Wading through the Athletic Recovery Landscape with so many Gadgets, Gizmos, and Wearables - Tips from an Athletic Trainer Perspective

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The Athlete Recovery Landscape Can be Challenging

Factors Affecting Athletic Performance

- Traditionally athletes have spent a much greater proportion of their time recovering than in training, but more attention has been focused on training and less on recovery!

Historical Look @ Athlete Recovery

Load-Overload-Recovery

- Load – a stimulus experienced and responded to by an individual before, during, or after participation.
- Load creates a demand or stress both physiologically and psychologically
- Safely managed will result in improved athletic capacity and performance, as well as injury/illness risk reduction!
External vs Internal Loads

<table>
<thead>
<tr>
<th>Load Type</th>
<th>Description</th>
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<tbody>
<tr>
<td>External Load</td>
<td>Causes include physical, physiological, and psychological demands.</td>
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<tr>
<td>Internal Load</td>
<td>Results in anatomical, physiological, and/or psychosocial conditions</td>
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Adaptation to Loading

Model of Adaptation to Load

Effect of Training Overload

Medical Issues Associated with Overtraining

- Overtraining is often characterized by performance plateau not improved with the usual rest & recovery cycle.
- Systems that can be affected:
  - Cardiovascular – Respiratory – Hormonal - Immunity
  - Musculoskeletal
  - Bone Stress Injury (BSI)
  - Physical Injury
  - Muscle Injury
  - Tendinopathies
  - Joint Injury
  - Psychosocial & Mental Health

Role of the Athletic Trainer

- Understand medical issues including sleep disturbances, immune dysfunction, and overtraining.
- Be involved in the management of medical illnesses/musculoskeletal injuries resulting from overtraining.
- Understand sport- and age-specific implications of overload injuries.
- Understand the psychological components of overload and recovery.
- Collaborate with "athletic care network" (coaches, SA's, S&C coaches, team physician, nutritionists, etc…) to manage medical manifestations of overload/overtraining.
- Work with "athletic care network" to facilitate adjustments to training and competition loads, especially when internal loads are unfavorable.

Load-Overload-Recovery

- Recovery – is the period and process during which the body responds to load.
  - Goal = optimize physical, physiological, and psychological adaptation to internal and external loads.
  - From an athletic trainers perspective — aid in reducing fatigue and enhancing performance!
  - Recovery of muscle function is chiefly a matter of reversing the major cause of fatigue/damage.
Categories of Recovery

- **Immediate Recovery** – is the recovery which occurs between rapid, time-proximal finite efforts
  - Ex. Race walker has 1 leg in immediate recovery between strides

- **Short-Term Recovery** – recovery between interval sprints or weight training sets
  - The duration of this recovery period has been evaluated and various work to rest ratios suggested

- **Training Recovery** – the recovery between successive work outs or competitions
  - Holds most promise for enhancing athletic performance and likely the category ATC’s would want to be involved with!

Training Recovery Hypotheticals

![Graph showing training recovery](image)

- **Training Recovery Hypotheticals**

Measurement and Monitoring

- Due to the multifactorial nature of recovery, the assessment of the recovery-fatigue continuum should be relative to the demands of the sport
- **Laboratory Measurements**
- **Questionnaires**
- **Measurement Systems**
- **Wearables Technologies**

Limitations in Measurement Techniques

- Limited large-scale, independent, longitudinal data
- The need to place devices at specific anatomical locations
- Movement artifact
- Frequency of data sampling
- Monitoring of a few selected variables (instead of a suite)
- Lack of simultaneous measurement of environmental factors
- Inconsistencies and accuracy of algorithms that collect/analyze/distribute data
- Variability of data interpretation by coaches, scientists, medical personnel, athletes
- Inability to transmit data indoors, underwater, built-up areas, and interference from other physiological responses

Laboratory Measurements

- **Blood Tests**
- **Urinalysis**

Questionnaires

- Nutritional
  - 1. During the past month, how many times did the number of hours you slept in bed
  - 2. How many times did you have trouble sleeping
  - 3. How many times did you wake up in the middle of the night
  - 4. How many times did you wake up during the night
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- Psychological – POMS – RESTQ – Sport
- Pittsburgh Sleep Quality Index

- Perceived Exertion – RPE

- Wellness Scales
  - Muscle soreness scale

- Nutritional
  - 7-day dietary recall log
Measurement Instrumentation

• Force Plates
• VO2 Max
• Imaging (US – MRI)
• Isokinetic Testing
• Assessment of Velocity & Power
• Video Analysis
• Internal Measurement Systems

Wearable Technologies

• Global Positioning Systems (GPS)
• Heart Rate Monitors
• Heart Rate Variability Devices
• Velocity/Acceleration Measurements
• Motion Capture Systems
• Sleep Monitors

Role of the Athletic Trainer

• There are components of load, overload, and recovery that are measurable
• Further research is needed to determine the utility of tools and technology in improving performance and reduce risk for injury/illness in sport
• Become familiar with categories of measurement techniques
• Understand the limitations of the data obtained from these measurement processes and the interpretation of these data
• Collaborate with “athletic care network” to effectively monitor athletes using technology
• Collaborate with “athletic care network” to enable acute adjustments to the training and competitive loads for athletes if internal overload factors are unfavorable.

