

Restoration

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Introduction



- Greater the load, greater the recovery
 - Identify common stressors
 - Strategies to enhance recovery
- NEED TO HAVE A PLAN**

METABOLISM

EXERGONIC REACTIONS

ENDERGONIC REACTIONS

Catabolism

Anabolism

Exercise

Recovery/Adaptation

RECOVERY TO GET BACK WHAT WAS LOST

ADAPTATION:

The process of adjustment to a specific "stimulus"

Positive Adaptation = Improved performance

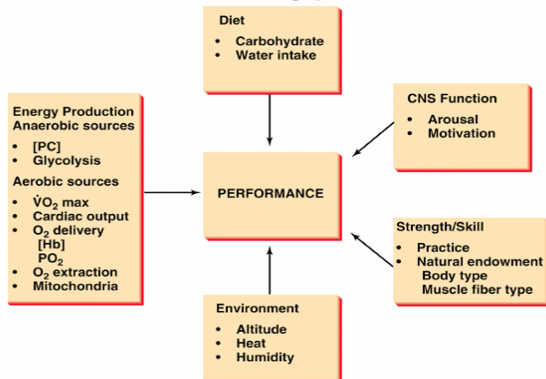
Restoration is creating an ideal environment for the cell to regenerate.

Stressors are Additive



Fig 1: The major problems resulting from overtraining

Factors affecting performance



Prevention



Carefully Planned Training and Restoration

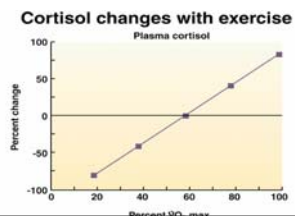
Considerations

- Training Regimen
 - Overtraining/Over-reaching
- Chronological/ Training Age



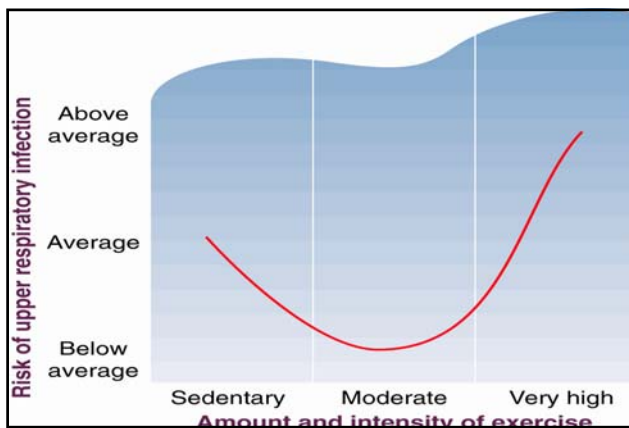
Individual Variability

- Individuals tolerate different levels of stress
 - Stress hormones activated
 - Emotional stress and chronic elevation of cortisol
 - Physical stress and transient increase



Key to Recovery is Avoiding Overtraining

- Signs of Overtraining
 - Decreased performance with increased training
 - Frequent Upper Respiratory Infections
 - Frequent injuries



General Adaptation Syndrome

- Alarm Reaction: Similar to fight or flight
- Resistance: Struggle to overcome, hard work, limited rest/sleep
- Exhaustion: Body systems crash, fatigue, errors, irritability, vulnerable to illness (colds, URI)

Key to Recovery is Avoiding Overtraining

- Causes of Overtraining
 - Training too intense
 - Training too prolonged
 - Insufficient recovery
 - Stress unrelated to training
 - academic
 - significant others
 - financial



Suggested Minimum and Maximum Recovery Times Following Exhaustive Exercise

Recovery Process	Minimum	Maximum
ATP + PC	2 Minutes	5 Minutes
Muscle Glycogen	10 hours (continuous exercise) 5 Hours (intermittent exercise)	46 Hours (continuous exercise) 24 Hours (intermittent exercise)
Liver Glycogen	Unknown	12 - 24 Hours
Reduction of Lactate	30 Minutes	1 hour
Restoration of O ₂ Stores	10 - 15 Seconds	1 minute

