Recovery-Adaptation

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What to do today?

• What is recovery?
  – Return what was lost
  – “...the compensation of deficit states of an organism (e.g., fatigue or decrease in performance) and, according to the homeostatic principle, a reestablishment of the initial state.”

• Not Enough!!!!!
• RECOVERY-ADAPTATION
  – Models for Better Understanding and Implementation
The Model

• Three Parts
  – Predisposing
  – Enabling
  – Reinforcing
<table>
<thead>
<tr>
<th>Predisposing</th>
<th>Enabling</th>
<th>Reinforcing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preconditions for RA</td>
<td>Local RA</td>
<td>Systemic RA</td>
</tr>
<tr>
<td>Periodization &amp; Planning</td>
<td>Peripheral</td>
<td>Central</td>
</tr>
<tr>
<td>Planned REST</td>
<td>Short-term &gt; 5 min, &lt; ≈ 24 h</td>
<td>Long-term &gt; ≈ 24 h</td>
</tr>
<tr>
<td>Health</td>
<td>Fatigue Management</td>
<td>Fatigue Management</td>
</tr>
<tr>
<td>Complete Nutrition</td>
<td>Implement REST</td>
<td>Manage Rest (PRN)</td>
</tr>
<tr>
<td>High Fitness</td>
<td>Manage Inflammation</td>
<td>Manage Inflammation</td>
</tr>
<tr>
<td>Vigilant Monitoring</td>
<td>Pain Reduction</td>
<td>Pain Reduction and Management</td>
</tr>
<tr>
<td>Mental Training - Resilience</td>
<td>Enhance Circulation</td>
<td>Enhance Circulation</td>
</tr>
<tr>
<td>Absence of Pain</td>
<td>Activate Immunity/Endocrine</td>
<td>Enhance Immunity/Endocrine</td>
</tr>
<tr>
<td>Ensure Comfort</td>
<td>Naps (≤ 20min)</td>
<td>Enhance/Manage Sleep</td>
</tr>
<tr>
<td>Ensure “Decompression”</td>
<td>Nutritional Adjuncts/Timing</td>
<td>Continue Long-term Nutrition</td>
</tr>
<tr>
<td></td>
<td>“Decompression”</td>
<td>Continue Long-term Psych</td>
</tr>
<tr>
<td>Practice Psych Resilience</td>
<td>Enhance Social Support</td>
<td>Enhance Social Support</td>
</tr>
<tr>
<td>Compassionate Touching</td>
<td>Enhance Comfort (PRN)</td>
<td>Enhance Comfort (PRN)</td>
</tr>
<tr>
<td>Enhance Comfort (PRN)</td>
<td>Compassionate Touching (PRN)</td>
<td>Accumulate Fitness</td>
</tr>
<tr>
<td></td>
<td>Assess All (PRN)</td>
<td></td>
</tr>
</tbody>
</table>
Predisposing
Preconditions for Recovery-Adaptation

– Periodization
  • Intelligent planning of loads
  • Planned rest
– Adequate specific fitness
– Adequate nutrition
  • Sufficient calories
  • Sufficient macro/micro nutrients
– Positive Health, absence of disease, allergy
– Mentally resilient
– Intelligent
– Permeates all aspects of RA
What RA is NOT?

• Not
  – Substitute for smart training
  – Substitute for healthy living
  – Substitute for conditioning
  – Substitute for sound coaching practices
  – Magic

• Nothing in RA is powerful enough to overcome
  – Stupid Coaching
  – Bad Planning
  – No Talent
Why do coaches resist planning?

- Everything is in their heads.
  - Experience replaces planning.
  - Plans never last.
  - Everything/one is individual.
  - Time consuming
  - Always done it that way

- U.S. Army
  - No plan withstands contact with the enemy.
    - The real world is too complex for planning
    - Yet, they plan everything
      - contingencies, rehearse, assess, plan, repeat.

