Evidence Based Recovery Strategies to Prevent Fatigue and Over-Reaching

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I. Presentation Overview:
   a. Fatigue vs. Overtraining
      i. Influencing factors and mechanisms
      ii. Effects on performance and injury
   b. Evidence based solutions for combating fatigue & over-training
      i. 3R’s (Re-Fuel, Rest, & Restoring Movement)
   c. Implementing an integrated and systematic recovery program

II. Effects of Fatigue
   a. Sport & athletic performance depends upon ability to produce and sustain high level of performance throughout competition and training
   b. Fatigue can deteriorate physical, technical, decision-making, and psychological skills and lead to long-term performance deficits if not managed appropriately
      i. Magnitude and duration of performance deficits dependent upon management

III. Fatigue and Performance
   a. Muscle Performance (strength, power, contraction velocity)
   b. Exercise Performance (speed, power, balance, stability, movement)
   c. Competition/training Performance (work rate during competition/training, decision making, anticipation)

IV. Mechanisms of Fatigue
   a. Peripheral / local - (muscle biochemistry)
   b. Central - (neural drive to the muscle: voluntary & involuntary)

V. Strong correlation between training load & injury rates

VI. Over-Training & Over-Reaching
   a. Disturbed stress-regeneration balance
      i. Stress: physical and/or mental

VII. Over-training is a misnomer
   a. With appropriate recovery practices/strategies over-training can be prevented

VIII. Optimum Recovery
   a. Re-Fuel Strategies
      i. Meals
         1. Eat breakfast, regularity/consistency, balanced
ii. Hydration
   1. Water (3-4 L / day), electrolytes (sodium, potassium, calcium)

iii. Pre-Training
   1. Higher carbohydrate, moderate protein, lower in fat

iv. Post-Training
   1. Timing (within 30 minutes) & water replacement

b. Improper Re-Fuel Consequences
   i. Inadequate energy intake relative to expenditure will compromise performance and result in negative catabolic response
      1. Loss of lean tissue mass (strength and endurance)
      2. Compromised immune, endocrine and musculoskeletal function
   ii. Long-term improper re-fueling results in poor nutrient uptake, especially micro-nutrients
      1. May result in metabolic dysfunctions and lowered resting metabolic rate
   iii. Have a nutritional consultant to tailor a re-fueling plan according to the individual’s needs

c. Rest Strategies
   i. 7-8 hours of sleep (minimum) – sleep extension has performance benefits
   ii. 60-minutes of relaxation per day
   iii. Minimize psycho-social stress

d. Inadequate Rest Consequences
   i. Physical performance (weight training, cardiorespiratory functioning)
   ii. Weight loss (% fat loss vs. % lean muscle mass)

e. Restore Movement Strategies
   i. Muscle balance is key
      1. Identify movement impairments & determine underlying causes
         a. Single leg squat, overhead squat, landing error scoring system
         2. Corrective exercise (3x/wk) – Mobility, Stability, Neuromuscular Control
   ii. Dynamic warm up & cool down
   iii. Monitor training load
      1. (RPE x Training/Competition Duration (min))

IX. Recovery - Supplemental Behaviors
   a. Implemented in addition to best practices (not in place of) – there’s no “magic bullet”
      i. The application of the following recommendations may be dependent on:
         1. Time of season/schedule
         2. Training load
         3. Injury status
         4. Practicality
   b. Supplemental recovery behaviors application:
i. Reduction of symptoms associated with exercise-induced muscle damage
   1. Tissue disruption & catabolism
   2. Delayed onset muscle soreness (DOMS)
   3. Decreased muscle force output between bouts of activity
ii. Improved fatigue resistance during strenuous activity
iii. Reduction in immunosuppression post strenuous activity
c. Nutrition-based
   i. Antioxidants – Vitamin C, Vitamin E, Coenzyme Q10
   ii. Phytochemicals – Tart Cherry Juice
   iii. Amino Acids – L-Carnitine, Leucine/HMB, Beta-Alanine
   iv. Fatty Acids – Omega 3 (EPA & DHA)
d. Modality-based
   i. Whole body vibration
   ii. Massage
   iii. Compression garments
   iv. Cryotherapy

X. Planned recovery requires an integrated and systematic approach
   a. Educate your clients & athletes – consistent messaging
   b. Provide access / remove barriers to best practices
   c. Monitor movement efficiency, training loads, recovery behaviors

XI. Five Take-Away Points
   a. Fatigue is a physiologic stimulus for anabolic response if recovery is optimized
   b. Foundation for optimum recovery = 3R’s
      i. Re-fuel, Rest, Restore Movement Efficiency
   c. Supplemental recovery behavior (nutrition & modalities) must be combined 3R’s
   d. Monitoring of training load and recovery behaviors is necessary to direct behavior
   e. Recovery behaviors are best applied in a systematic & integrated approach

XII. Selected References