AEROBIC MUSCLE FATIGUE

Due to Aerobic Exercise

- results from
 - glycogen depletion
 - dehydration
 - buildup of heat
- recovery time
 - until glycogen repletion is complete
 - varies with intensity and duration of activity

ANAEROBIC MUSCLE FATIGUE

Due to Anaerobic Exercise

- results from
 - accumulation of hydrogen ions
 - depletion of substrate
- recovery time
 - within six hours lactate absorbed by non working muscles
 - time to allow microtrauma to heal
 - time normally 48-72 hours

ALACTIC MUSCLE FATIGUE

Due to Alactic Exercise

- results from
 - depletion of substrate (ATP)
 - unavailability of CP
- recovery time
 - approximately 3 minutes required for 98% return
 - no measurable waste products

Methods of Restoration

Have a Plan!!!!

Pedagogical (Coaching) Restoration

- employs periodized programs to optimize the balance between training stresses and natural recuperative processes

Medico-Biological Restoration

- covers a broad spectrum of therapeutic measures offered by medical and allied practitioners.

Psychological Restoration

- involves management of the mental state

Mel Siff "Super Training"

Planned Training Regimen

- The same workout may have different effects on:
 - Fitness
 - Fatigue
 - Illness
- Type of restoration may have different effects

TRAINING METHODOLOGY

- Considerations
 - training density
 - training emphasis
 - competitive demands
 - health
 - stress levels
- Recovery
 - resting pulse rate
 - weight
 - blood values



TRAINING METHODOLOGY

- Active recovery
 - increases lactate metabolism within muscle
 - reduces release of lactate into blood stream
 - decreases muscle lactate
- Passive recovery
 - increased glycogen resynthesis
 - not due to glycogen neogenesis

Russian Restoration System

Recognizes the specificity of each technique or sequence of techniques for a particular event, phase of training, individual athlete, time of the day, type of stress and type of fitness.

Applies a different techniques before, during, shortly after and a long time after training and competitions.

Records on athlete's daily variation in physical and psychological state, a process which implies close cooperation between athletes, coaches and athletic trainer.

Passive Physical Means

Classical massage	Nutrition) Myofascial
Release massage	Hydration
Acupressure/ shiatsu	Hydrotherapy
Stretching techniques	Flotation
Aromatherapy	Therapeutic Touch
Electronic technology	Laser therapy
Passive machines	Reflexology
Barotherapy (pressure)	Balneo-therapy (baths)
Aromatherapy	Active Release
Therapy	

Active Physical Means

PNF (Neuromus means)	Stretching
Physical activity	Recreational sport
	Manual labor Dance
Play	Postural Alignment
	Breathing regimens
	Tai Chi
Progressive relaxation	Yoga
Self-massage (active/passive)	

Essential Recovery Methods

- Nutrition/Ergogenic Aids
 - Hydration Status
- Acclimatization
- Rest
- Therapeutic Modalities/Exercise



EFFECTS OF DEHYDRATION

- Dehydration of 1-2% of body weight can impair performance and physiological processes
 - A 3 lbs weight loss in a 155 lb athlete
- Dehydration of >3% of body weight during exercise
- No one adapts to dehydration

Ganio M. S., D. J. Casa, L. E. Armstrong, C. M. Maresh. Evidence-based approach to lingering hydration questions. Clinics in Sports Medicine. 26, 1-16, 2007.

Ideal Fluid Replacement Beverage

- Palatability - "tastes good"
- Multiple sugars such as glucose (polymer), sucrose and fructose enhance fluid uptake
- Sodium can enhance fluid retention in short term
- Cooled to 50-59° F (10-15° C)
- Amino acids don't seem to help fluid absorption or performance
- Plan to drop ship our sports drink and foods



Mitchell et al. JAP 89:1302-09, 2000.

Casa et al. J Athletic Training. 35:212-24, 2000.

