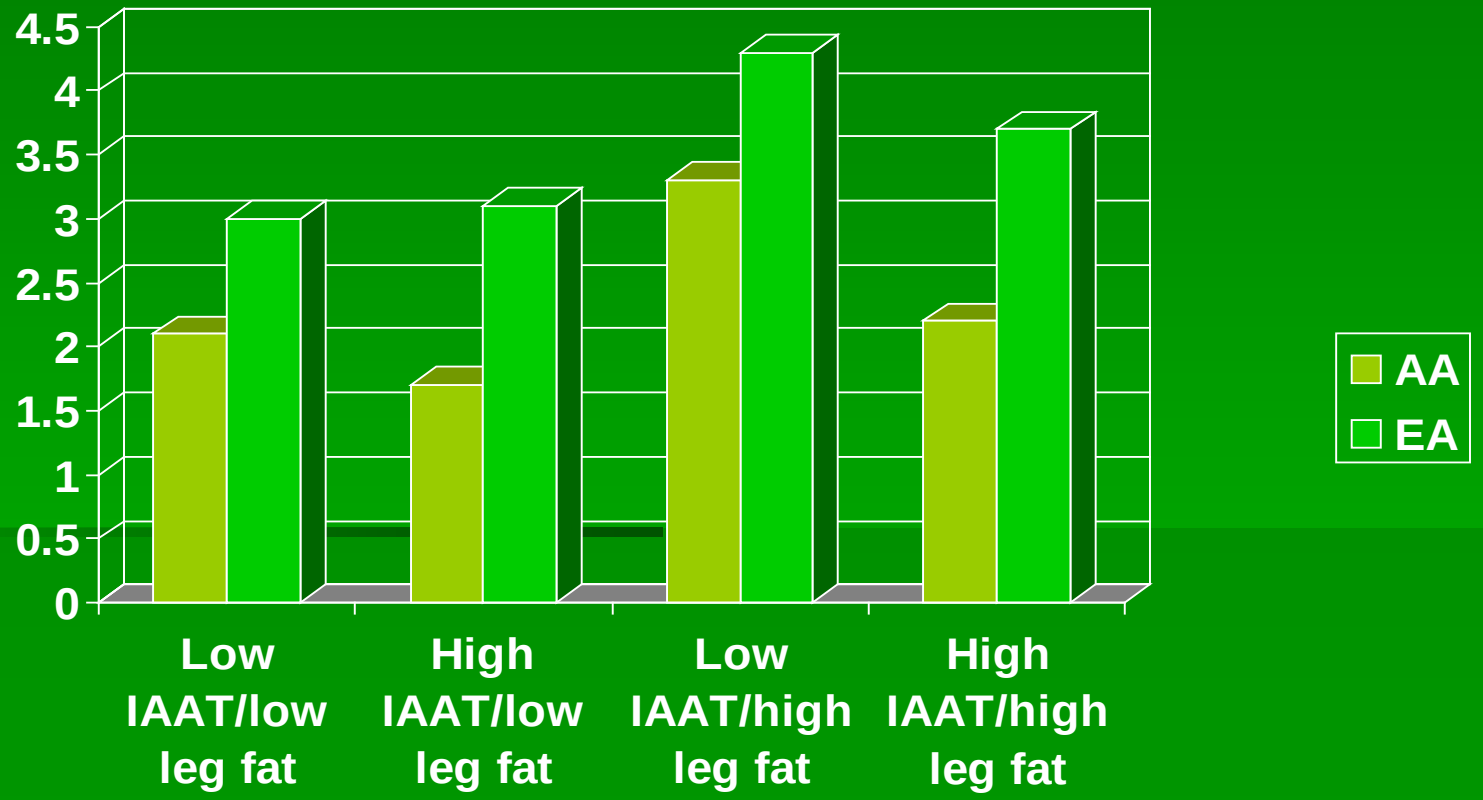
It is probable that cut-points for healthy BMI and even %fat should be race specific

- With weight loss AA have:
- Less increase in insulin sensitivity & Less increase in muscle function
- Less improvement in inflammation
- Less improvement in Si

Difficult to Determine how much lower body fat but

- Based on differences in visceral fat accumulation the cut-point for adverse percent fat in premenopausal AA women would be almost 2% lower than EA women or about 33% fat for young AA instead of 35% for EA women

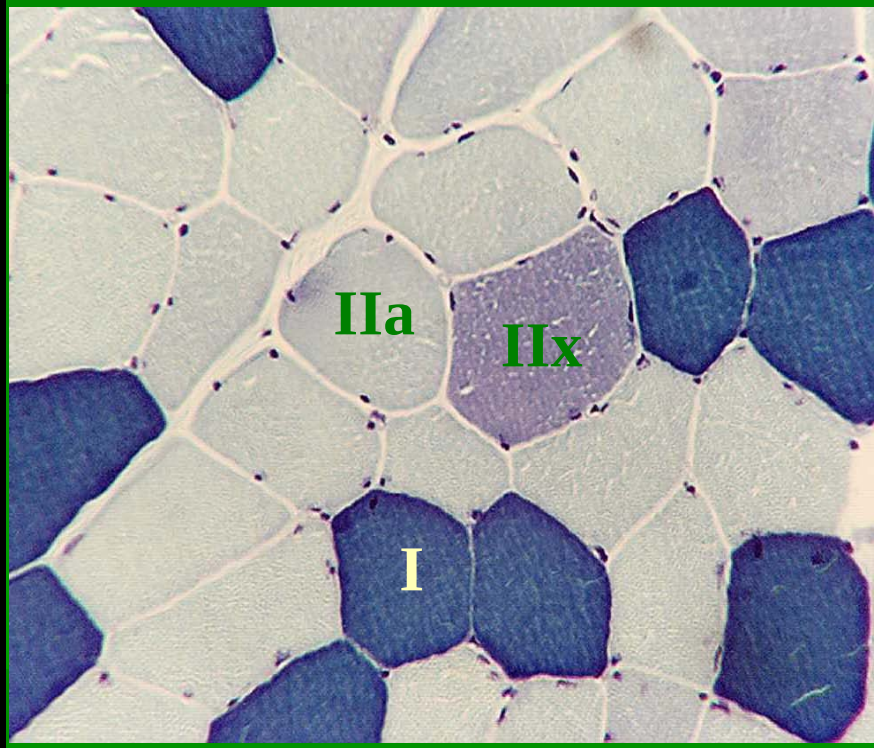
Insulin sensitivity and fat distribution