- IDF
  - Plans are the platform for change.
    - Here’s the trick.
    - Periodization/Planning allow flexibility in training.
### Senior Competitions

Possibility of 23 competitions in 39 microcycles

### Recovery Modalities

Change ≈ 3 wk  
Remove <>
Enabling
Enabling

- Short-term recovery
  - 0 to approximately 24 hours
- Direct modalities
- Peripheral fatigue and recovery
- Optimization of inflammatory cascade
- REST
  - Short-term sleep – one evening
  - Naps
- Nutrition
  - Emphasis on nutrient timing
    - Carbohydrates and extra protein
    - Adequate hydration
- Psychology
  - Reduction of threats and uncertainty
  - Increase social support
- Peripheral (emphasis on limbs and body areas)
  - Enhanced Circulation
    - Blood and Lymphatics
      - Thermal
        » Heat
        » Cold
      - Compression
      - Electrical stimulation
  - Active vs passive recovery activities
    - Low intensity
  - Touch (massage and vibration)
    - Compassionate touching
      - C-Tactile neurons
    - Warmth
    - Issue manipulation
  - Comfort
Track Cycling

NOT bilaterally Symmetrical!!!
Peripheral Fatigue
Peripheral Modalities
Selecting Strategies

- Rest
- Nutrition - Timing
  - Drinks, foods, supplements.
- Enhance Circulation
- Temperature
  - Heat, comfort, selective application of cold
- Compression
- Sleep
- Pain reduction
- Hydrotherapy
## Recovery-Adaptation Plan (Female WL)

<table>
<thead>
<tr>
<th>Day</th>
<th>M</th>
<th>Tu</th>
<th>W</th>
<th>Th</th>
<th>Fr</th>
<th>Sa</th>
<th>Su</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overall Load</td>
<td>Med</td>
<td>High</td>
<td>Low</td>
<td>Med</td>
<td>High</td>
<td>Med</td>
</tr>
<tr>
<td></td>
<td>AM Load</td>
<td>Med</td>
<td>High</td>
<td>Low</td>
<td>Med</td>
<td>High</td>
<td>Med</td>
</tr>
<tr>
<td></td>
<td>AM Recovery</td>
<td>Nutrition/20 min nap</td>
<td>Nutrition/Cold Plunge 20 min nap</td>
<td>Nutrition/60 min massage</td>
<td>Nutrition/Cold Plunge 20 min nap</td>
<td>Nutrition/30 min massage</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>PM Load</td>
<td>Low</td>
<td>High</td>
<td>Low/Med</td>
<td>Off</td>
<td>High</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>PM Recovery</td>
<td>Nutrition/HC Contrast End Hot</td>
<td>Nutrition/Hot 30 min massage</td>
<td>Nutrition/HC Contrast End Hot</td>
<td>Nutrition/Recreate</td>
<td>Nutrition</td>
<td>Recreate</td>
</tr>
<tr>
<td></td>
<td>Comment</td>
<td>Massage only if &gt;1 hr post practice else wait 24 hr</td>
<td>Possible massage from Tu</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NSCA National Strength and Conditioning Association**

**Coaches Conference**

everyone stronger NSCA.com
Reinforcement

NEEDS MORE
JIGGAWATTS
Reinforcing
Ensuring Adaptation

- Long-term (>24 hours)
- Central – Fatigue => Central Recovery
- Adaptation – increased fitness, enhanced immunity
- Psychology
  - Mental training
  - Resilience
  - Social support
- REST
- Immune response
- Regular sleep
- Endocrine
- Nutrition
- Pain management
Two Lessons:
Recovery-Adaptation is Difficult to Study
Athletes learn and apply RA modalities on their own?
(And no one acknowledges contamination)

- Athletes naturally choose “modalities” to increase their comfort and confidence.
- The athletes “contaminate” their Recovery-Adaptation interventions.
- Usually involve some type of rest or low intensity activity.
- Presents a problem for studying recovery.
  - Athletes are contaminated by their personal recovery approaches.
What about process?

- Homeostasis
  - Set point regulation
  - Narrow range of change
  - Survival importance
  - Reactive
- Allostasis
  - Internal viability through bodily change
  - Feedforward
  - Predictive
- Allostatic State
  - Chronic over-activation, beyond set points
- Allostatic Overload
  - Pathological overstimulation
Boundary of Adaptability

Danger Zone when stress exceeds capacities

Allostatic Load

Psycho-physiological Capacities and States

Glucocorticoids

Catecholamines

Other Responses

Allostasis

“Normal” Currents and Variation of Stress Response

Homeostasis

O₂ tension, BP, pH, Temperature

Time

Applied Stress

NSCA NATIONAL STRENGTH AND CONDITIONING ASSOCIATION

everyonestronger NSCA.com
Summary - Strategies

• Determine local areas of stress
  – Direct modalities
  – Use one or more peripheral fatigue modalities for specific areas.
  – Incorporate planned rest, comfort, timed nutrition, relaxation, etc.
  – Mental Training
    • Relaxation training

