Periodization for Rehabilitation Athletes:
Lane Bailey, PhD, PT, DPT

10-35 min (Bailey): Key concepts Periodization

Goals of Presentation- Discuss the:
1. Gain knowledge regarding active rest and recovery within a session (rehabilitation) ± training, between sessions, and throughout the season & year for healthy and injured athletes
2. Discuss recovery strategies that have application to Rehabilitation Professionals working with our patients

History of Periodization Principles in Rehabilitation (Knight 1979)
- Delorme & Progressive Resistive Exercise (PRE)
- Daily adjusted progressive resistive exercise (DAPRE) system
- Current Status and Future Directions

Integrating Strength & Conditioning into Physical Therapy (Lorenz 2010)
- Resistance Training Principles
- Tissue Loading Responses
- Role of Periodization in Rehabilitation

Rehabilitation Assessment and Programming Selection (Reiman 2011)
- Injured Athlete Assessment & Systems Analysis
- Phases of Recovery Specific to Rehabilitation based on S&C Principles
- Exercise Selection, Order & Frequency
- Overcoming Equipment Availability Challenges
- Rest and Recovery Principles to Rehabilitation

Fundamentals of Periodization in Sports Physical Therapy (Lorenz 2015)
- Linear vs Non-Linear Training Models
- Block Periodization
- Strength and Conditioning Programming
- Strategies for Strength Programming
- Strategies for Power Development


Todd JS, Shurley JP, Todd TC. Thomas L. DeLorme and the science of progressive


Muscular and Joint Recovery for LE Pathology
- Craig Garrison, PhD, PT, SCS, ATC

Goals of Presentation – Discuss the:
- Lower extremity tissue adaptation to physical loading
- Operating within the “Envelope of Function”
- Proposal for unloading the lower extremity to allow for optimal function
- Clinical application for lower extremity recovery

Physical Stress to the Lower Extremity (Mueller PT ’02; Comfort Athl Train 2015)
- Lower extremity physical stress during exercise
- Tissue adaptation in response to loading
- Lower extremity physical stress as a composite value
- Effects of poor dynamic lower extremity limb alignment

Lower Extremity Envelope of Function (Dye Clin Ortho Rel Res ’96; Chazaud Immun Cell Biol ‘15)
- Theoretical Model
- Excessive joint loading
- Tissue regeneration through inflammation
- Lower extremity joint loading to promote tissue homeostasis

Principles of Unloading and Recovery in the Lower Extremity (Lorenz Sports Health ‘10; Comfort Athl Train ‘15)
- Dose-response as part of the rehabilitation process
- SAID principle
- Restoration of movement efficiency
- Appropriate loading progressions
- The role of recovery in rehabilitation

The Science Behind Clinical Strategies for Lower Extremity Recovery (Macdonald ‘14; Cheatham ‘15; Herbert ‘11; Bleakley ‘12; Costello ‘15)
- Patient education on the importance of recovery
- Foam rolling
- Stretching
- Cryotherapy
- Muscle strengthening
Clinical Decision-Making for Recovery in Lower Extremity Pathology (Kentta Sports Med '98)

- Assessing lower extremity recovery – TQR scale
- Recovery in the acute phase of rehabilitation of lower extremity pathology – when is my athlete ready to begin loading?
- Recovery in progressive loading - return to jogging following lower extremity pathology
- Recovery in the return to sport phase – multi-speed and multi-planar loading
- Reduction of risk for secondary injury

References:


Shoulder Recovery Issues for UE Pathology in Overhead Athletes

I. Range of Motion Recovery in the Overhead Athlete

a. Glenohumeral Joint ROM Descriptive Data
   i. Wilk et al, (2011)
   ii. Shanley et al, (2011)

b. Acute Changes in Range of Motion with Overhead Activity
   i. Reinold et al, (2008) (decreases in IR and total rotation ROM after acute throwing bout)
   ii. Martin et al, (2015) (decreases in IR and total rotation ROM during repeated tennis match performance (Figure 1)
   iii. Kilbler et al, (2012) – recovery issues in shoulder ROM after throwing and tennis serving (Figure 2)

c. Evidence Based Recovery Strategies to Optimize Glenohumeral Joint ROM in Overhead Athletes
   i. Immediate effects of common stretching techniques on shoulder ROM
   ii. Non-Immediate effects (training studies) of stretching
   iii. IASTM (Bailey et al, 2015)
      1. Improvements in IR (7 deg), total rotation (8 deg) and HADD (7 deg) following IASTM with stretching in baseball pitchers
II. Muscular Strength Recovery in the Overhead Athlete

a. Isokinetic endurance studies of the rotator cuff
   i. Ellenbecker & Roetert (1999) Decreased ER isokinetic endurance ratios in the ER as compared to the IR in elite tennis players
   ii. Beach et al, (1992)

b. Additional research on muscular recovery/strengthening of the rotator cuff in overhead athletes
   i. Moore et al, 2013 (improved muscular endurance in the posterior shoulder following a training program in baseball players)
   iii. Carter et al, (2007) Improved rotator cuff and throwing velocity in collegiate baseball pitches after plyometric and isotonic strengthening of the rotator cuff
   iv. Ellenbecker & Roetert (2002) no change in rotator cuff strength over a collegiate season of tennis in female NCAA elite tennis players
   v. Joshi et al, 2011 (effects of ER fatigue on scapular function in overhead athletes) (interdependence of scapular and glenohumeral joint force couples)

