ACSM Exercise Specialist®

Workshop

Exercise Prescription – Resistance Training

Resistance Training

•Specific exercises and technique will reviewed in the practical session

Resistance Training
Position Stand

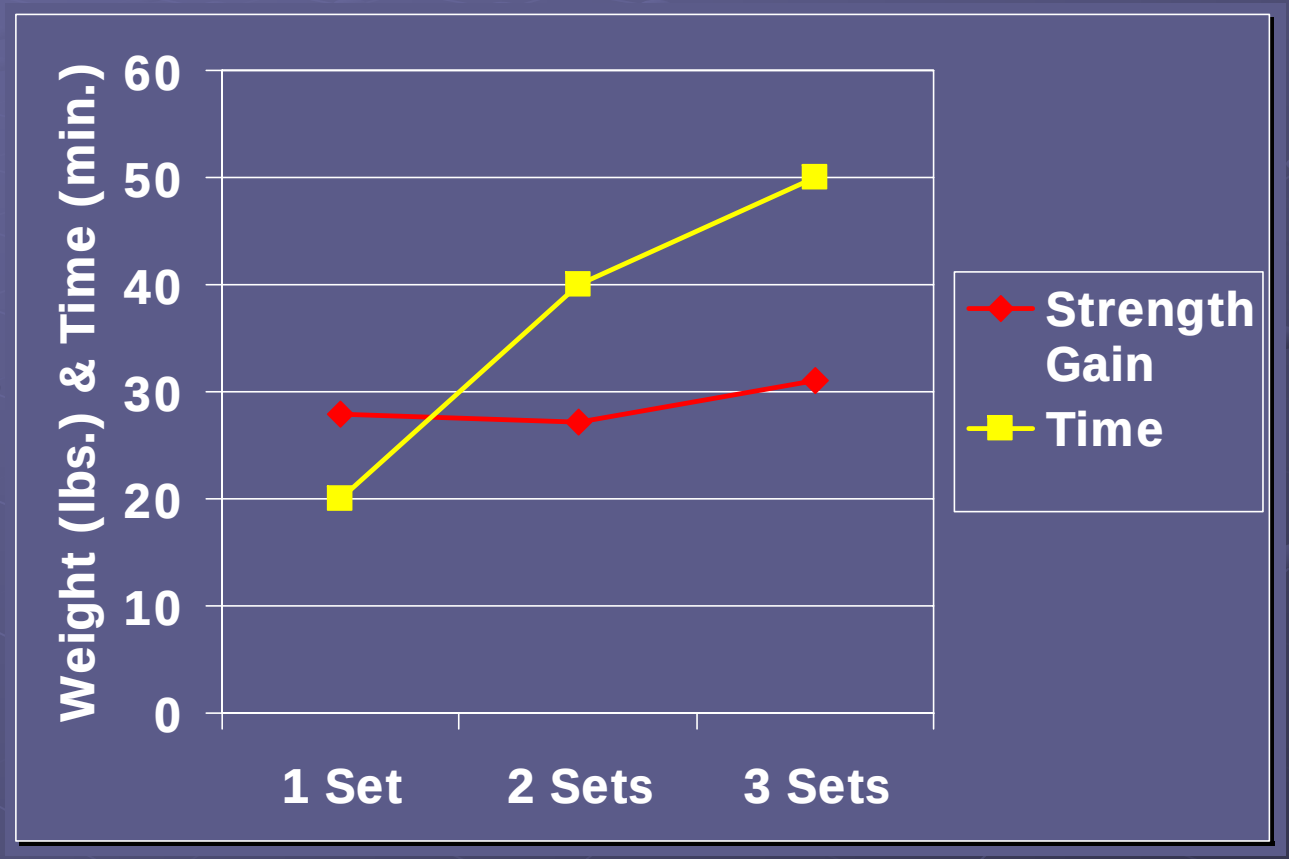
- "Resistance training should be an integral part of an adult fitness program and of sufficient intensity to enhance strength, muscular endurance, and maintain fat-free mass."
  (ACSM 1998)

Resistance Training

ACSM Guidelines for Healthy Adults

- Frequency:
  - 2-3 days a week
- Intensity:
  - 8-12 repetition maximum
- Time:
  - 1 set of 8-12 repetitions (multiple sets may elicit greater benefits)
- Type:
  - Dynamic resistance exercise, consisting of all major muscle groups

Resistance Training
Single vs. Multiple Sets

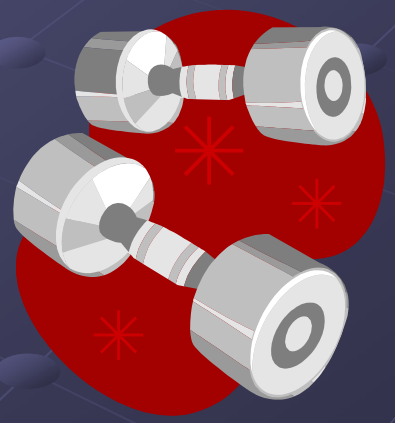


- Berger RA: Res Q 1962; 33 (2):168-181
- Messier SP: Res Q Exerc Sport 1985; 56 (4):345