• Incorporate long-term life-style habits
  – Indirect modalities
  – Continue Enabling Modalities
  – Nutrition
  – Mental training
    • Resilience
    • Confidence
    • Mental toughness
  – Sleep
  – Neuroendocrine support
Obesa contavit

Questions?
Later
Thanks

- Gatorade
  - Mike Gattone
  - Kimberly Stein
  - Amari Thomsen
- NSCA
- My mentors
- My students
Consider nutrient intake as an additional modality in the recovery toolbox

a. The definition of “modality” in this context, is a therapeutic method
b. In addition to various physical therapies, the ingestion of nutrients in the recovery period should be considered an additional modality
c. Appropriate nutrient intake and timing will not only help the athlete return to baseline but promote training adaptations
Determinants of Recovery Nutrition Strategies

- The goal of the athlete. For example: in-season performance, lean mass gain, overall weight loss
- Recovery time
- Type of sport/activity
- Environment
- Short term versus long term recovery needs
The “R’s” of Recovery

REFUEL
CARBOHYDRATE

REBUILD
PROTEIN

REHYDRATE
FLUID

REPLENISH
ELECTROLYTES (SODIUM)

Tart Cherry Juice?
Vitamin D?
Omega 3?
REFUEL
CARBOHYDRATE

“The restoration of muscle and liver glycogen is a fundamental goal of recovery between training sessions or competitive events, particularly when the athlete undertakes multiple workouts within a condensed time period.”

The recco: 1.0-1.2 g/kg when 8 hours or less before next session

The practical: This is a lot for some athletes, figure out how much they can tolerate

Focus on easily digested, quickly absorbed carbohydrate sources

REBUILD

PROTEIN

• 0.25 g/kg; ~20g is the right amount for most athletes
• Consuming more increases protein oxidation, not MPS
• Eat shortly after, then every 3-4 h to promote MPS
• Criteria for type of protein: quickly absorbed, complete protein rich in the amino acid leucine
• Leucine is both a building block for new muscle and signals the building process to begin (via activation of mTORC)
• Whey and milk protein meet all the criteria and based on the literature may be the best choices for recovery


REHYDRATE

FLUID

- Amount ideally should be based on body weight changes from pre-post
- If you don’t track body weight, monitor urine color (should be light yellow, like lemonade)
- Consume 20-24 oz of fluid per pound of body weight lost
- Don’t chug (increases urine production)
- Don’t forget eating fruits and vegetables, or other foods with high water content, contributes


REPLENISH
ELECTROLYTES (SODIUM)

• Replaces sweat losses
• Helps retain fluid as opposed to urine losses
• May consume with fluid (ie: sports drink) or from food

**Omega 3 fatty acids (~3.0 g/d) may:**
- Support increased MPS via mTORC1 activation
- Increase the activity of anti-inflammatory cells
- Decrease inflammatory cytokine expression
- Decrease DOMS

**Maintaining adequate Vitamin D status (≥75 mmol/L) may decrease:**
- Risk for acute illness
- Inflammation
- Risk of stress fracture
- Muscle pain/weakness

**Tart Cherry Juice may:**
- Improve recovery of muscle function
- Decrease inflammation & oxidative stress
- Decrease pain
- BUT antioxidants may blunt training adaptations, use depending on goal

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TIMING

- Eat as soon as possible following training/practice/competition
- Take into account other modalities. Research is lacking in this area, but it makes sense to:
  - consume recovery nutrients after practice but before therapies designed to improve blood flow, to help better deliver the nutrients to the muscle
  - OR, if you are using cold therapy, eat and give your body time to digest before slowing blood flow to the muscle
- Sleep is a critical modality
  - To get the most of recovery during sleep, ingest ~30-40 g of protein shortly before going to bed.
  - This practice should be employed even if the athlete has an evening practice or workout and consumed recovery foods

PRACTICAL CONSIDERATIONS

• Recovery nutrition should be considered one piece of the overall athletic recovery program

• Adjust nutrients based on the goals of the athlete. For example:
  • During tournaments when recovery time is short, focus on carbohydrate and hydration
  • During the offseason when looking to change body comp, focus on protein and lower carbohydrate
  • Antioxidant supplements should likely be avoided when training to promote adaptations

• Time intake with other modality use as it makes sense – make sure the goals of the modality and nutrient intake match