Utilizing Sport Science Technology to Improve Athletic Performance

Andy Bosak, Ph. D., EP-C, CSCS, *D
Liberty University
ATSPC Clinic: June 10-11, 2016
Definition of Recovery

- Defined as the ability to perform at or above a previously defined level after a maximal (ie. highly intense) bout of exercise or PA!

1. Immediate Recovery
   - Occurs between finite efforts (ie. running steps)

2. Short-term Recovery
   - Between interval repeats or weight training sets

3. Training Recovery
   - Between successive workouts or competitions
Assumed Recovery Cycle

Sub-elite/recreational

Train
24
Recover

Bishop et al., JSCR, 2008
Results of Minor Fatigue

1. More prone to **injury**
2. Muscular Strength is **decreased**
3. **Prolonged** reaction & movement times
4. Agility and neuromuscular coordination are **reduced**
5. Whole-body movement speed is **slowed**
6. **Reduced** concentration and alertness
   • A decline in “making the right plays”
7. **Reduced** athletic performance!
Training Recovery: A Review

• Recovery after training is needed to...
  • 1) Repair damaged muscle fibers
  • 2) Replenish “fuel” stores
  • 3) Reestablish muscle capabilities
    • “RECOVERY” from DOMS (24-72 hours???)

• Balance between training & recovery, is the key to improving performance!
  • Too much of a GOOD THING?
Detraining

- Decrease in:
  - Muscle size, Girth, Strength, & Power
  - Fat-free mass and Definition and Tone.
  - Strength of Connective Tissues
  - Muscular and Cardiorespiratory Endurance
  - Speed, Agility, and Flexibility

- Muscle Conversion Properties return to normal!

- Partial or complete loss of training-induced adaptations in response to:
  a) cessation of training or
  b) decrement in the training load

Wilmore & Costill, & NSCA
Barriers To Monitoring Athletes’ Recovery Status

1. Time of Sport Season
2. Experience of Lab Technicians
3. Reluctance of Coaches and/or Athletes
4. Essential Equipment
5. Length of Data Collection
   • Protocol and Subject Choice
      • Reliability and Validity
6. Subject Attrition
7. Motivation of Athletes
Technology and Monitoring Recovery

- **Heart Rate Variability (HRV)**
  - Beat-to-beat variation in either heart rate or the duration of the R–R interval
    - Strong relation to Autonomic Nervous System
  - If heart rhythms are rhythmic and "in balance"
    - Immune system is functioning well
    - Athlete is recovered?
  - If heart rhythms are erratic
    - Athlete is "stressed"
    - Possibly overtrained?
1. HRV Systems
   - BioForce, FIRSTBEAT, omegawave, etc.
     - “Red-Orange-Yellow-Green Zones” vs 100 pt. scale
     - Recovered vs not-fully recovered

2. GPS Tracking Systems
   - catapult, Garmin, Polar, Adidas, etc.
   - Analyze quality (length, intensity, etc.) efforts of movement (practice and games!)
     - Determine “overwork”
     - “Precise” quality efforts!
Practical Monitoring Intensity Tools

1. **Session RPE**
   - Foster et al., JSCR, 2001
   - Robertson (U. Pitt.), Green (UNA), etc.

2. **Perceived Muscle Soreness**
   - Scale of 1-100

3. **Soreness, Fatigue, Tiredness Scale**
   - Likert Scale – Visual Analog Scale (VAS)
   - Bosak et. al., MSSE & TSJ, 2005-2009
4. **Total Quality Recovery Scale**
- Structured Around RPE (Kentta, 1998)
  - Monitors Factors of Recovery Process
    - Stress, Adaptions to Training, etc.
    - Five Page Questionnaire

5. **Perceived Readiness Scale**
- Geared towards Interval Training
  - When does athlete “feel” ready to go hard again.
    (Edwards, 2010)

6. **Training Impulse Score**
- Session RPE X activity duration
7. **Recovery Protocols**
   - McLester et al., JSCR, 2003
   - Bosak et al., Jones et al., Campbell et al., etc.

8. **Perceived Recovery Status Scale**
   - Laurent, Green, et al., JSCR, 2011 (March)

### Perceived Recovery Status Scale

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
<th>Performance Expectation</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Very well recovered / Highly energetic</td>
<td>Expect Improved Performance</td>
</tr>
<tr>
<td>9</td>
<td>Well recovered / Somewhat energetic</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Moderately recovered</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Adequately recovered</td>
<td>Expect Similar Performance</td>
</tr>
<tr>
<td>6</td>
<td>Somewhat recovered</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Not well recovered / Somewhat tired</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Very poorly recovered / Extremely tired</td>
<td>Expect Declined Performance</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Take Home Message

- **Overtraining:** decreased performance capacity.
- **Detraining:** cessation or decreasing of regular physical training.
- Individual recovery abilities
  - Future performance
    - *Increased* with *adequate* duration of *recovery hours!*
- **Recovery monitoring tools are important**
- Don’t forget... **INDIVIDUAL VARIABILITY!**
- Precise Training = Future Success?
The End & Thank-You!

Comments?
Questions?

andy.bosak@liberty.edu
OR
434-592-4874
References


References