During Exercise

- Drink 200 to 300 mL (7 to 10 fl oz) every 10 to 20 minutes
- Goal is to drink amount equal to sweat and urine losses



Acclimatization Example for Track and Field



Week 1

- Monitor hydration
- ↓ Exercise intensity
- Short duration
- Shorts, t-shirts
- Consider ↑ salt

Week 2

- Monitor hydration
- Gradually ↑ intensity
- Gradually ↑ duration
- Gradually ↑ equipment
- Blood sodium normalizes
- Sweat rate ↑

Table 2.2
 "Plateau days" of **Physiological Adaptations** (Point at Which Approximately 95% of the Adaptation Occurs) During **Heat Acclimatization**

Adaptation	Days of heat acclimatization													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Heart rate decrease														
Plasma volume expansion														
Rectal temperature decrease														
Perceived exertion decrease														
Sweat Na ⁺ and Cl ⁻ concentration decrease*														
Sweat rate increase														
Renal Na ⁺ and Cl ⁻ concentration decrease														

* While consuming a diet low in NaCl.
 Reprinted from Armstrong and Dziadosz 1986.

Acclimatization Factors

- Clothing/equipment
- Duration of exercise in the heat
- Time of day
- Exercise intensity
- Hydration status
- Sleep loss
- Infection or illness
- Age
- Degree of maximal aerobic power (VO_{2max})

Gender does NOT make a difference

Restorative Aids

Identify medical facilities and support for training and competition



Therapeutic Modalities

- Electrical Stimulation
- Laser Therapy
- Cryotherapy
- Cooling Systems

Therapeutic Modalities

- Electrical Stimulation
- Laser Therapy



Therapeutic Modalities

- Cryotherapy



Therapeutic Modalities

- Cryotherapy

There is some indication of cryotherapy effectiveness over recovery periods relevant to between training session intervals following exercise that may be more representative of training than that used to induce DOMS

- Eston R, Peters D. Effects of cold water immersion on the symptoms of exercise-induced muscle damage. *J Sports Sci.* 1999; 17: 231-8.
- Yanagisawa O, Miyanaga Y, Shiraki H, et al. The effects of various therapeutic measures on shoulder strength and muscle soreness and biochemical and functional outcomes of eccentric. 2003; 43: 189-201.

- Cooling Systems

These data suggest an improved physiological response to exercise heat stress with all three commercial systems.

- Cadarette BS, et al. Evaluation of three commercial microclimate cooling systems. *Aviation, Space, And Environmental Medicine.* 1990; 61: 71-6.

Endurance times for running at 95% of VO₂max were increased by up to 49 s. Perceptions of the thermal state and skin wetness showed changes to greater levels of effectiveness.

- Webster J. A light-weight cooling vest enhances performance of athletes in the heat. *Ergonomics.* 2005, 10: 48, 821-37.

Therapeutic Modalities

- Cooling Systems



Therapeutic Exercise

- Massage
- Manual Therapy
- Aquatics Therapy
- Core/Functional Exercises

Therapeutic Exercise

- Massage
- Manual Therapy



Therapeutic Exercise

- **Massage**

- No evidence of improved pre-exercise performance, post-exercise recovery or prevent muscular injury.

- Weerapong P et al. The mechanisms of massage and effects on performance, muscle recovery and injury prevention. *Sports Med.* 2005; 35: 225-56.
 - Monedero J, Donne B. Effect of recovery interventions on lactate removal and subsequent performance. *Int J Sports Med.* 2000; 21: 593-7.
 - Murphy A, Wilson G. The ability of tests of muscular function to reflect training-induced changes in performance. *J Sports Sci.* 1997; 15: 191-200.
 - Harner P. The effect of pre-performance massage on stride frequency in sprinters. *J Athl Train.* 1991; 26: 55-8.

- Benefits are primarily psychological thru relaxation.

- Weinberg R, Jackson A, Kolodny K. The relationship of massage and exercise to mood enhancement. *Sport Psychol.* 1988; 2: 202-11.
 - Hemmings B. Sports massage and psychological regeneration. *Br J Ther Rehabil.* 2000; 7: 184-8.

- **Manual Therapy**

- Only benefit occur from joint dysfunction

Therapeutic Exercise

- Aquatic Therapy
- Core Exercise



Conclusion

- Recovery individualized
- Life stresses slow recovery
- DEVELOP A PLAN
- Restoration aids