

**“No Runner Left Behind: Considerations for a Diverse Athletic Population”**  
**Combined Sections Meeting**  
**Saturday, February 18, 2016**  
**3:00 p.m. – 5:00 p.m.**

**Special Populations in the Runner: The Skeletally Immature/Adolescent Runner**  
**Dr. Burke Wilson, PT, DPT**  
**Board Certified in Sports Physical Therapy**

- I. Introduction
  - a. General benefits of exercise
  - b. Red Flags in the Skeletally Immature Runner
- II. Injury Risk and Patterns
  - a. Injury Rates
  - b. Risk Factors
    - i. Female Athlete Triad
    - ii. Achieving a “competitive body” might be detrimental to health
  - c. Common injury patterns
    - i. Apophyseal injuries/avulsions
    - ii. Bony lesions/stress fractures
    - iii. Other types of common injuries
- III. Running Biomechanics in the Developing Athlete
  - a. Biomechanical Considerations
  - b. Running Performance
    - i. Physiological
    - ii. Muscle strength
    - iii. Muscle power
    - iv. Anthropometric
  - c. Building aerobic capacity in kids
- IV. Unique Considerations for the Skeletally Immature Runner
  - a. Cardiopulmonary
    - i. Aerobic capacity related to growth
    - ii. Stroke volume, cardiac output, and max heart rate
    - iii. Oxygen extraction at the tissue level
  - b. Musculoskeletal
    - i. Bone
      - 1. Bone mineral density related to dietary intake
      - 2. Open growth plates
    - ii. Tendon and Ligament
      - 1. Apophyseal tendon attachments are weak
      - 2. Amount of physical activity may cause microinjury to these attachment sites
  - c. Temperature regulation
    - i. Heat intolerance – heat absorption due to higher surface area to mass ratio and lower sweating rates
    - ii. Importance of hydration in skeletally immature runners
  - d. Psychological Considerations
    - i. Effects of weekly training volumes
    - ii. Positive psychological benefits of sport and competition

- iii. Psychological stress and increased injury risk
    - iv. Importance of goal setting
- V. Exercise prescription considerations
  - a. Resistance training
  - b. Endurance training
  - c. Neuromuscular control

**Special Populations in the Runner: The Pregnant and Postpartum Runner**  
**Dr. Kate Mihevc Edwards, PT, DPT**  
**Board Certified in Orthopedic Physical Therapy**

- VI. Pregnant runner (\*Physical exercise in pregnancy has minimal risk)
  - a. Unique considerations pregnant runner
    - i. Emotional/influence of others
    - ii. Fetal health
    - iii. Daily-weekly changes in physiology/biomechanics
  - b. Contraindications to exercise during pregnancy (chart on slide)
  - c. Benefits of exercise during pregnancy
    - i. Systemic: lower incidence of gestational diabetes, hypertension disorder, improved aerobic capacity, blood pressure; decreased risk of preeclampsia, reduced fatigue, varicosities, and peripheral edema, prevention of excessive gestational weight gain, obesity/weight retention, decrease nausea
    - ii. Psychological: improved self-esteem, decreases in depression, improvement/maintenance of fitness
    - iii. Childbirth: decreased incident cesarean, increased incidence of vaginal delivery, decreased labor time
    - iv. Baby: prevention of chronic disease development in offspring, and appropriate fetal weight gain, Offspring of those who exercised were significantly lighter and leaner at 5 years of age compared with those offspring of women who stopped exercising during pregnancy
    - v. Postpartum: decreased recovery time
  - d. Physiological/biomechanical changes
    - i. Ligament laxity (increased progesterone, relaxin)
    - ii. Increased blood volume (up to 50%)
    - iii. Increased resting HR (10-15 BPM)
    - iv. Temperature regulation
    - v. Lower extremity edema
    - vi. Weight gain
    - vii. COM
    - viii. Increased lumbar lordosis
    - ix. Anterior pelvic rotation
    - x. Diaphragm elevated
  - e. Common Musculoskeletal Injuries
    - i. Low back pain
    - ii. SIJ pain
  - f. PT Management and Treatment of the Pregnant Runner
    - i. Education
      - 1. Exercise recommendations (frequency, duration, intensity)
      - 2. Gabriella belt / SIJ belt, Spanks
      - 3. Running shoes and orthotics
      - 4. Stress incontinence

5. Red flags: vaginal bleeding or fluid leaking, regular contractions, dyspnea before exercise, dizziness, headache, chest pain, muscle weakness, calf pain or swelling
    - ii. Considerations during treatment
      1. Positioning for manual therapy
      2. Running mechanics
- VII. Postpartum runner
- a. Unique considerations of postpartum runner
    - i. Breastfeeding
    - ii. Bone density
    - iii. Lack of sleep
    - iv. Diastasis recti
    - v. Pelvic floor dysfunction
    - vi. Nutrition
    - vii. Energy availability
    - viii. Running with jogging stroller
  - b. Benefits of running postpartum
    - i. Less incidence of postpartum depression
    - ii. Improved self image/body image
    - iii. Weight management
    - iv. Socialization
    - v. CV health
  - c. Physiological/Biomechanical changes
    - i. Posture
    - ii. Increased lumbar lordosis
    - iii. Width of hips
    - iv. Changes in feet/arch
  - d. Common Musculoskeletal Injuries
    - i. Stress fracture
    - ii. Lumbar radiculopathy
    - iii. Low back pain
    - iv. SIJ pain
    - v. Hip labral tears
    - vi. Pelvic floor dysfunction
  - e. PT Management
    - i. Education
      1. New Runners
      2. Shoes/Bra
      3. Postpartum depression
      4. Diastasis
      5. Pelvic floor dysfunction
      6. Gait retraining
    - ii. Exercise
      1. Core stability
      2. Breathing
      3. Posture
      4. Manual therapy
      5. Myofascial work