Hunter et al Obesity 2010

Review of Primary Fiber Types

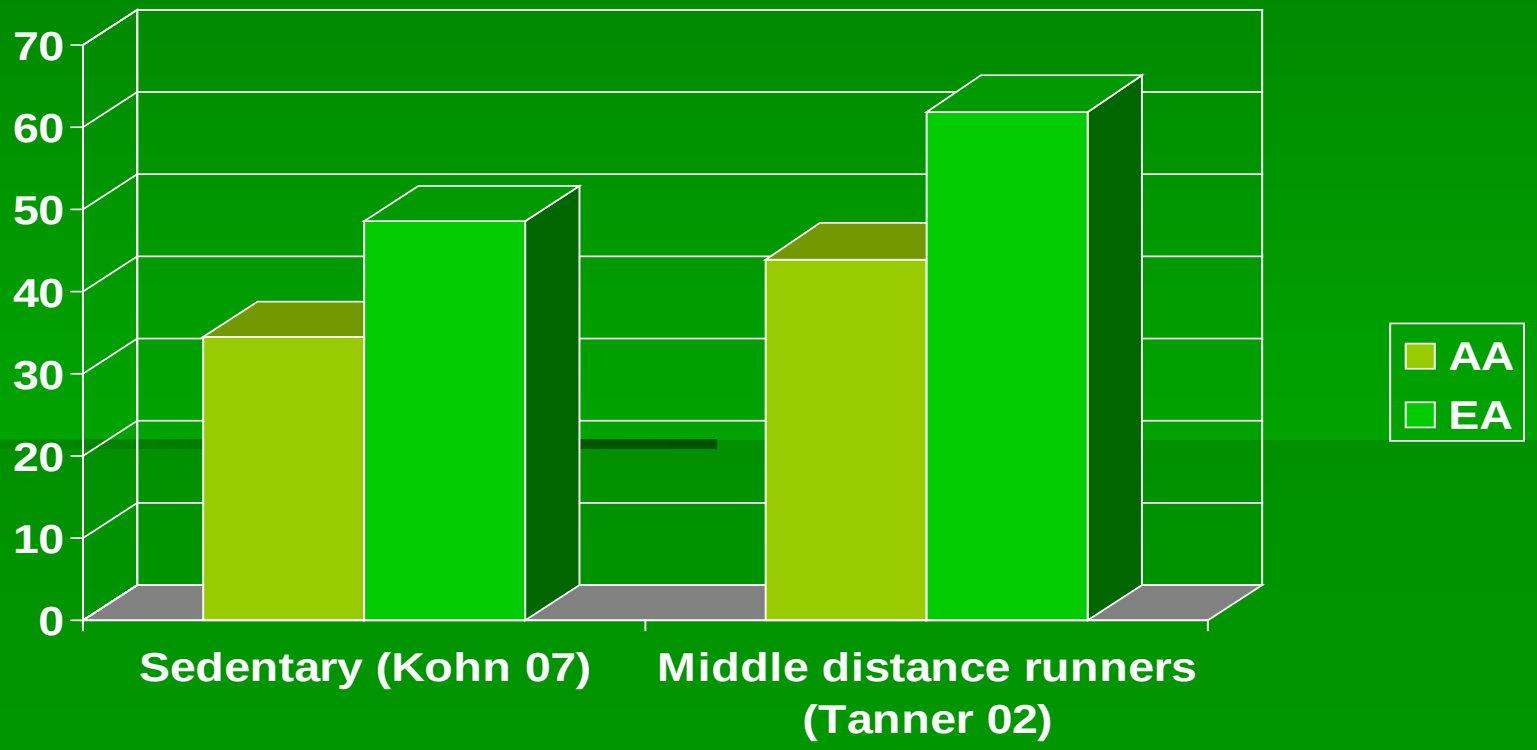
Variable	Type I	Type IIa	Type IIx
Twitch time	Slow	Fast	Fast
Motor unit threshold	Low	Moderate	High
Glycolytic capacity	Low	High-Moderate	High
Oxidative capacity	High	High	Low
Resistance to fatigue	High	Moderate	Low
Specific Tension		20% higher	20% higher
Shortening velocity	Low	Intermediate	Highest
Myosin heavy chain	MHCI	MHCIIa	MHCIIx



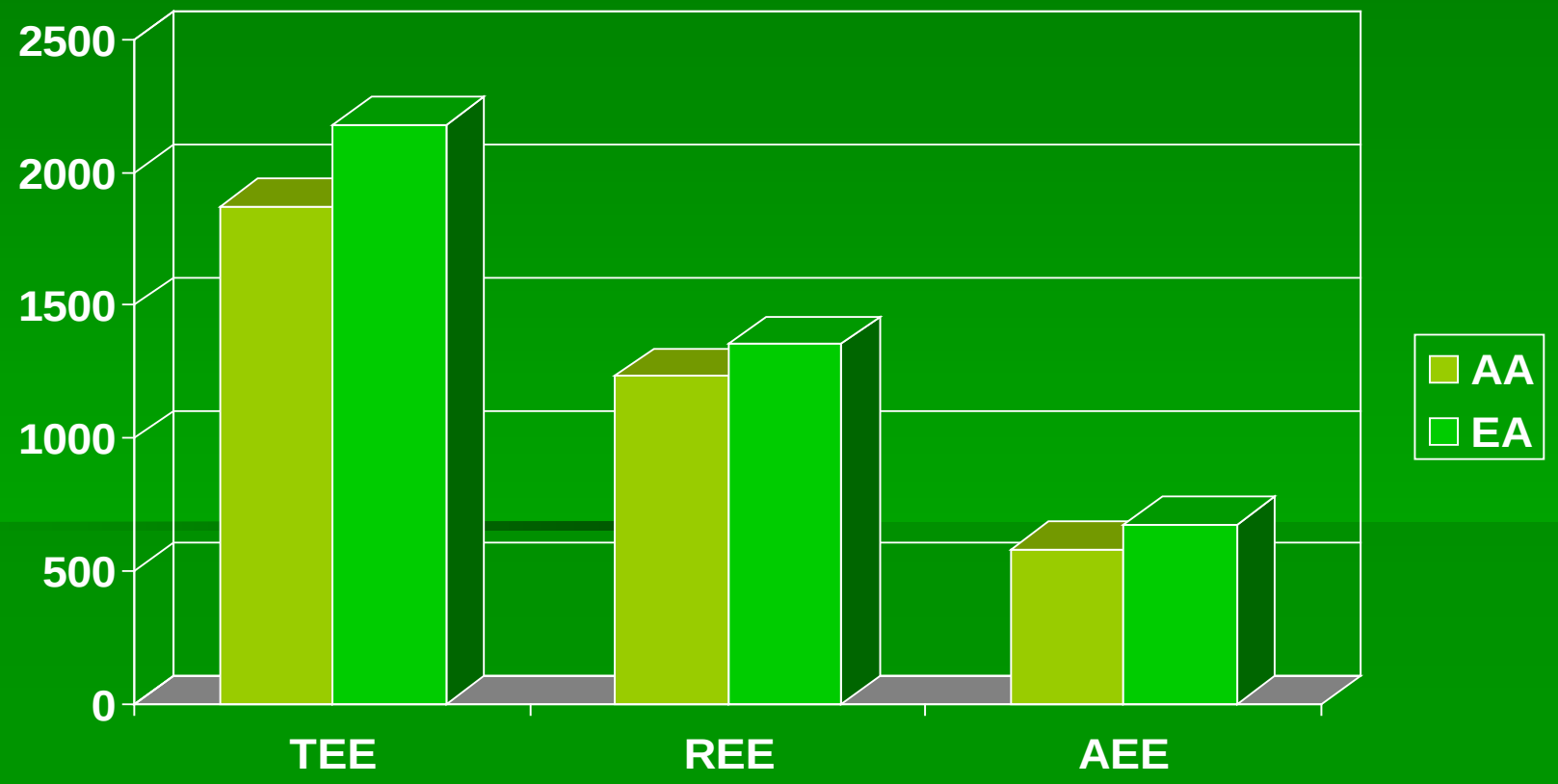
Health ramifications of type 2 fiber type

- May be a disadvantage in insulin signaling and glucose disposal
- Is related to long term weight gain

Muscle fiber type may be different between AAs and EAs (type 1 %)

