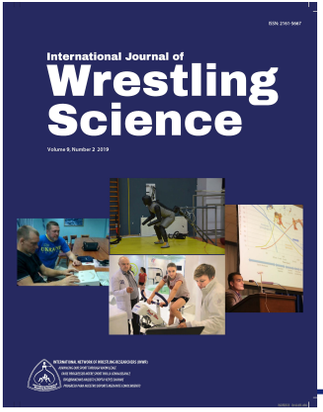

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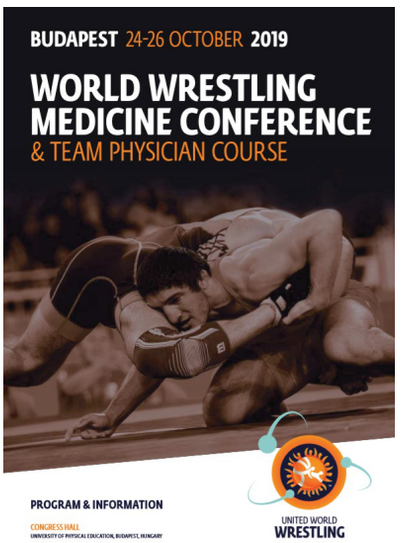

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OVERTRAINING AND FATIGUE SYNDROME IN ELITE ATHLETES

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Definitions

Overreaching:
- Excessive Exercise volume or intensity → reduced sport-specific athletic performance
- Temporary impairment
- Supercompensation → Increased performance

Functional overreaching
- Increased training load
- Short term (days – weeks)
- Good: Supercompensation

Non-functional overreaching
- Intense training load
- Long term (weeks – months): 6 weeks – 8 months
- Other symptoms: psychologic, neurologic, endocrinologic
- Bad: Symptoms, time out of training

Overtraining Syndrome (OTS)
- Maladaptive response to excessive exercise without sufficient rest
- Extreme non-functional overreaching?
- More than 2 months: 2 years – no recovery
- Severe varied symptoms
- Bad: symptoms, time out of training, secondary complications, potential career ending

OTS
- Continuum from non-functional overreaching?
- Additional stressor?
- Multi-factorial?
- Individual and unique to each athlete?

Prevalence
- Overreaching:
  - Common
  - Up to 60%

- Overtraining: Unexpected and Paradoxical Deconditioning
  - Much less common
  - Approx. 15%
  - Mostly studied in endurance athletes
  - Less evidence in resistance athletes
  - Common in Wrestling

OTS: Signs & Symptoms

Underperformance & Fatigue
Multi-system & severe
Hormonal, immunologic, neurologic, and psychologic impairments
Other background risk factors and harmful behaviour:
- Insufficient intake of Carbohydrate, Protein, Calorie
- Poor sleep habits and quality
- Excessive cognitive effort

Sympathetic (anaerobic sports):
- Insomnia
- Irritability
- Agitation
- Tachycardia
- Hypertension
- Restlessness

Parasympathetic (aerobic sports):

Fatigue
Depression
Bradycardia
Loss of motivation
Other:
Anorexia; Weight loss
Lack of mental Concentration
Frequent Muscles soreness
Anxiety
Unrefreshing sleep

OTS: Diagnosis

Challenging:
Retrospective and duration dependent by definition
No single diagnostic test or biomarker
Multi-factorial
Differential diagnosis
Detailed thorough history and physical examination
Training and competition load
Recovery: awareness, appropriate duration and techniques
Background harmful clinical behaviour
Past Medical History
Relevant systemic examination

OTS: Diagnostic tests

Screening for organic conditions
History and examination led
asthma, thyroid disease, primary mood disorder, adrenal disease, diabetes, iron deficiency, anemia, infection, malnutrition, oncologic condition, rheumatologic condition, renal, liver disease, …

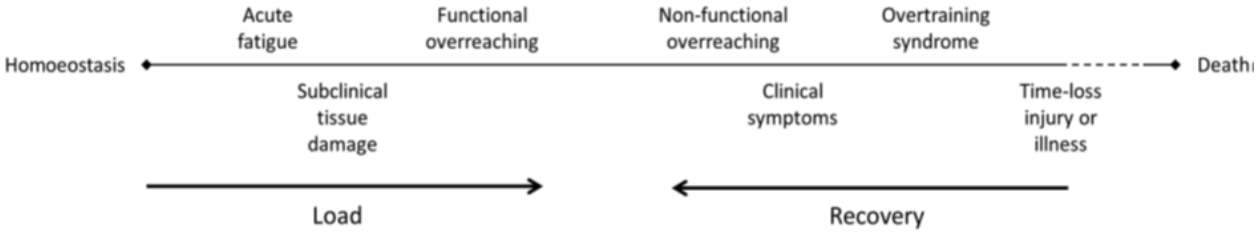
Tests to consider:
FBC, ESR, CRP, U&E, biochemistry and metabolic profile, Haematenics, CK, TFT, LFT, rheumatology screening, ANA, serum and salivary immunoglobulins, vitamin D, vitamin B12, folate, serologies for viral hepatitis, toxoplasmosis, cytomegalovirus/Epstein–Barr virus, …

- ✓ No definite biomarker
- ✓ Performance test (response to two maximal tests, 4 hours apart) + physiologic markers of deconditioning: differentiate between OTS and Non-functional OR
- ✓ ↓ GH, cortisol and prolactin response to non-exercise stimulation tests → ↓ pace and performance
- ✓ ↓ testosterone → ↓ muscle mass
- ✓ ↑ oestradiol & ↓ testosterone / oestradiol → psychological and metabolic:
  Depression, confusion, fatigue, reduced strength
  Muscle catabolic state, lower metabolic rate, higher body fat,

Screening & Prevention

Multifactorial, Harmful behaviour and other Risk Factors
Unique to individual athlete

Principles of optimal load and monitoring



Regular monitoring
External load: quantify training and competition load
- hours of training, distance run, weight lifted, number of games played
- other: life events, daily hassles or travel

Internal load: physiological and psychological response

- RHR, Max HR, Rate of Perceived Exertion
- Well-being questionnaires, regular urinary hydration tests, body composition and weight monitoring

Identify early signs:

abnormal body fat gain, paradoxical muscle loss, worse libido, mood

Summary

Functional and non-functional overreaching vs overtraining syndrome

Complex multi-factorial individual, not a single easy correlation with loading: unexpected paradoxical deconditioning?

Diagnosis challenging, need to rule out possible organic causes

Role of screening and monitoring in prevention