Intervention Strategies for Enhancing Recovery

• Training Tactics:
  – Customized periodization program with monitoring
  – Limiting weekly hours of training & mileage
  – Limiting the # of games and tournaments allowing adequate time for recovery between
  – Implementing NM training programs such as the FIFA 11

• Active vs. Passive Recovery Techniques:
  – Role of active recovery in reducing lactate concentrations has traditionally been the rationale, however research is incomplete!
  – Passive techniques range from application of external methods (massage) to implementing a period of inactivity or rest

• Nutritional Considerations:
  – Free radical physiology & reactive oxygen species has lead to an interest in antioxidant nutrient therapy during recovery from exercise and competition
  – Poor diets may contribute to early onset of fatigue
  – Iron deficiencies present in endurance athletes
  – Importance of hydration consumption during recovery period
    • Replenish electrolytes
    • Water and other sport beverages are recommended
Intervention Strategies for Enhancing Recovery

**Mental Health Considerations:**
- The post-performance phase involves responses to external consequences and internal processes associated with performance.
- 3 pathways:
  - Sustaining involvement
  - Re-engaging after a brief dysfunctional period
  - Disengaging from the activity

**Sleep Considerations:**
- Athletes generally sleep less than non-athletes and often have difficulty sleeping.
- Athletes need to understand how sleep affects performance/recovery, factors affecting sleep quality, and develop optimal sleep habits.

**Whole Body Cryotherapy:**
- Traditionally involved cold or contrast water immersion techniques.
- Contemporary methods involve WBC.
- Some evidence with recovery from sprint exercise.
- Improvements in subjective recovery & muscle soreness, but little benefit toward functional recovery!

**Role of Sleep in Performance and Recovery of Athletes:**
A REVIEW ARTICLE

Babad E. VENTER
Department of Sport Science, Stellenbosch University, Stellenbosch, Republic of South Africa

**The Evolution of RICE**

What if RICE is wrong?
- Newer evidence is suggesting that both ICE and REST may actually delay recovery! Does this turn an ATC’s life into peril?
The Anti-ICE Age via ACTIVE recovery

- Active recovery with non-fatiguing muscle activation, flushing out waste, and delivering nourishment to the target area

Intervention Strategies for Enhancing Recovery

- **Massage Therapy:**
  - Gained popularity because:
    - Feels good
    - Not banned by sport governing bodies
    - Has no known side effects
  - Effects of massage still questionable (systematic and mechanical benefits remain unsubstantiated)

Intervention Strategies for Enhancing Recovery

- **Analgesics:**
  - NSAIDS used to relieve signs associated with training inflammation
  - Effects on prostaglandin production
  - Useful in speeding training recovery of muscle function (prophylactic use better than therapeutic use)
  - Reduced muscle soreness
  - Reduced CK activity

Intervention Strategies for Enhancing Recovery

- **Stretching/Flexibility Exercises:**
  - One of the most commonly used recovery strategies, yet least substantiated!
  - Reports of benefits and claims have been mixed
  - No detrimental effects on performance and recovery noted with stretching

Intervention Strategies for Enhancing Recovery

- **Compression Garments:**
  - Compression clothing has been used medically in the treatment of lymphatic and circulatory conditions
  - Graded compression to the limbs from proximal to distal
  - External pressure may reduce intramuscular space available for swelling and promote a stable alignment of muscle fibers
  - Reduction in DOMS in distance runners
  - Small benefits and no indications of impediments to recovery!

Intervention Strategies for Enhancing Recovery

- **Compression Modalities:**
  - Mechanical intermittent pneumatic compression
  - Aids in lymphatic flow and drainage and venous return
Intervention Strategies for Enhancing Recovery

- **Micro-mobile Compression Device:**
  
  [Image of a compression device]

  https://www.youtube.com/watch?v=vADfbmsBsTU

- **Hyperbaric Oxygen Therapy:**
  - "Hyperbaric oxygen therapy (HBOT) saturates the organs with 100% pure oxygen to help improve recovery". In theory "This helps alleviate pain and minimize training stresses by delivering restorative adenosine triphosphate (ATP) to muscles. This flushes lactic acid from muscles in order to accelerate recovery. Ultimately, more oxygen-rich blood boosts healing”

  [Image of a hyperbaric oxygen chamber]

- **Infrared Saunas:**
  - Aids the neuromuscular system in recovery from maximal endurance performance.

  [Image of an infrared sauna]

- **Passive Treatment Modalities:**
  - Physical Modalities (electricity, thermal agents, electromagnetic agents)
  - Mechanical Agents (hydrotherapy)
  - Traction
  - Taping & Bracing

  [Images of various treatment modalities]

Concluding Thoughts

- Athletic trainers need to take an active role in the athlete recovery process --- the “waters are murky” but trust your instincts!
- Understanding the benefits of a comprehensive, multifaceted approach to addressing the musculoskeletal, medical, and psychological issues in recovery is paramount!
- Collaboration with a comprehensive “athlete care network” is vital
- Plethora of recover strategies can be cumbersome and “mind-boggling” so clinicians need to seek out the best available evidence to support their use
Thank You

FEAR THE BIRD