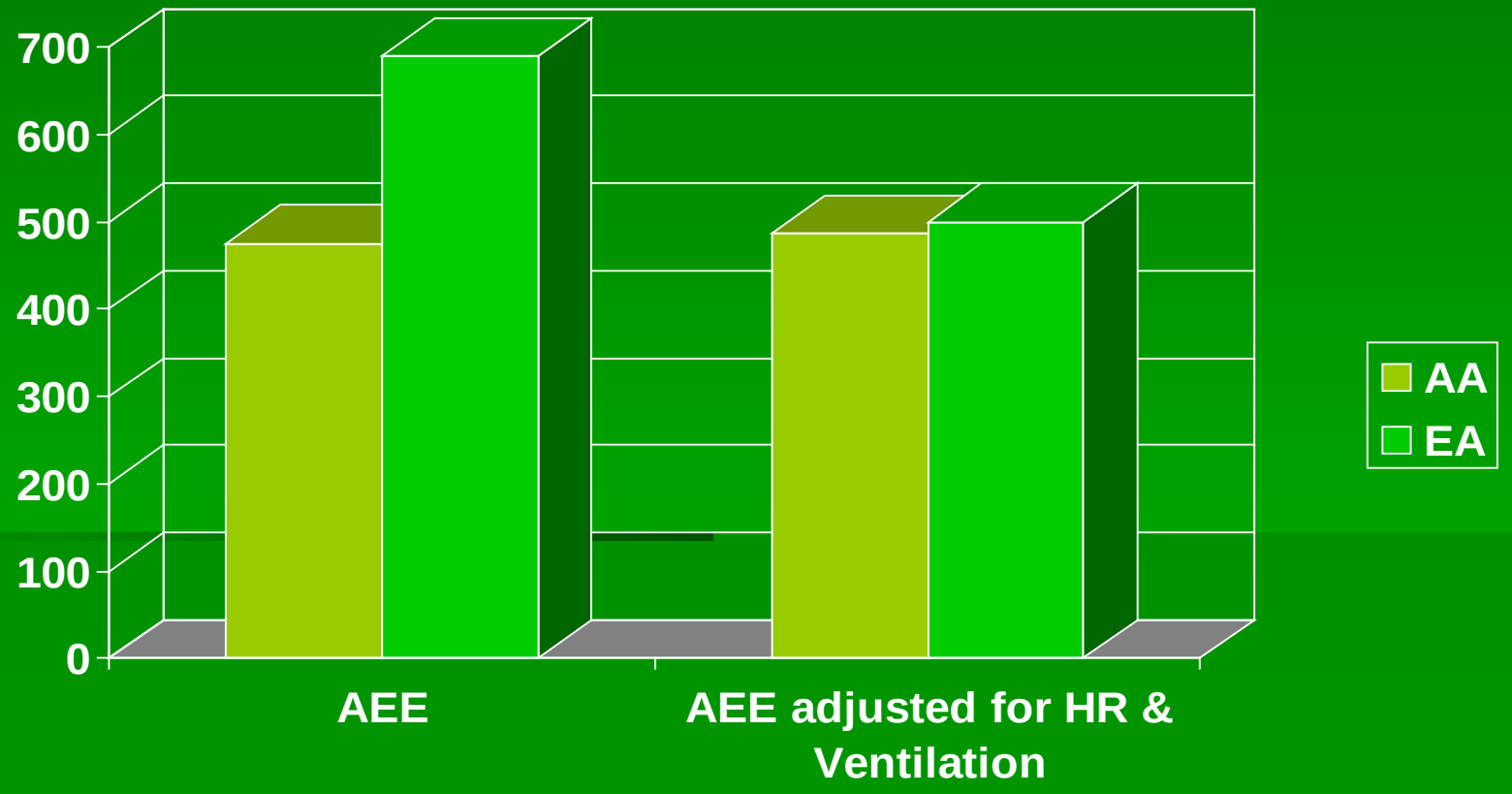


Energy Expenditure Differences



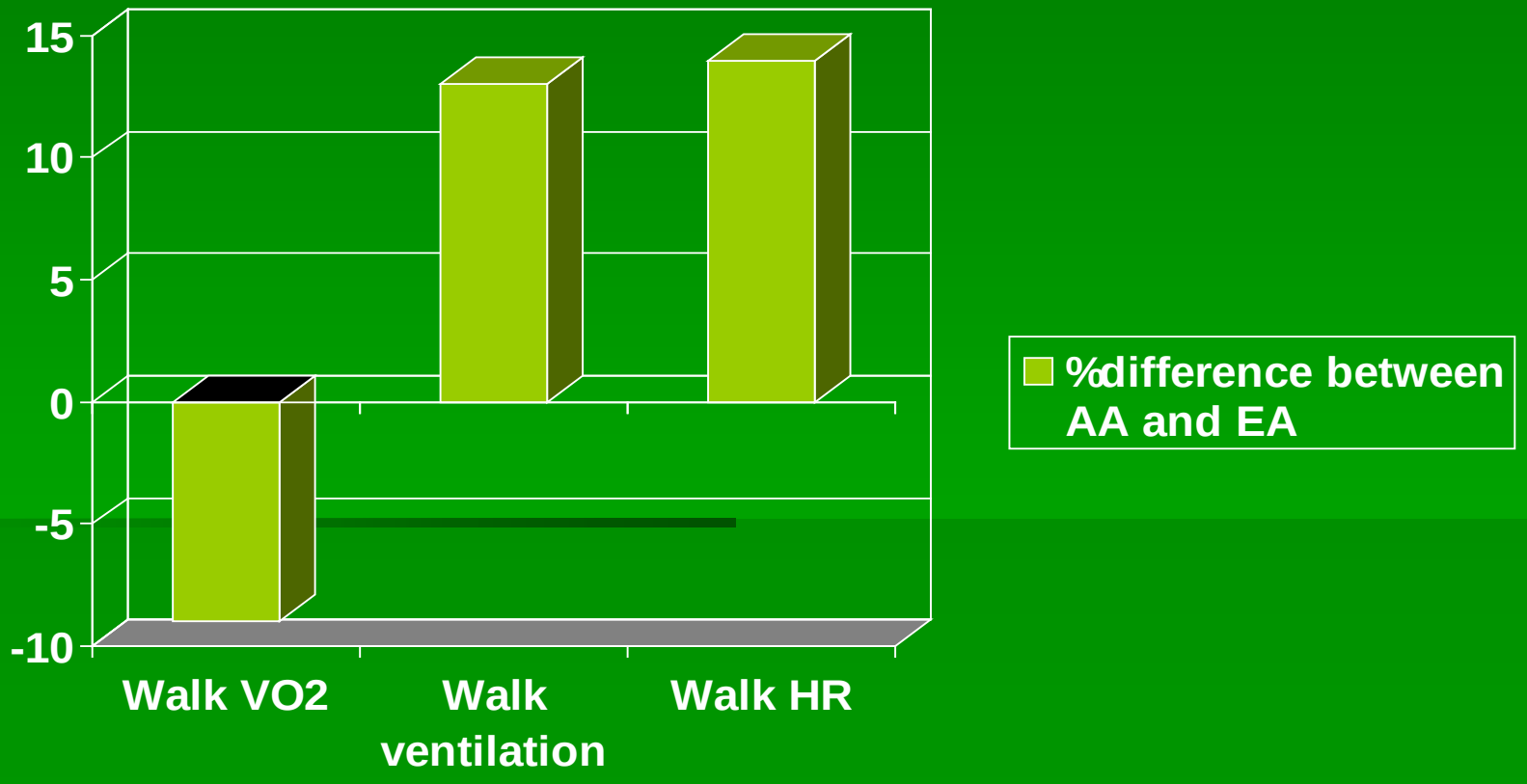
Hunter et al Am J Clin Nutr 2000

Ease of moving may affect participation in AEE



Adapted from Hunter et al Int J Obes 2004

Despite lower oxygen cost of walking AA women have less ease in walking

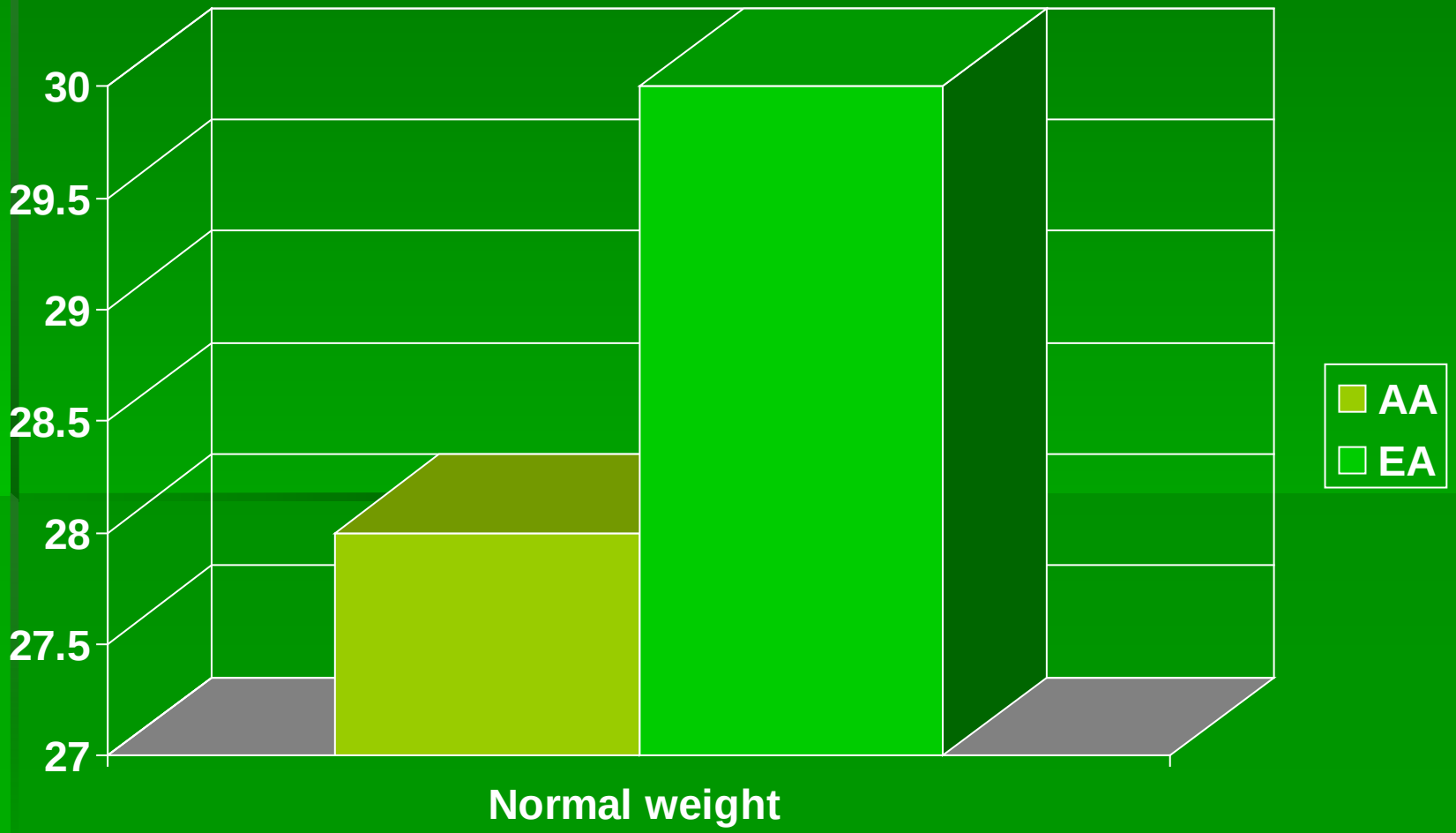


Reduced TEE in AA Women

Metabolic differences may be cellular

- Sea-Horse isolated mitochondrial metabolism reduced in endothelial cells of AA – may contribute to increased BP
- Increased oxygen concentration in vitreous of AA suggests reduced metabolism of retina and cornea in AA – may contribute to up to 4-fold increase in risk of glaucoma

