New Aspects to Overtraining - Unexplained Underperformance Syndrome

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The case

32 years old athlete

September 2009 pain in the right jaw and cephalgia, multiple examinations by practitioner and specialist without findings, tooth 1/7 revised.

During the months before no bites of insects or other severe infection despite in july heavy cold.
Complaints

Training load was reduced gradually more and more

Fatigue after training increased, performance and maximal force decreased

Regeneration was not possible

Complaints increased

At a given work load puls rate increased
Training and First diagnosis

Training for 22 years
15 units and 20 hours per week
reduction down to 3 units and 4 hours per week

Working diagnosis

Overtraining
or UPS:
Unexplained underperformance syndrome
Why speak about overtraining? My athletes need more training!

Overload and fatigue are part of training
UPS: Unexplained underperformance syndrome

A prolonged decrease in performance or trainability and increased fatigue for more than several weeks to months in an athlete - which can not be attributed to another defined pathology and when the previous training was more than 5-7 times or more than 10 hrs per week.
Fatigue is part of physical training

Peripheral fatigue (local fatigue)
- Muscular fatigue
- Limited by organ capacities
- May be compensated by effort
- Typical for normal training processes

Central fatigue
- Mood disturbances
- Hypothalamic dysfunction
- Mental-psychological overload
Training, overreaching and overtraining

3 phases model acc. to Lehmann et al. 1997

Overtraining

Overreaching

Training
## Time domain: functional overreaching and the overtraining syndrome


<table>
<thead>
<tr>
<th>PROCESS</th>
<th>TRAINING (overload)</th>
<th>INTENSIFIED TRAINING</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTCOME</td>
<td>ACUTE FATIGUE</td>
<td>FUNCTIONAL OR (short-term OR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NON-FUNCTIONAL OVERREACHING (extreme OR)</td>
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<tr>
<td></td>
<td></td>
<td>OVERTRAINING SYNDROME (OTS)</td>
</tr>
<tr>
<td>RECOVERY</td>
<td>Day(s)</td>
<td>Days – weeks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weeks – months</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Months - …</td>
</tr>
<tr>
<td>PERFORMANCE</td>
<td>INCREASE</td>
<td>Temporary performance decrement (e.g. training camp)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STAGNATION DECREASE</td>
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<td></td>
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<td>DECREASE</td>
</tr>
</tbody>
</table>
Fiber type transformation during training occurred only during the rest periods.

Semistarvation alters protein synthesis rate


Protein synthesis rate

Exercise Training

Time

Protein synthesis rate
Basal Cortisol increases during phases of intensive training
Leptin and insulin resistance in overreaching


![Graph showing changes in leptin concentration and insulin resistance (glucose/insulin ratio) over a training phase.]

- **Leptin**
- **Insulin resistance** (glucose/insulin ratio)

**Graph Details:**
- **X-axis:** Training phase
  - Baseline
  - RT
  - R1
  - ET
  - R2
- **Y-axis:**
  - Leptin concentration (% change)
  - Changes in glucose/insulin ratio (% change)
Thyroid axis responds to training load


Graph showing TSH levels over different phases of training.
Immune reaction is lower during training


Induration for skin antigens (mm)

- Exercised Triathletes
- Triathletes resting
- Nonathletic controls
J-Curved relationship between infect rate and training load

Hyperinflammation?

- **Damage is caused by training**
  - Stress and damage causes Hyperinflammation
  - Hyper inflammatory Damage Associated Molecular Patterns are activated (DAMP)

- **Damage is caused by pathogens**
  - Pathogens may cause activation of Pathogen Associated Molecular Patterns (PAMP)

- Hyperinflammation causes metabolic stress and reduced immune function
Stress and recovery balance

Disbalance

Training load
Competition
Nontraining Stressors

Recovery
Stress / recovery balance

Kellmann et al. (2001). Sport Psychologist 15: 151

Stress

Regeneration

Injury / Burnout

Selfregulation

Personal accomplishment
Different pathogenesis of UPS and burnout

**UPS:**
Training > 10 hrs / week

**Burnout:**
- Appraisal of demands
- Appraisal of ability to deal with demands
- Attempts to cope
- Exhaustion

Non-functional overreaching and overtraining have mood disturbances
- Exhaustion, lethargy and negative mood

UPS may have common symptoms of burnout

Treatment is similar

Cresswell & Eklund, in press-a; Maslach 1982; Raedeke, 1997; Schutte, Toppinen, Kalimo & Schaufeli, 2000
Diagnostic workup: make it explainable

- **History including training history**
- **Physical examination**
- **Exercise test: maximal performance**
- **Laboratory: exclusion of significant other illnesses**
  - No specific lab value for UPS / OTR established
  - TSH, Leptin, HOMA
  - Zytokine patterns?
- **Psychological questionnaires**
  - RESTQ-Sport
  - POMS, HADS
Therapeutic measures: Medicine

- **Information and therapeutic visits / talks**
  - Use of daily log book

- **Treatment**
  - Infections
  - Injuries
  - Allergies / Asthma

- **General measures:**
  - Inhalation, physical therapy

- **Psychological intervention**
  - Training of relaxation techniques
Therapeutic measures: Sport

- **Stop training for certain time**
  - Days, weeks

- **Start exercise trials**
  - Duration first <30 min, later <60 min
  - Heart rate < 40% HRmax or < 120/min
  - Variable training programme, no Monotony
  - Short intensities (2-3 min) and strength training often better tolerated (depends on sport)

- **Games help to reintroduce pleasure**

- **Recovery to training gradually**
**Therapeutic measures: psychosocial and environment**

- **Sleep**
- **Social activities outside of sport**
  - Friends, theatre, dancing, swimming, sauna, …
- **Change of environment**
  - Days off, vacation
- **Partner and family related problems should be solved**
- **Problems in profession should be solved**
Therapeutic measures: nutrition and environment

- Carbohydrate rich nutrition
- Fluid intake
- Intake of vegetables and fruits

- Avoid training in unsafe or stressful conditions
  - Avoid exhaustion
  - Very cold weather, wind, rain, …
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