# Aging Athletes

**Background**

1. No specific definition for aging athlete
    - VO2 max decr after age 25
    - Cardiovascular dz
        - More common in athletes >35 yo
    - Masters level category
        - For athletes in marathons, track and field
        - >30 yo
    - Each sport defines senior level athletes differently
2. General information
    - By 2030-70 million adults >65 yo
    - >85 age group will be fastest growing age group
    - Aging involves multiple variables
        - Lifestyle
        - Genetics
        - Chronic dzs
    - Due to variables, specific training recommendations will be unique for each individual
    - Chronic dzs impact training of aging athlete
    - Endurance training can maintain/ improve cardiovascular function
    - Strength training can decr loss of muscle mass and strength normally associated w/aging
    - ACSM/AHA Physical Activity and Public Health in Older Adults
        - http://circ.ahajournals.org/cgi/reprint/CIRCULATIONAHA.107.185650

**Pathophysiology**

1. Cardiovascular function w/incr age
    - Decr stroke volume
    - Decr cardiac output
    - After age 10, heart rate max decr 1 beat/yr (220-age)
    - After age 25, V02 max decr 5-15% per decade
        - Endurance athletes have slower V02 max decline
        - Measurement of V02 max can help determine intensity of training
    - After age 25, decr in stroke volume, cardiac output, heart rate lead to decr in max ventilation by 10% /decade
        - Decr in max ventilation rate leads to decr performance in aging athlete
        - Endurance athletes only decr max ventilation rate by 4% /decade

**Therapeutics**

- ACSM exercise recommendations
- Contraindications
- Exercise stress testing and exercise prescription
- Strength training
- ACSM Strength Training Recommendation
- Basal diet of 0.8g of protein/Kg/day
- Cross training

- To avoid overuse injuries
- Contraindications to strength training
- Postural stability and flexibility
- Exercise w/co-morbidities

1. **ACSM exercise recommendations**
    - Utilize high intensity workouts
        - 2100-2300Kcal/session
    - Utilize high resistance training 3x/wk
    - Monitor nutrition
    - Ages 17-49: (SOR:C)
        - Aerobics
        - Strength training
        - Balanced diet
    - Ages 50+
        - Decr intensity
        - Incr freq to avoid injury
    - Ages 60+
        - Flexibility
        - Balance
        - Strength
    - Recommend >30 mins of exercise 5-7 days/wk (SOR:A)
    - Prior to starting training or competition
        - Previously documented cardiovascular dz
            - Assess left ventricular function: ECHO
            - Exercise stress testing
            - Tests should be done while athlete on routine meds
            - Minimal risk
                - Ejection fraction > 50%
                - Normal exercise tolerance
                - No inducible ischemia w/exercise testing
                - No VTach
        - Screening of asymptomatic individuals
            - Hx of diabetes
            - Males >45 yo
            - Females >55 yo
2. **Contraindications**
    - Unstable heart dz
    - Decompensated heart failure
    - Uncontrolled HTN (systolic >170)
    - Uncontrolled arrhythmia
    - Pulmonary artery HTN
    - Myocarditis
3. **Exercise stress testing and exercise prescription**
4. **Strength training**
    - Decr rate of sarcopenia that naturally occurs w/aging
    - Need adequate protein intake for positive nitrogen balance
    - Normal aging decr lean muscle mass
    - Resting metabolic rate gradually decr
        - By age 80, decr by 15%

- Overtraining: excessive load or repetitions can lead to injury
  - 70% of injuries in >60 year old athlete are "overuse injuries"
  - <40% of athletes <25 years of age are "overuse injuries"