Muscle mitochondrial function (ADP recovery rate following maximal exercise)



Hunter et al 2003

Reactive Oxygen/Nitrogen Species

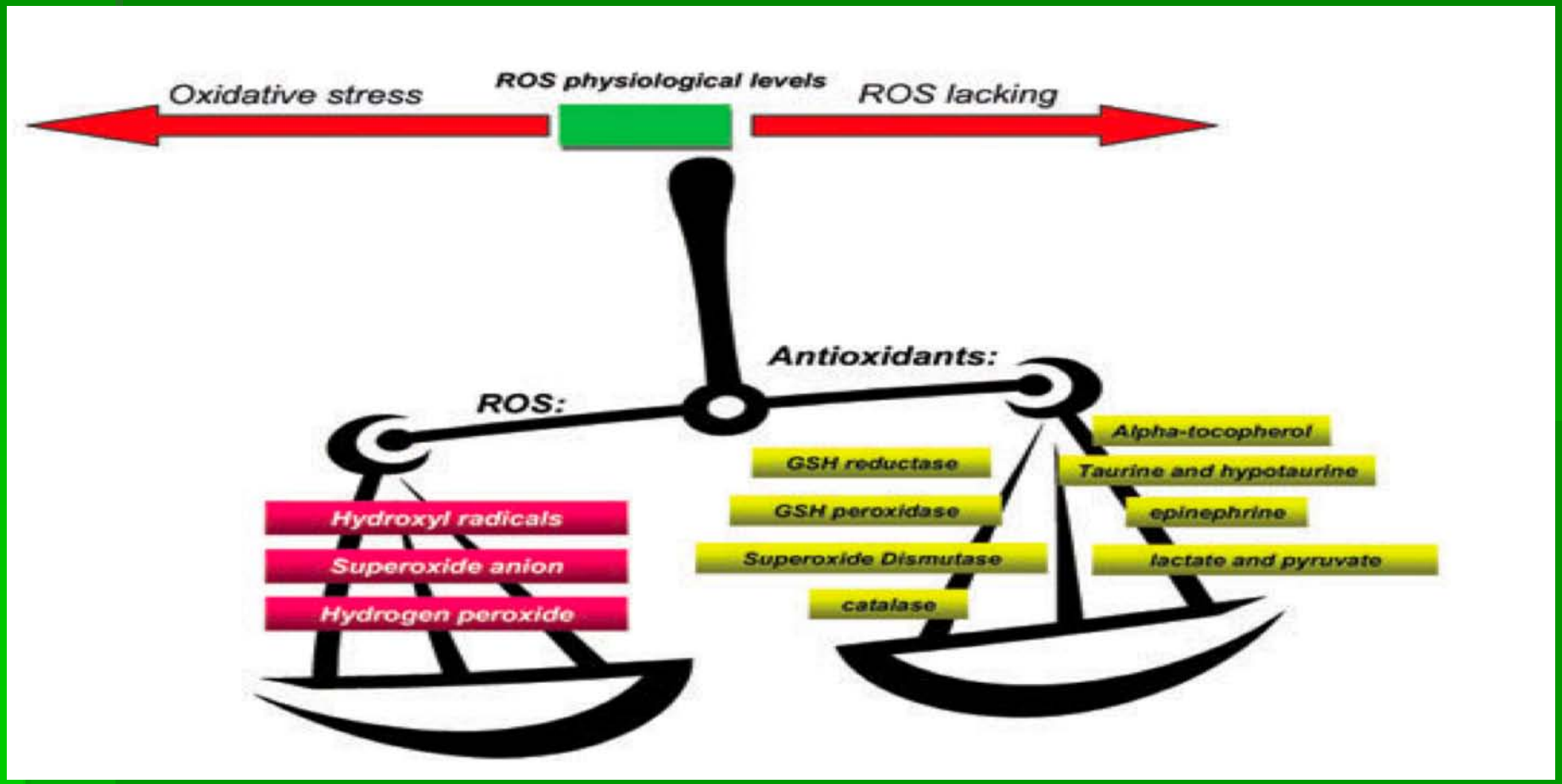
- Formed as natural byproduct of cellular metabolism and have important roles in cellular signaling.
- Reactive oxygen/nitrogen species are highly reactive due to the presence of at least one or more unpaired valence shell electrons.

Why Study ROS?

- Oxidative stress is linked to many diseases
  - atherosclerosis
  - hypertension
  - diabetes
  - immune dysfunction
  - cancer
  - Parkinson's disease and Alzheimer's disease
  - ageing

Oxidative/Nitrosative Stress

Results from an imbalance between excessive ROS/RNS formation and/or limitations in the antioxidant defense mechanisms.