**Special Populations in the Runner: The Biomechanically Challenged Runner**  
**Dr. Josh Barabas, PT, DPT**  
**Board Certified in Orthopedic Physical Therapy**

- VIII. "A runner for whom idealized running is restricted due to co-morbidity."
  - a. Anatomical restriction
    - i. Poor AROM/Strength through ROM
    - ii. Limited in ability to control movement through necessary range.
    - iii. Decreased isolated or composite strength
  - b. Modified nervous system
    - i. Peripheral Nerve Injury
    - ii. Central Nerve Injury
  - c. Obesity (body composition for given body mass)
    - i. Increased loads at knee/increased quadriceps demand
    - ii. Decreased running economy
- IX. How to identify a Biomechanically Challenged Runner.
  - a. Subjective/History
  - b. Functional Movement Screen(s)
    - i. Body-weight Squat/Deep Squat
    - ii. Active Straight-Leg Raise
  - c. Gait Analysis
    - i. Frontal Plane
    - ii. Sagittal Plane
    - iii. Cadence/Vertical Excursion
- X. Treating the Biomechanically Challenged Runner
  - a. Address primary mobility restriction
    - i. Joint Mobilization
    - ii. Nerve Mobilization
    - iii. Soft Tissue Mobilization/Stretch
  - b. Train Movement into Idealized Range
    - i. Neuromuscular Re-Education
    - ii. Stabilization
  - c. Strength Training
  - d. Composite Multi-Joint Lifts
    - i. Squats
    - ii. Deadlifts
    - iii. Presses
    - iv. Pull(s)
  - e. Accessory Lifts
    - i. Posterior Chain
    - ii. SL Movements
    - iii. Core
  - f. Long-term tissue change
    - i. 3-4 sets of 6-8 reps, >70-80% 1 RM
    - ii. Can take 6-12 weeks for significant tissue change
- XI. Gait Training
  - a. Identify "problem segments" of Total Running Movement
    - i. Segmental Practice
    - ii. Drills
  - b. Running practice with cues
    - i. Tactile cues

- ii. Auditory cues
  - iii. Visual cues
  - iv. Feedback
- XII. Unique Considerations for the Biomechanically Challenged Runner
  - a. Modification of Return-to-Run timeline
    - i. Allow for management of primary deficit
    - ii. Tissue Turn-over
    - iii. Development of fundamental Stability
  - b. Modification of Running Performance
    - i. Speed
    - ii. Distance
    - iii. Terrain
    - iv. Frequency
  - c. Modification of Patient Expectations
    - i. Change to meet capabilities
- XIII. Case Presentation

#### Key Points

- Identify/Address Primary/General Functional Limitations/Deficits
- Modify Dose and Expectation
- Modify Rehabilitation/Recovery Timeline

### **Special Populations in the Runner: The Aging Runner**

**Dr. Eric Greenberg, PT, DPT**

**Board Certified in Sports Physical Therapy**

- XIV. Introduction
  - a. Statistics
  - b. General benefits of exercise on aging
  - c. Pre-participation screens
    - i. Overall health
    - ii. Vision
    - iii. Comorbidities such as DM and HTN
    - iv. ECG testing in those over 40 years old with at least 1 cardiac risk factor
- XV. Injury Patterns in the Aging Runner
  - a. Rates compared to younger runners
    - i. "Healthy runner effect"
  - b. Risk Factors
  - c. Differences in Injury patterns
    - i. Location and types of injuries
      - 1. Calf, and foot
      - 2. Hamstring
      - 3. Decreased incidence in knee injuries compared to younger runners
    - ii. OA and total joint arthroplasty
- XVI. Running Biomechanical changes and aging
  - a. Changes in Running Performance
    - i. Slower self-selected running speeds
  - b. Biomechanical Alterations
    - i. Shorter stride length

- ii. Decreased ability to absorb shock
          - 1. Higher impact peaks forces and initial loading rates
        - iii. Decreased propulsion
        - iv. Smaller knee joint excursions
- XVII. Physiologic Changes associated with advanced aging
- a. Cardiovascular
    - i. Decreased VO<sub>2</sub> max
    - ii. Decreased maximal HR
    - iii. Increased arterial stiffness
  - b. Pulmonary
    - i. Loss of lung elastic recoil and stiffer chest wall
    - ii. Increased ventilation/perfusion mismatch
  - c. Musculoskeletal
    - i. Skeletal muscle
      - 1. Sarcopenia (Type I and II)
      - 2. Decreased motor unit activation
      - 3. Loss of flexibility
      - 4. Decreased angular velocities
    - ii. Bone
      - 1. Decline in bone mineral density
      - 2. Impact activities and running can decrease bone loss (Vopat, 2014)
    - iii. Tendon and Ligament
      - 1. Decreased tendon and ligament compliance
      - 2. Physical activity may preserve size and mechanical properties of tendon
    - iv. Cartilage
      - 1. Degradation with inactivity
      - 2. Slower rate of articular cartilage volume loss with regular vigorous activity
      - 3. Effects of running on OA and following total joint replacement
  - d. Fluid replacement and Temperature regulation
    - i. Heat stress results in increased core temperature, HR, fluid loss and lower sweating rates
    - ii. Cold exposure is associated with blunted vasoconstrictor response and greater loss of heat
- XVIII. Exercise prescription considerations for the aging runner
- a. Resistance Training
  - b. Endurance Training
  - c. Flexibility and Balance
  - d. Gait retraining and shoe wear considerations

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### **Aging Runner**

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