1 Physical Fitness Testing: Cardiorespiratory Fitness, Body Composition, Muscular Fitness, and Flexibility

Chapters 4 - 5

2 Fitness Testing: Why

- Education
  - Individual results
  - Health-related standards and age-gender-matched norms.
- Formulating an appropriate exercise prescription
- To monitor progress and set goals
- Risk stratification

3 Fitness Testing: Programming Issues

- Provide detailed instructions for the client prior to scheduled testing day
- Assure that testing environment is appropriate prior to participants arrival
  - Calibration and organization of equipment
  - Forms
  - Testing Environment
  - Testing Order
    - Resting, cardiorespiratory fitness, muscular fitness, and flexibility
    - Body composition

4 Cardiorespiratory Fitness: Max or Submax

- Concept of VO\textsubscript{2}max (VO\textsubscript{2pk})
- Criterion measure of fitness
- Open-circuit spirometry – generally reserved for research or clinical purposes

- Estimating VO\textsubscript{2}max
  - Maximal Test - Use of ACSM equations based on speed and grade (treadmill) or workload (cycle) to calculate VO\textsubscript{2}max (Appendix D)
  - Submaximal Test – Use heart rate response (assumptions) to predict VO\textsubscript{2}max

5 Cardiorespiratory Fitness: Modes of Exercise Testing

- Field tests
- Treadmill
  - More expensive, good mode for most
- Cycle Ergometer
  - Less expensive, may be unfamiliar to most, 10-12% lower VO\textsubscript{2}max than treadmill
- Arm ergometry
  - VO\textsubscript{2}max generally 20 – 30% lower than treadmill
  - Not used for most diagnostic purposes
- Stepping
6. **Cardiorespiratory Fitness: Exercise Protocols**

7. **Cardiorespiratory Fitness: Submax testing**
   - HR should be measured using ECG, HR monitor, or a stethoscope and recorded during the last 10 seconds of each min.
   - 85% of age-predicted max HR is a standard end-point for sub-maximal testing.
   - Environmental considerations are important.
   - Specificity of mode of testing.
   - Allow participant to reach steady-state.

8. **Cardiorespiratory Fitness: Submax testing**
   - Cycle ergometer
     - Astrand-Rhyming cycle ergometer test
     - Power work capacity tests (ex. PWC-170)
     - YMCA protocol
   - Treadmill
     - Use multi-stage tests (3 min stages) to 85% of age-predicted max HR.
   - Step
     - Astrand Rhyming
     - YMCA step test

9. **Cardiorespiratory Fitness: Results**
   - Use Table 4-5 to give normative percentile Values.
   - If client is in lowest percentile, one should weigh the benefits/risks of informing the client.
     - I.e. mode of testing, measured or estimated, age.
     - Baseline measures compared to progress are a good approach.

10. **Cardiorespiratory Fitness: Physiologic and Subjective Monitoring**
    - Heart Rate (bts•min⁻¹)
    - Pulse
    - Electrocardiogram
    - Blood Pressure (mmHg)
      - Systolic
      - Diastolic
    - Borg Rating of Perceived Exertion (RPE)
      - Scale of 6 to 20 which is used to determine subjective rating of exertion from the patient.
    - Other (not likely for fitness testing)
      - Dyspnea
      - Angina

11. **Cardiorespiratory Fitness: RPE**

12. **Cardiorespiratory Fitness: Order of measures (Box 5-1)**
    - Pre-test
      - HR, 12-lead ECG
      - BP
Exercise
- BP taken prior to ECG; start pumping of cuff about 1 minute before the end of the stage
- 12-lead ECG recorded during last 10 seconds of every stage and at peak exercise
- RPE and other scales at the end of each stage (last 15 sec)

13  
**Cardiorespiratory Fitness: Order of measures**
- Recovery (active)
  - Should include 4-min of low-intensity activity
  - 12-lead ECG immediately after exercise, then every 1 to 2 minutes until back to baseline
  - BP immediately after exercise, then every 1 to 2 minutes until back to baseline
  - Monitor symptoms

14  
**Muscular Fitness: Why**
- Improves and/or maintains:
  - Fat-free mass and resting metabolic rate
  - Bone mass
  - Glucose intolerance
  - Musculotendinous integrity
  - Activities of daily living

15  
**Muscular Fitness:**
*Key points for administration*
- Specificity
- Familiarization
- Safety
- Absolute Vs. Relative Strength Gains
- Page 82 and Box 4-5 for administration

16  
**Muscular Fitness:**
*Strength and endurance*
- Strength – maximal force generated by a muscle group
  - 1-repetition max (1-RM)
  - Bench press and leg press
- Endurance – ability of a muscle group to execute repeated contractions over time to cause fatigue
  - Push-ups
  - Curl-ups
- Tables 4-7 – 4-10 for norms

17  
**Flexibility: Philosophy and modalities**
- Determine the ability to carry out activities of daily living
- Specificity
- Most common sites
  - Neck and trunk, hip, shoulder, postural assessments
- Sit-and-Reach Test
- Box 4-5 for administration
Table 4-11 for norms

18 Contraindications:

Muscular Fitness and Flexibility
- Muscular Fitness (strength)
  - Elderly
  - Hypertensive patients
- Flexibility
  - Make sure to note any musculoskeletal injuries that may be exacerbated by ROM testing
    - Ex. Muscular Fitness:

19 Body Composition: Why
- Relative percentage of body weight that is fat and fat-free tissue
- Related to rates of hypertension, type 2 diabetes, and hyperlipidemia
- Obesity “epidemic” in the U.S.

20 Body Composition: Methods
- Densitometry – based on mass/volume ratio
  - Hydrostatic weighing
  - Plethysmography
- Anthropometric Methods
  - Waist-to-Hip Circumference
  - Skinfold measurements
- Bioelectrical impedance
- Dual energy e-ray absorptiometry (DEXA)
- Near-infrared interactance (NIR)

21 Body Composition:
Results and Appropriateness of testing
- Table 4-4 and 4-5 for norms
- Use body type presentation to determine the most appropriate mode of testing
  - Ex. Use waist-to-hip as a measure in obese