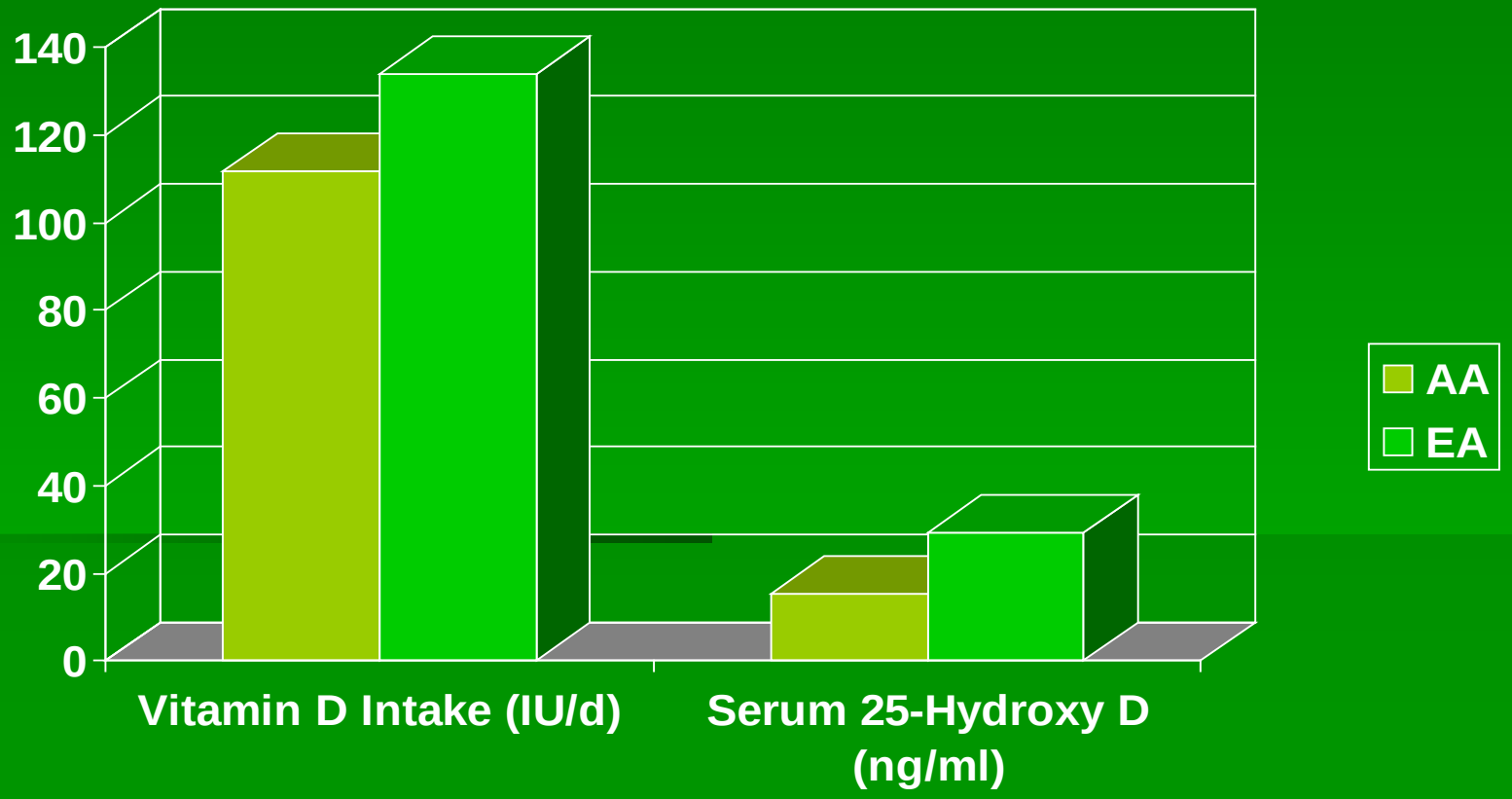
Si negatively related to 3-nitrotyrosine but not nitric oxide

- AA have elevated 3-nitrotyrosine and myeloperoxidase and do not decrease 3-nitrotyrosine or myeloperoxidase with wt loss
- EA have lower 3-nitrotyrosine and myeloperoxidase and decrease 3-nitrotyrosine and myeloperoxidase with wt loss

Fenster et al Free Rad Bio & Med 04

Dietary differences between AA & EA

Vitamin D



Alvarez et al Nut & Met 2010

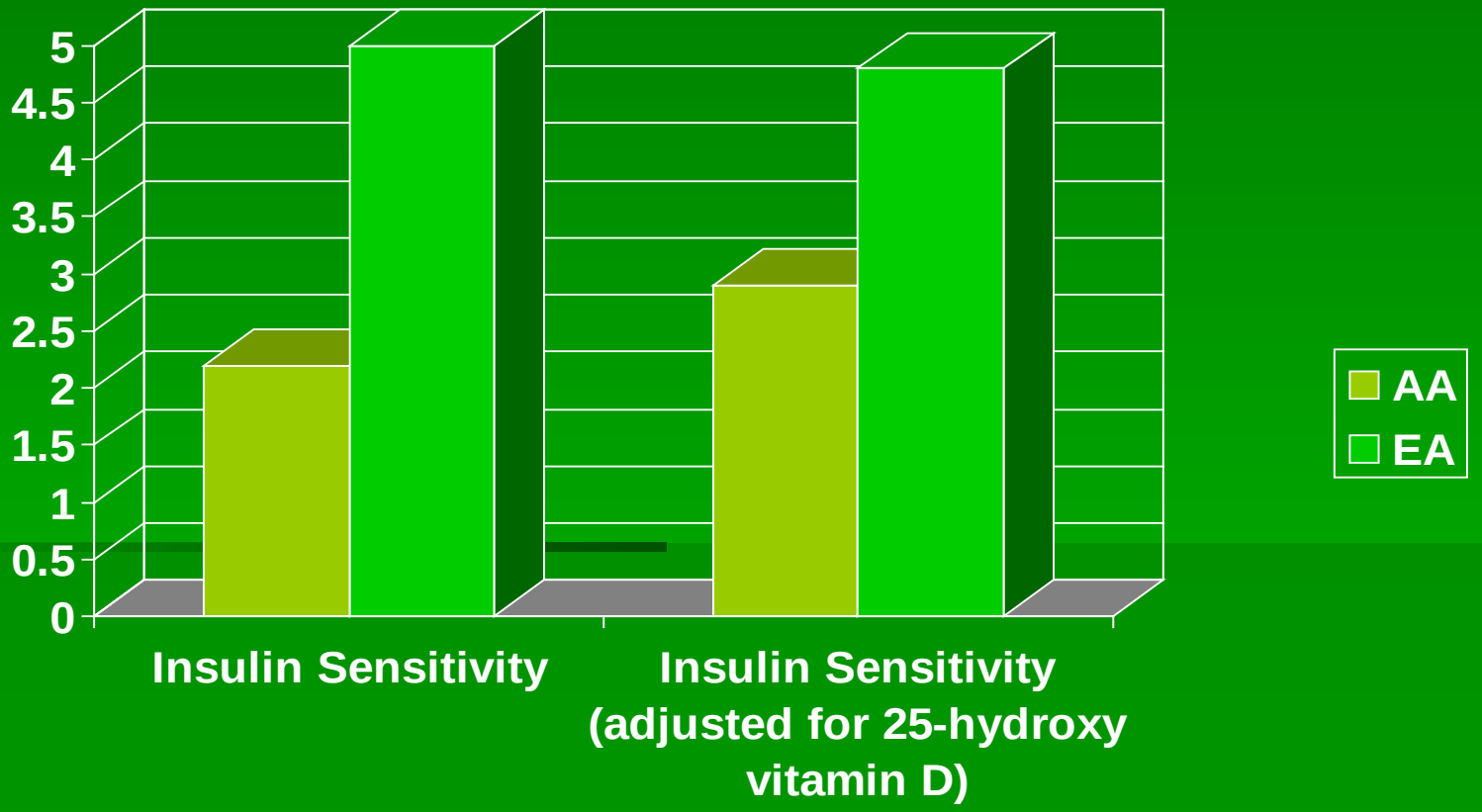
Alvarez et al AJCN 2010

25-hydroxvitamin D and insulin sensitivity

- Serum 25-hydroxyvitamine D is related to insulin sensitivity even after adjusting for visceral fat, age, ethnicity, and parathyroid hormone.