Resistance Training
Benefits

- Development and maintenance of muscular strength, endurance, and muscle mass
- ↑ bone mass/attenuation of sarcopenia
- ↑ strength of connective tissue
- ↑ basal metabolic rate
- ↑ functional capacity
- reduced depression

- Muscular endurance
  - lighter weights, greater number of repetitions
- Muscular strength
  - maximal or nearly maximal muscle tension, fewer repetitions



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Resistance Training
Physiological Adaptations

- Muscle Tissue
  - Muscle Fiber Size ↑
  - Fast Heavy Chain Myosin ↑
- Enzymes
  - Creatine Phosphokinase ↑
  - Myokinase ↑
  - Phosphofructokinase ↑
- Substrate Molecules
  - Stored ATP ↑
  - Stored Glycogen ↑
- Body Composition
  - Percent Body Fat ↓
  - Fat-Free Mass ↑

Resistance Training
Contraindications

- < 2-4 weeks after MI
- < 3 months post sternotomy or ICD/pacemaker implant
- New onset of cardiac symptoms (chest pain, arrhythmias)
- Blood Pressure >160/105
- Moderate to severe heart failure
- Hypertrophic cardiomyopathy
- Severe valvular disease
- Diabetic retinopathy
- Orthopedic injury
- Myocardial Ischemia < 5 METS*
  - Pollock et al. Circulation. 2000, 101:828-833

Resistance Training
Modalities

- Exercise that train major muscle groups can be performed using various modalities
  - Calisthenics
  - Resistance bands
  - Machine weights
  - Free-weights
  - Other: balance balls, medicine balls, etc.
- Eccentric, concentric and isometric contractions all have specific benefits

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Resistance Training
Frequency

- Perform 2-3 nonconsecutive days/week

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Resistance Training
Intensity

- % 1 RM
  - Higher (more reps) = endurance
  - Lower (less reps) = strength training
- RPE (12-13 to 15-16)
- RPP (below ischemic threshold)
  - Note: Low HR response typically keeps RPP well below ischemic threshold
- S_aO_2: maintain above 88%

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Resistance Training
Duration

- Duration is set by the combination of repetitions per set, sets per exercise, and exercises (muscle group focuses) per resistance training session

- Repetitions
  - 8-12 repetitions for healthy participants <50 years of age (combines improvement in muscular strength & endurance)
  - 10-15 repetitions for healthy participants >50 years of age (focuses more on muscular endurance)

- Sets
  - Minimum of 1 set to volitional fatigue

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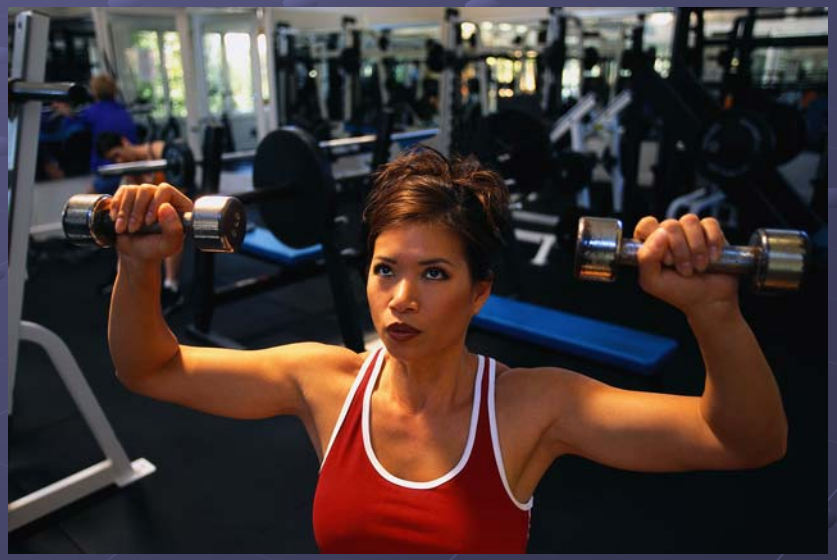
Resistance Training
Getting Started

- Monitor clinical response and emphasize form:
  - Dynamic exercises
  - All major muscle groups
  - Slow, controlled movements
  - Full range of motion
  - Avoid valsalva maneuver
  - Consider a ‘workout buddy’ system

- Use light resistances to allow familiarization
  - Initial target of 10 reps, working up to 15 reps per set
  - See next slide for progression information

Resistance Training
Progression

- Progressive overload by changing intensity:
  - Weight or resistance increase by 10-15% when 1-2 sets are performed with ease
  - Number of repetitions increase up to 15 before changing resistance
  - Length of rest interval between exercises can be shortened to increase intensity of session
  - Number of sets of each exercise completed increased, although strength gains are minimal beyond 1 set
  - Number of exercises increased to include more muscle groups or more specific exercises per muscle group



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Resistance Training
Other Considerations

- Valsalva maneuver- can cause a dramatic, acute increase in SBP and DBP
- Time course post-procedures/event
- Exercises should be rhythmic, performed at a moderate-to-slow speed, involve full range of motion (e.g., 3 sec concentric/3 sec eccentric)
- Focus on proper technique
- Promote use of exercise training partner
- Use charting system to assist with progression determination
- Watch/assess for injuries

