

The Mental Muscle

THE ROLE OF PERFORMANCE AND THE BRAIN DURING RED-S

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Objectives

- 
 Understand the characteristics of athletes that puts them at risk for disordered eating/eating disorders.
- 
 Define what is RED-S, overtraining and eating disorder in sport.
- 
 Identify the nutrition, behavioral and physical risks of being in energy deficit specifically in the brain
- 
 Identify when the athlete has crossed the line between exploring performance and eating disorder.

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Mental Health in Sport

- Higher risk population
 - Personality trait
 - Culture of the sport – “no pain no gain”
 - Fear of negative implications when asking for help
- The pure demand physically is thought to contribute to flat affect or mood making it hard to diagnose depression
- Athletic ideal vs societal ideal= double edge sword



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The Good Athlete and ED Characteristics

<p>Good Athlete</p> <ul style="list-style-type: none"> ↳ Mental Toughness ↳ Commitment To Training ↳ Pursuit of Excellence ↳ Coachability ↳ Unselfishness ↳ Performance Despite Pain 	<p>Anorexic Individual</p> <ul style="list-style-type: none"> ↳ Asceticism ↳ Excessive Exercise ↳ Perfectionism ↳ Overcompliance ↳ Selflessness ↳ Denial of discomfort
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Thompson, Sherman, 1999

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Mental Health in Elite Athletes

"Elite athletes may experience a great overall risk of mental health symptoms and disorders compared with their counterparts"

Especially if suffering a severe musculoskeletal injury, undergo multiple surgeries, decreased sports performance and maladaptive perfectionism.

5% to 35% of elite athletes have reported mental health disorders in a 12 month follow up.

In team male sports 5% noted burn out, 45% used alcohol for anxiety & depression.

In collegiate athletes 10% to 25% were noted for depression and eating disorders.

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Is it a mental health disorder or under fueled athlete?

- Overtraining vs Major depression
- Non-functional overreaching (NFO) accumulation of training load without compensatory recovery, with resultant performance decrement and need for more prolonged recovery.
- Overtraining- extreme form of NFO that results in prolonged performance decrements (> 2 months) and more severe psychological and/or neuroendocrinological manifestations.
- 50% report less than 7 hours of sleep per night in season
- 79% report 8 hours of less of sleep per night in season

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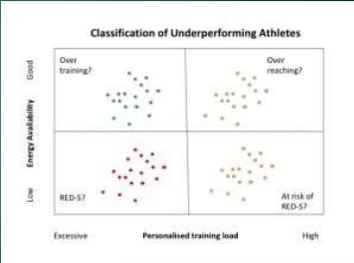
OT Vs RED-S

OR/OT- Overload is not matched with recovery, good energy balance

RED-S (Lower right)- Inadequate energy balance+ increased training load or intentional weight loss = decreased performance.

IF RED-S prolonged endocrine networks are impacted leading to more serious health impairments as well as significant performance decline.

Dr. Nicky Keay, Sports/Dance Endocrinologist 19 May 2017



The matrix 'Classification of Underperforming Athletes' plots Energy Availability (Good/Low) against Personalised training load (Excessive/High). The top-left quadrant is labeled 'Over training?', the top-right 'Over reaching?', the bottom-left 'RED-S?', and the bottom-right 'At risk of RED-S?'. Data points are represented by colored dots in each quadrant.

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"Cessation of training in athletes with NFO or OT often improves mood and associated symptoms."
 Mental health in elite athletes: International Olympic Committee consensus statement (2019).
 Br J Sports Med, 2019

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Relative Energy Deficit in Sport Syndrome (RED-S)

- Energy gap that results in an imbalance of energy needs versus energy intake
- Over time this gap becomes insufficient to support activities of daily living, growth, health and functioning.
- This syndrome affects: bone health, menstrual function, metabolic rate, immune system function, protein synthesis, cardiovascular health and psychological health.
- *Most common initial symptom is a change in overall mood.*
- While more common in females, RED-S also affects young male athletes.

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What has tipped the energy scale?

