Gender Differences: Physiological & Performance

Chapter 9

Gender Differences:
Physiological

- Body Composition/Structural Differences
  - Major differences in body size and composition are not seen until puberty
  - At 12-13 years, the ratio of FFM to height in females begins to plateau
  - In males it continues to increase until age 20
  - Females peak at age 15-16
  - Males peak at age 18-20

Figure 18.1 Sex differences in fat-free body mass changes with age.
Body Composition/Structural Differences

- Body composition of the sexes begins to differ markedly during puberty
- Primarily due to endocrine responses
- Prior to puberty the anterior pituitary gland does not secrete gonadotropic hormones:
  - Follicle Stimulating Hormone (FSH)
  - Luteinizing Hormone (LH)

- Testosterone secretion results in:
  - Bone formation
  - Protein synthesis

- Distribution of muscle mass is different between the sexes
  - Males have a higher percentage of muscle mass in the upper body compared to females

- Estrogen
  - Broadening the pelvis, stimulating breast development, increasing fat deposition
  - Increases growth rate of bone
Body Composition/Structural Differences

• With age, men and women tend to accumulate fat and lose muscle
• Changes associated with decreased physical activity, decreased testosterone

Cardiovascular Differences

- Stroke Volume
  - Approximately 25% lower in women compared to men
  - Due to:
    • Smaller heart size
    • Smaller left ventricle
    • Smaller blood volume
- Heart Rate
  - Generally higher in females
  - Accommodates for lower SV

Cardiovascular Differences

- Cardiac Output
  - Similar, but met through higher HR and lower SV
Cardiovascular Differences

- Women have less potential for increasing A-V O₂ difference
  - Due to lower Hb content (10% less than men)
  - Which results in lower arterial O₂ content, reduced muscle oxidative potential
  - Lower Hb is important contributor to lower VO₂max in women

Gender Differences: Strength

- Upper body strength
  - Women 40-60% lower than males
- Lower body strength
  - Women 25-30% lower than males
  - How about when expressed relative to body weight, FFM, or muscle cross-sectional area?
    - Per body weight-lower body strength still 5-15% lower
    - Per FFM, no difference no lower body strength!!
    - Upper body strength still reduced when

Gender Differences: Strength

- The bottom line is:
  - For the same amount of muscle, there are no differences in strength between men and women.
  - Women have smaller muscle fiber cross sectional areas, less muscle mass
Gender Differences: Max VO₂

- After puberty, women have VO₂max 70-75% of average man
- Why is there a difference?
  - Physical activity
  - Body composition differences
  - Lower body volume

Gender Differences

- Despite differences between the genders, there are still some women who outperform men
- However, when comparing the “best of the best” differences still persist
- Examples:
  - Norway National Team XC skiing
  - VO₂ max values for top males vs females
    - Males > 90 ml/kg/min
    - Females 77 ml/kg/min
    - 17% difference
  - Marathon
    - Current world record times
    - Males = 2:05:38
Training

• Body composition
  – Similar changes in men and women
  – Magnitude of change related to intensity of activities, not gender
  – Women may gain less FFM, due to hormonal differences (lower testosterone)

• Strength
  – Similar increases in muscle strength
  – Hypertrophy may be less in women
  – Possibly neural factors play a larger role in improvements in strength?

• Aerobic Capacity
  – Similar improvements in men and women
  – Magnitude related to intensity and duration of exercise, not gender issues