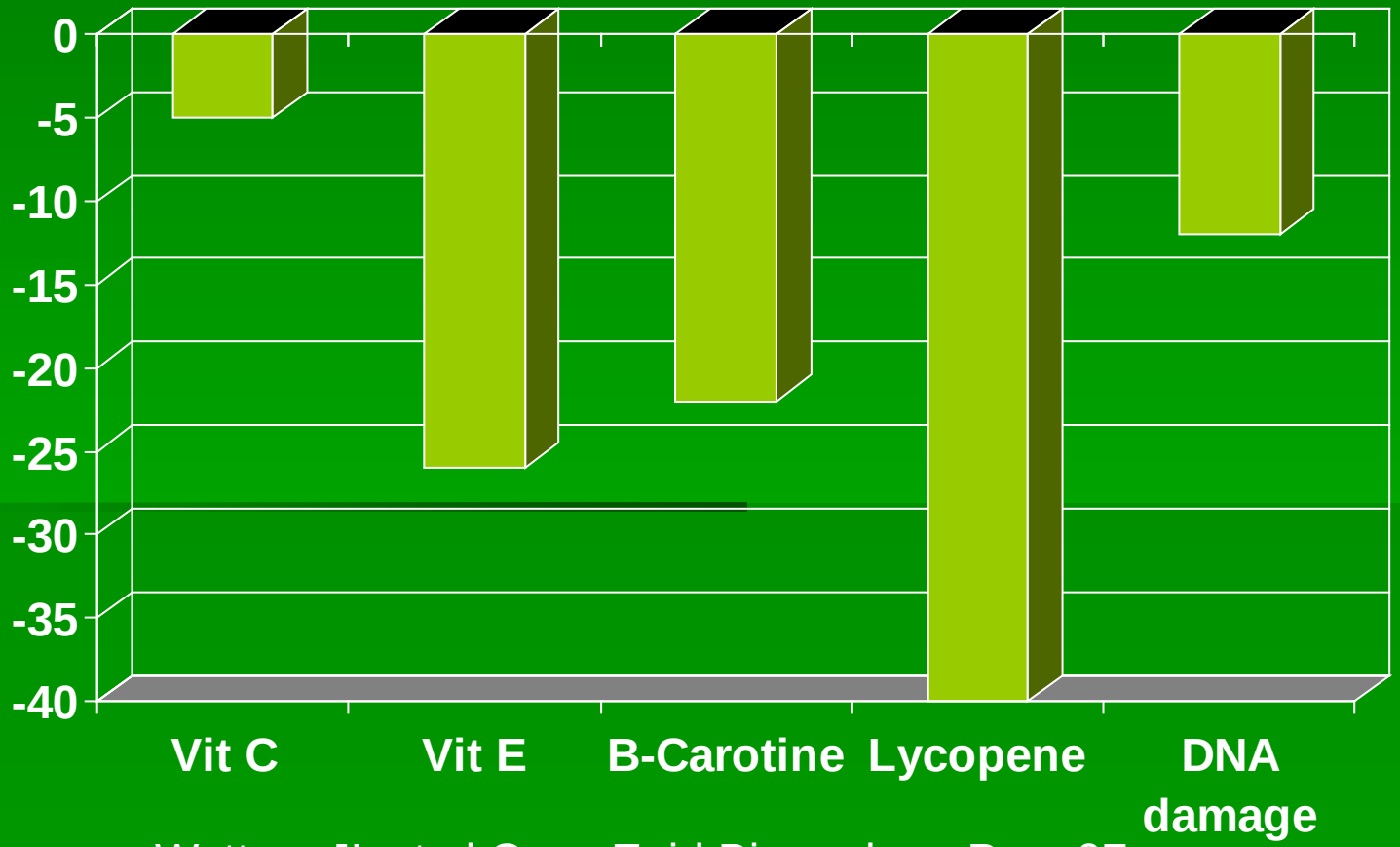
Alvarez et al Am J Clin Nutr 2010

Vitamin D & Insulin Sensitivity



Alvarez et al AJCN 2010

% Difference in serum antioxidant levels and serum DNA oxidative damage between AA & EA (% less than EA)



Watters JL et al Canc Epid Biomarkers Prev 07

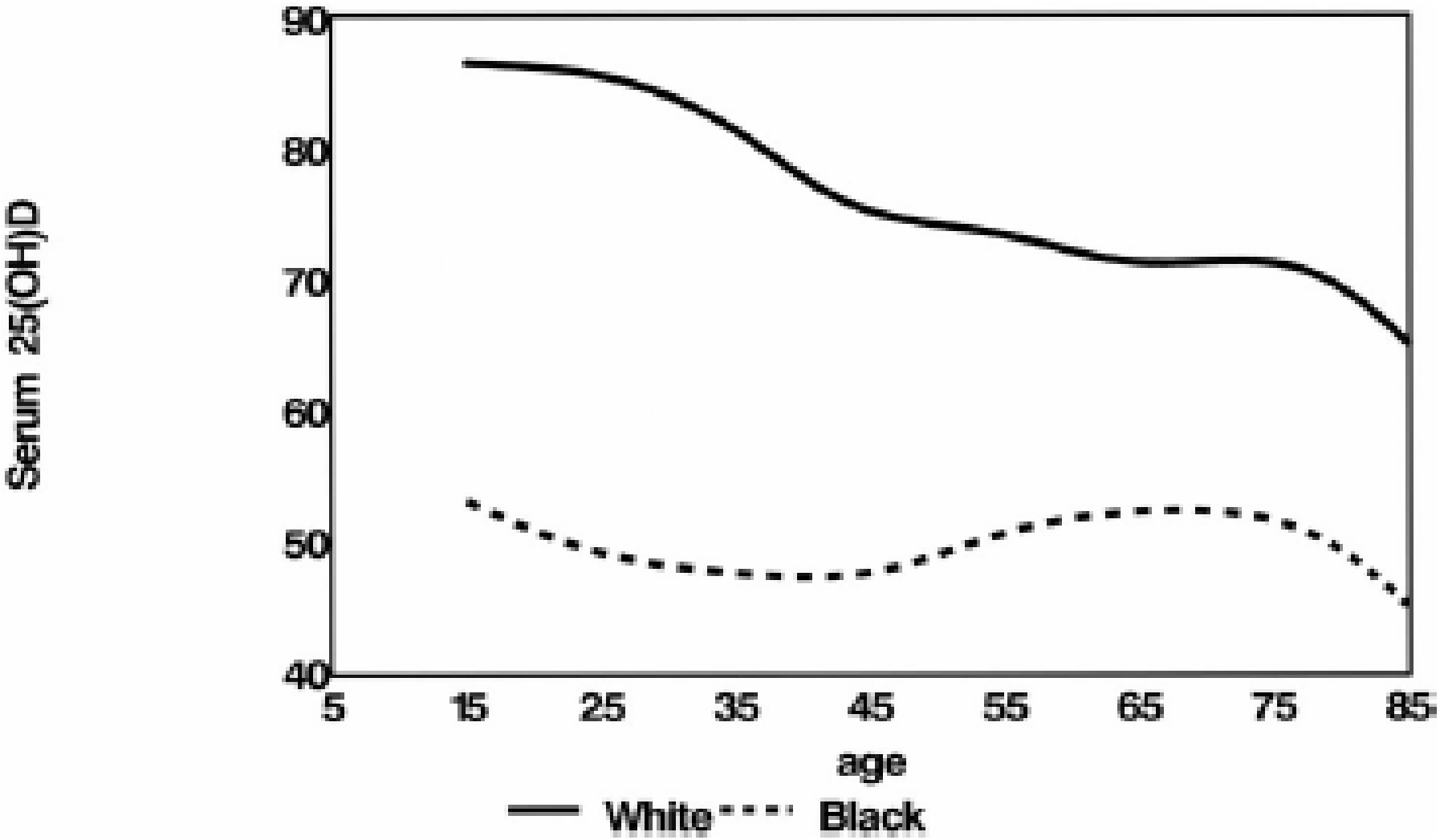


FIGURE 1. Serum 25-hydroxyvitamin D [25(OH)D] distribution in all African American and white participants in the third National Health and Nutrition Examination Survey (with sampling weights), by age.