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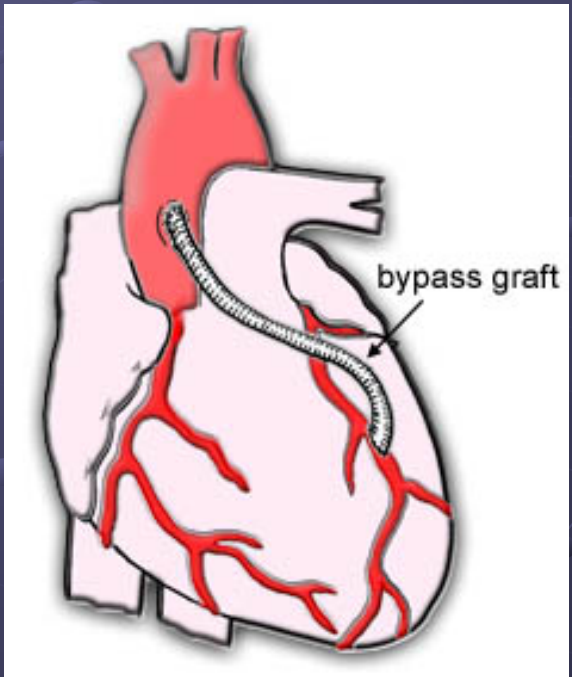
Resistance Training
Cardiac Disease

- Begin no sooner than 5 weeks post MI or CABG (3 weeks PCI) or 4 weeks (2 for PCI) in cardiac rehab.
- Little information for heart failure, dysrhythmias, valvular disease, uncontrolled hypertension
- Begin: low weight, 10-15 reps per set, 1-2 sets of 8-10 different exercises
  - RPE 11 -13
  - Watch RPP ischemic threshold
  - Increase resistance 2-5 lbs/week for arms
  - Increase resistance 5-10 lbs/week for legs
- Elastic bands, light cuff and hand weights, wall pulleys



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Resistance Training

Cardiac Disease

Disease Specific Benefits of Strength Training

- Increase in muscular strength, endurance and power
- Decreased pressor response
- Moderate increase of cardiorepiratory function
- Improvement of cardiovascular risk factors
  - Glucose Control
  - Blood Pressure

Resistance Training
COPD

- Upper body resistance training
  - Use high repetition, low intensity
  - Coordinate breathing with upper body movements
- Consider
  - Dyspnea not above 2-3/4
  - S_aO_2 ($\geq$ 88%)
  - Focus on muscles of shoulder girdle that assist with respiration

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Resistance Training

COPD

Inspiratory muscle training

- Due to weak inspiratory muscles, training these may reduce dyspnea
  - Strength: high inspiratory resistances with few repetitions
  - Endurance: low-moderate inspiratory resistances are used for 15-30 min.
- Frequency: 4-5 days/week
- Intensity: continuous breathing against 30% of maximal inspiratory pressure measured at FRC
- Duration: 30 minutes/day or two 15-min sessions/day

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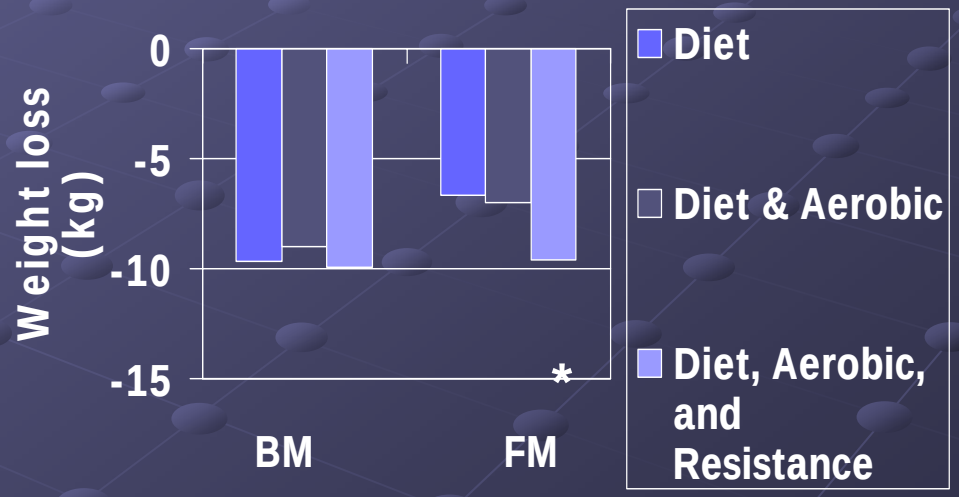
Resistance Training
Patients with Obesity

- Standard training recommendations for clinical populations can be used
- May need to modify based on body size and equipment
- ACSM
  - Strength training may serve as a valuable adjunct to aerobic training when trying to maintain or gain lean body weight
  - Up to 30% of weight loss can be lean body mass

Total body mass and fat-mass lost from a 12-week weight loss program



- Kraemer et al. 1999;31(9) MSSE