III. Additional research on muscular recovery in overhead athletes
     i. Improvements in blood lactate with EMS compared to passive and active recovery
     ii. No change among the three recovery strategies with respect to shoulder ROM
  b. Tsuruike & Ellenbecker (2013) Effects of compression garment application on rotator cuff strength. (improved maintenance of ER MVIC level with feedback from compression garment.
  c. Hydration effects

IV. Current Recommendations:
  a. ROM Maintenance
     i. Static v Dynamic Warm-up (Knudson et al 2004) tennis
        Williams et al (2013) baseball
     ii. Additional Methods (contract relax) (IASTM)
  b. Strength Maintenance
     i. Rotator cuff and scapular strengthening
     ii. ER/IR strength measurement (guideline) (Byram et al 2010)
Figure 1. Glenohumeral Internal Rotation Range of Motion Values During a Competitive Tennis Match (T0) Pre-Match, with significant decreases measured in 30 minute intervals during the match. (Martin et al, 2015)

Figure 2. Glenohumeral Internal Rotation across time with the explained variance of GIR in professional women’s tennis players in comparison to professional baseball players.

TP1 = baseline before match play, TP2 = immediately after match play, TP3 = 24-hours after baseline
References:


Recovery Considerations for Youth Athletes
-Ellen Shanley PhD, PT, OCS

Goals of Presentation- Discuss the:
- Unique challenges of the immature athlete
- Signs and symptoms of fatigue & incomplete recovery throughout the phases of rehabilitation
- Transitional strategies for recovery from rehabilitation to training & performance state
- Suggest monitoring and practical techniques to guide recovery in youth athletes

Recovery & Injury in Youth Athletes (Brink BJSM 2010)
- Physical stress ➔ injuries & illnesses
- Psychosocial stress ➔ illness

Recovery Strategies in Healthy Athletes
- Rest
  - Sleep Hygiene
  - Nutritional Support
  - Proper Hydration
  - Compression
  - Cold Immersion

What differentiates youth from mature athletes? (DiFiori 2014)
- Youth athletes are not simply mini adults
- Unique Considerations
  - Growth
  - Development
  - Readiness

Specific considerations for Youth Athletes (Valovich McLeod ‘11; DiFiori 2014)
- Bone metabolism & development
- Muscle mass & extensibility
- Regenerative capacity*
- Cognitive function
- Movement competency
- Available support

Principles of Recovery- Differences in Performance Training versus Rehabilitation
- SAID principle vs Adaptability
- Management and manipulation of Stress
- Differential Goals

Physical Stress Theory(PST)-Mueller & Maluf (PT ’02)
- Healthy vs Injured State

Clinical Decision Making with Youth Athletes (Thein Brody ’11, Valovich McLeod ‘11; DiFiori 2014)
- Assessing current status- Patient and/or Parent understanding
- Assessing baseline stability and irritability
Assessing Contextual factors

Role of Brain in Injury Recovery - youth/adolescent athletes
- Poor learned movement patterns - Risk factors in sports (ACL injury, Throwing issues)
- Youth athletes have incompletely developed movement systems
- Injury is a threat to the system promoting SNS activation > PNS
  - Revert to learned movement patterns
  - Rotational movement control is inhibited

Education as a tool to reduce stress and promote athlete buy in (Christakou ’09)
- Protection-Motivation model

Loading of Injured Tissues (Thein Brody ’11)
- Principles of Dosing-
  - PST
  - Specificity
  - Optimal Loading (RPE x Load x Duration)
- Dependent on-
  - Symptoms
  - Directionality and parameters of load
  - Ability to monitor

Recovery Strategies- (Tipton ’15; Milewski ’14; Laux ’15; Mah’11)
- Rest- Sleep Hygiene
- Nutrition
- Proper Hydration
- Modalities

Special Considerations
- Previous Injury
- Concussion

Strategies to monitor progression (Gabbet ’10;)
- Pain rules
- Subjective response to intervention
- Monitor Activity & physiologic response
- Degradation of movement (esp. triplanar movement)
- Pre-post treatment (motion)

Bibliography