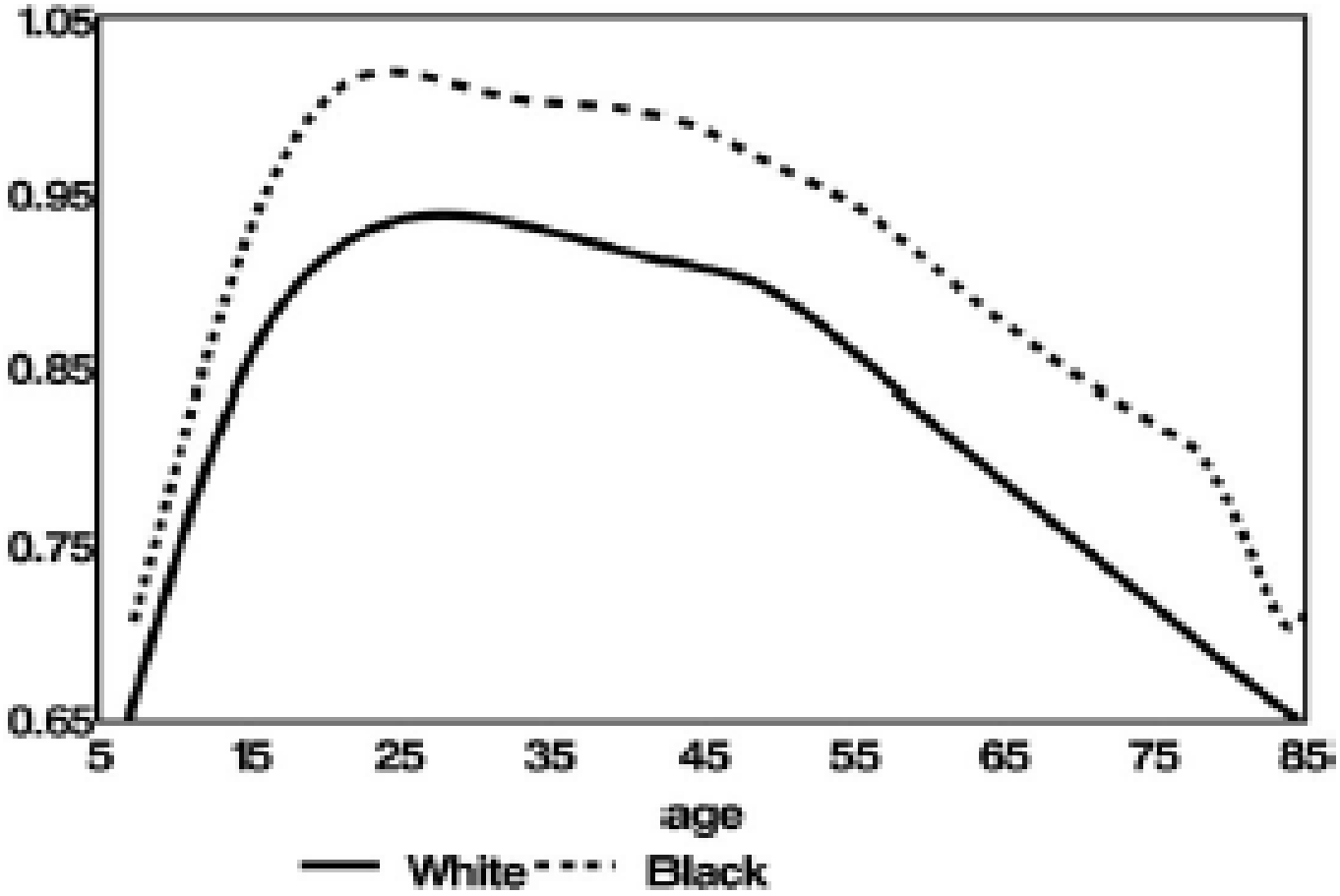


FIGURE 3. Total femur bone mineral density (BMD) in African American and white females, by age, in the BMD Child Study and the third National Health and Nutrition Examination Survey. Reproduced with permission from the *Journal of Clinical Endocrinology and Metabolism* (19). Copyright 2007, the Endocrine Society.

AA seem to have an advantage in sports that require running and jumping

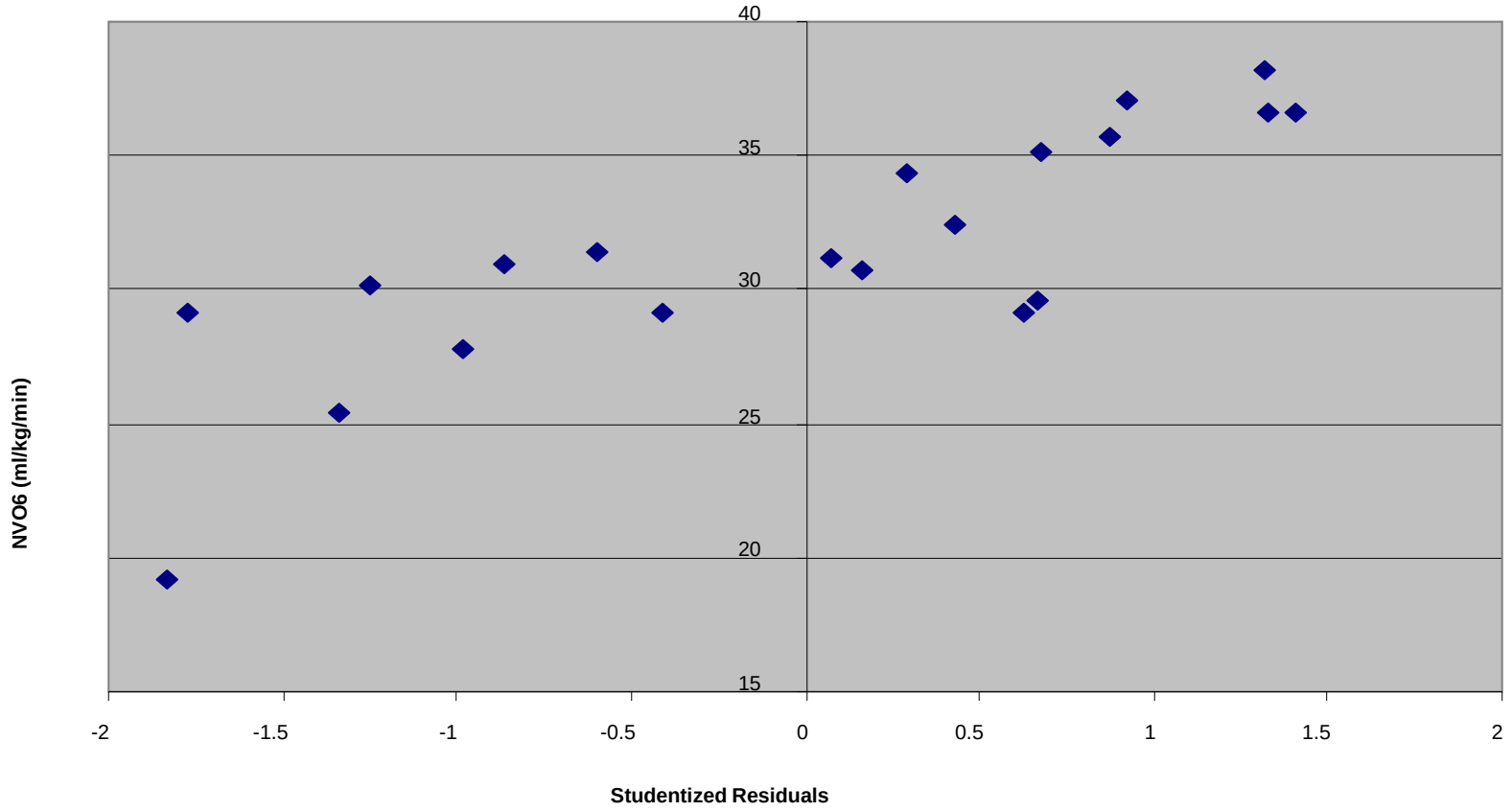
Muscle fiber type may influence performance differences in AAs and EAs