5. **ACSM Strength Training Recommendation**
   - Strength training 3-4x/ wk on all important muscle groups w/1 day rest in between sessions
6. **Basal diet of 0.8g of protein/Kg/day**
   - Incr to 1-1.25 g for moderate exercise
   - Incr to 1.2- 1.65 g in endurance athletes
   - Balanced diet should consist of: (SOR:C)
   - 60-65% carbohydrates
     - 40% at least being complex carbohydrates
   - 30% fat
   - 10-20% protein (low fat)
7. **Cross training**
   - Alternate workouts that utilize different muscle groups
   - May help decr overuse injuries
   - Cross training can improve performance
   - Cross training leads to better overall fitness
   - Cross training helps decr training burnout
   - Cross training allows exercise of certain muscle groups while resting others
   - Cross training after competition can allow muscle groups to recover while maintaining fitness
8. **To avoid overuse injuries**
   - Cross train
   - Do not "push" through pain
   - Steadily incr intensity of workout
   - Do not run >45 miles/wk
   - Run on flat surfaces
   - Alternate workout days
     - Strength and endurance training
   - Buy new shoes every 500 miles
   - Females may consider estrogen tx; estrogens incr
     - Cardiac output
     - Bone density
     - Ligamentous flexibility
   - Adequate protein intake
9. **Contraindications to strength training**
   - Neuromuscular disorders (multiple sclerosis)
     - Greater disability if train during a flare
   - Existing injuries
10. **Postural stability and flexibility**
    - Affected by alterations in sensory/motor systems
    - Dz/ conditions that affect posture
      - Arthritis
      - Osteoporosis
      - Joint replacement
      - Hip fracture
      - Parkinson's dz

        - CVA
    - Posture and incr risk of injury due to:
        - Displaced center of balance
        - Muscles not in optimal working position
    - Stretching enhances flexibility; improved flexibility
        - Improves physical function
        - Reduces pain/stiffness
    - Flexibility training should be incl exercise programs for athletes
        - Improves balance
        - Allows for better ventilation
            - Improved expansion and relaxation of chest wall
            - Improved posture
    - Primary goal of flexibility training: stress end range of joint
        - Adequate warm-up using muscle groups used in athlete's sport
        - Progressive larger ROM
        - Dynamic stretches after 10-15 mins of warm-up
        - Work specific muscle groups
    - Balance training
        - 10-15 mins of exercise program daily
        - Use balance ball
        - Seated/dynamic wt shifts
            - Eyes open and closed
        - Kick ball toward target
        - Resistance band training
            - Gradually incr step stride and speed
    - Frail and very old athletes
        - Goal: improve physiologic, metabolic, psychological and functional ability
        - Capacity for muscle to strengthen is more dependent on resistance (load) than on age
        - Work-out programs at least 2-3 days/wk for 2-3 sets
        - Use standing posture to improve balance
        - Use free wts to further improve balance
        - Graduate to one leg balance activities
        - Focus on lower extremity muscle groups: hip extensors, plantar flexors
    - Psychological function
        - Exercise improves executive processing
        - Exercise (especially aerobic) improves cognitive function
            - Task coordination
            - Recent recall
        - 15-30 mins/day of exercise may reduce risk of Alzheimer's dz
        - Perceptions of body image and self-esteem are improved
        - Physical activity decr incidence/severity of depression
        - Aging and motivation in sport
            - Older athletes often more goal directed
            - More aware of potential injury

- Set specific goals
  - Adjust goals to deal w/co-morbidities and injuries
  - Goals must be reasonable/realistic
  - Keep goals time based
    - Try to reach target in specified amount of time

11. **Exercise w/co-morbidities**
    - Exercise and HTN
      - Resting blood pressure incr w/age
        - Exercise helps decr BP
      - Severe HTN should be controlled before engaging in exercise program
        - Check BP before and after exercise
        - Avoid intense exercise if pre-exercise BP greater than 100/160 (SOR:C)
      - Beta blockers decr heart rate response
        - Grade intensity of exercise on perceived exertion, not heart rate
        - Longer cool down period to avoid post exercise hypotension
        - Train at lower intensity levels (40-50% V02 max) to avoid post exercise hypotension
    - Exercise and DM
      - Effect of exercise on diabetes
        - Less insulin resistance
        - Improved lipids
        - Improved glycemic control
        - Improved vascularity
        - Improved BP
        - Improved renal function
      - Check blood sugar freq
      - Target blood sugar for exercise is 150-250
      - Exercise cautiously if starting blood sugar is <100
      - Avoid exercise if blood sugar greater than 300
      - Overall goal is better blood sugar control w/exercise
    - Exercise and COPD
      - Goal is to incr endurance
      - High variability exercises should be avoided
        - Dancing, racquet sports
      - Recommend low variability exercises
        - Cycling, running, hiking
      - Exercise to improve breathing efficiency and exercise tolerance
      - Intensity of exercise based on perceived exertion
      - Utilize interval training techniques

**Follow-Up**

1. General guideline
    - See athlete as indicated by underlying dz process

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