- AA have lower type I and higher type II muscle fiber

Performance ramifications of type 2 fiber type

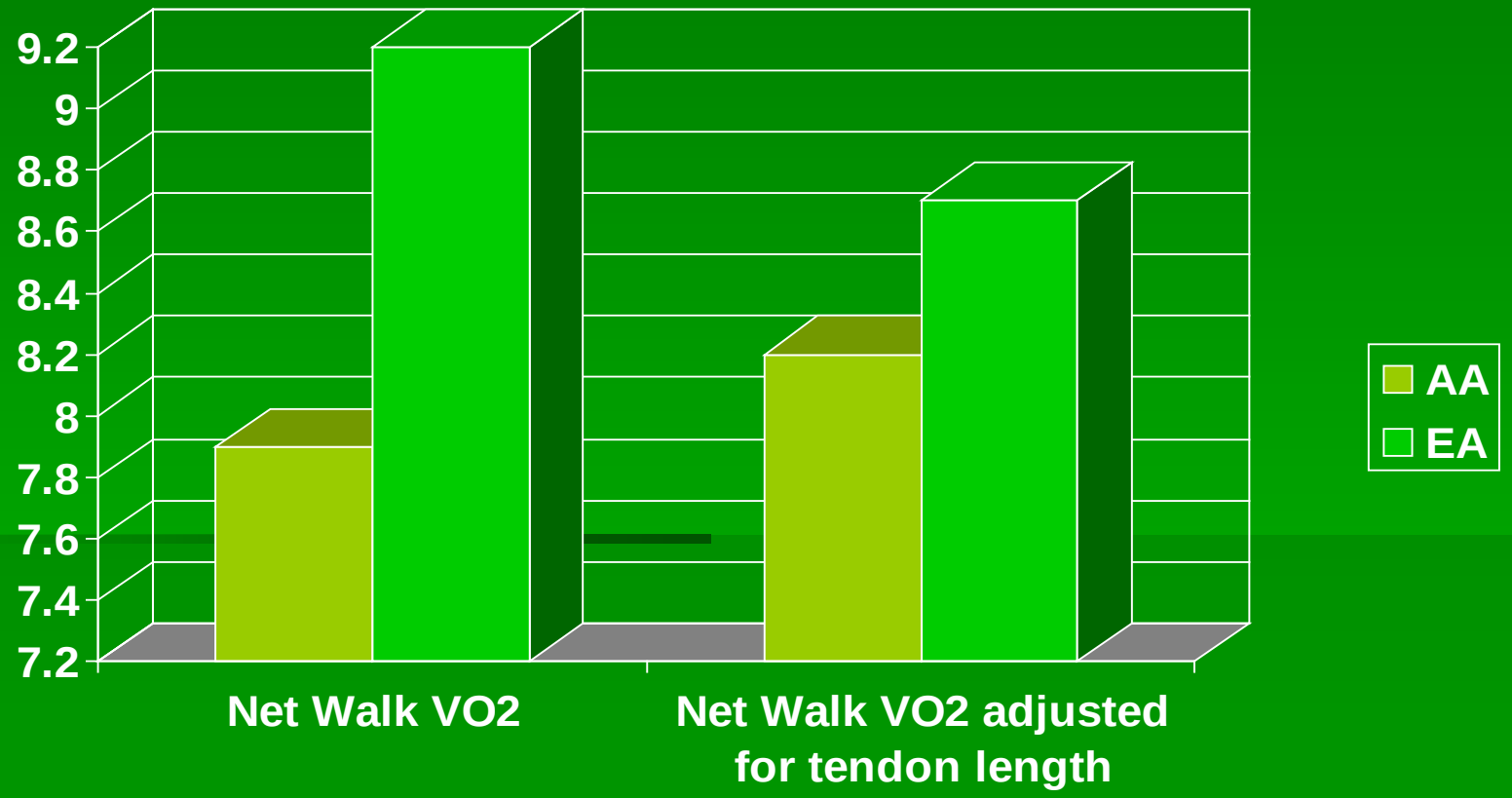
- May give advantage in rapid power development
- May be a disadvantage or in some cases an advantage in long duration endurance activities

Running VO2 with residuals for flexibility and length of the Achilles tendon (R = 0.69)



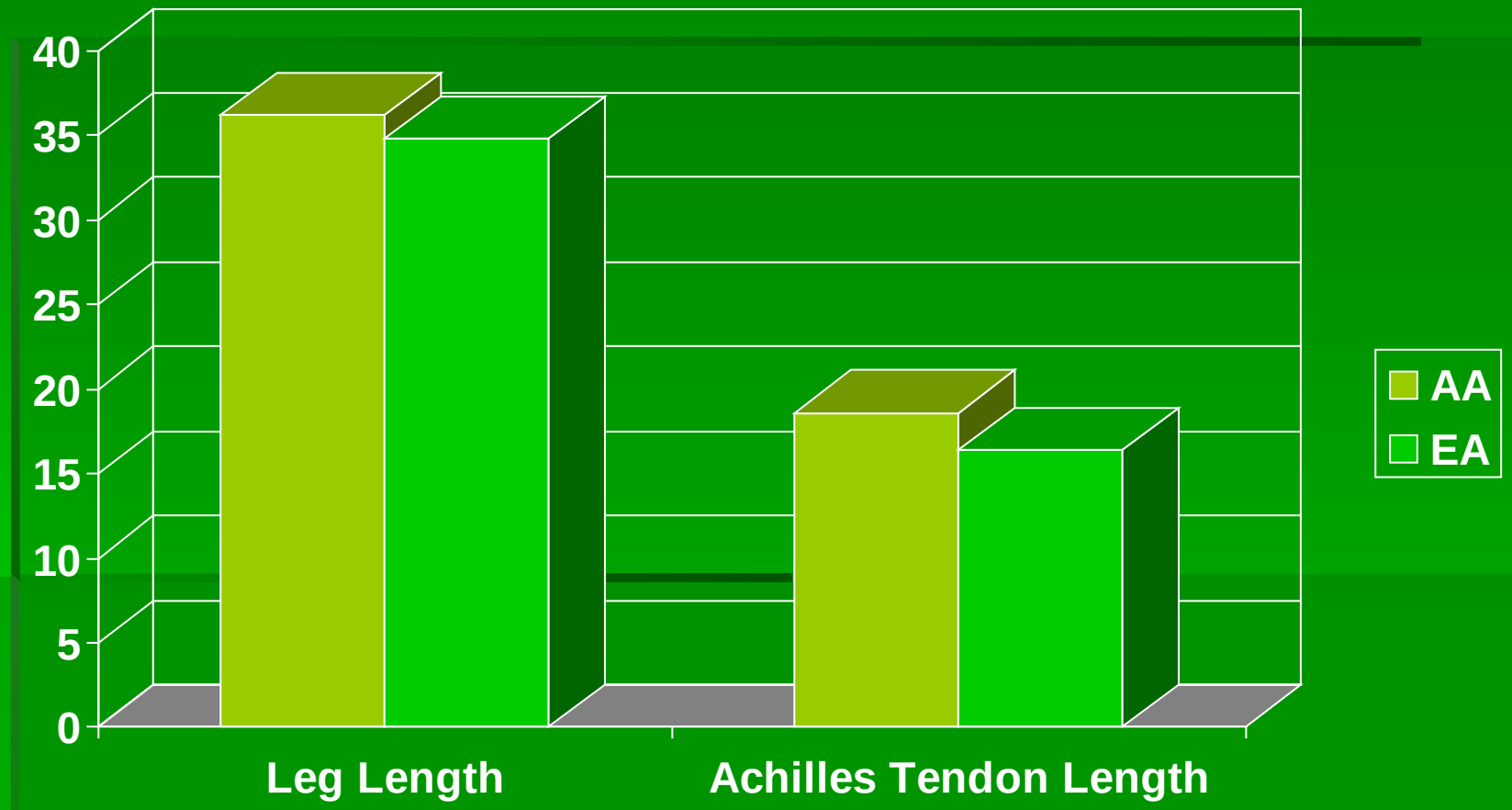
Leg press stretch shortening potentiation Achilles Tendon Length (r = 0.51)

Economy of Walking (ml/kg/min)



McCarthy JSCR 2006

Leg and Tendon Length



Muscle Metabolic Economy