Resting Metabolic Rate (RMR) - the minimal energy requirement needed to sustain all the body's functions in a waking state. This typically represents 60-75% of TDEE and is affected by:

- Body size** (larger individuals with more muscle mass will have greater RMR)
- Age** (RMR tends to peak in early adulthood, declining 2-3% per decade thereafter)
- Gender** (Males typically have 5-10% lower RMR than females)
- Climate** (Individuals living in extreme environments can have 5-20% increases in RMR for survival)

Thermic Effect of Food (cost of digestion and absorption) represents 10% of TDEE with protein foods requiring the most energy to digest and absorb.

Energy Expended during Physical Activity and recovery. This is the most variable and represents 15-30% of TDEE on average.

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Energy Availability

Energy balance (EB) = Energy Intake (EI) - total daily energy expenditure (EE)

EE = energy expended on metabolic rate + TEF (thermic effect of food) + TEE (energy expenditure) + adaptive thermogenesis (AT)

Energy Availability (EA) - calories available to the body to optimize physiological & metabolic functions

- What will be "left" to support growth, cellular maintenance, thermoregulation, etc.

Wade & Jones (2004) contend that body's physiological & metabolic processes will be prioritized according to survival.

Loucks et al 1998 were the first to find that 45kcal/kgFFM-day was necessary to maintain adequate EA.

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All about Balance

► When energy does not match body's needs whole body systems become dysfunctional & dysregulated

► Over time if this becomes a chronic issues body systems begin to slow or some even shut off communication such as hypothalamus & pituitary gland for reproduction

► Good news all is reversible

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Health Consequences of Relative Energy Deficiency in Sport (RED-S) showing an expanded concept of the Female Athlete Triad to acknowledge a wider range of outcomes and the application to male athletes ("Psychological consequences can either precede RED-S or be the result of RED-S).

Margo Mountjoy et al. Br J Sports Med 2014;48:491-497

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Physical :Menstrual Cycle/ Testosterone

- Menstrual cycle is believed to be the first body system to dysregulate or shut off communication.
- Depressed testosterone production is thought of as the equivalent of menstrual dysfunction
- Birth control has been shown to decrease the rate of bone breakdown but also reduces bone formation
- Further reduction in bone density will be seen when calorie deficit is large enough that weightloss continues

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Mental: Estrogen/Testosterone

- ▶ Estrogen & Testosterone
 - ▶ Increase serotonin and receptors in the brain
 - ▶ Produces and regulates endorphins
 - ▶ Stimulate and protects nerve growth and repair
- ▶ Believed to be linked to anxiety, depression and lack of sex drive.

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Cardiovascular

- They have an "athletic" heart- 60 & below
- The Scandinavian study 2014 found that on average elite endurance athletes only had a 10 beat differential than sedentary individuals (62.8bpm vs 74 bpm)
- Direct correlation between Amenorrhea & endothelial dysfunction (#1 cause of sentinel death)
- Low EA athletes also have unfavorable lipid panels- increased TC, LDL



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Nutritional/Medical Issues

Metabolic Insufficiency

- ▶ **Low metabolic rate (hypo-metabolism)**
 - Too few calories are consumed
 - Body processes are slow
 - Decreased energy use
 - Allows body to survive longer
- ▶ **Sick Euthyroid Syndrome**
 - Caution when patient says "low thyroid function" and are on/want hormones
 - Thyroid function normalizes with good nutrition without hormones Mehler, 2010
 - Hormone therapy can be harmful for person with malnutrition
- ▶ Other noted disruptions: elevated cortisol, increased secretion of stomach acid



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Hematological

- Most prominent deficiencies especially in meat-limiting or vegetarian diets
 - B-complex vitamins, Iron, Calcium, Zinc & Magnesium, Vitamin D
- All of these have critical roles in: energy production, hemoglobin synthesis, muscle tissue synthesis/repair, bone health & immune function.
- Performance wise this can lead to : fatigue, profound muscle weakness, musculoskeletal injuries and increased risk of infections

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Slide 17

- 2 I say patient is ok because at that point they are more than likely in a medical office asking for it
-Rebecca
, 3/8/2018
- 3 should i use patient? person? athlete?
-Lauren Harrell
, 3/8/2018
- 1 OK. That sounds right to me...
-Lauren Harrell
, 3/8/2018

Mental: Metabolic, Thyroid, & Hematological

- Iron deficiency-
 - impact on neurotransmitter signaling,
 - formation of nerve insulation called myelin
 - brain energy metabolism
- Thyroid-
 - neurological component
 - Cognitive impairment
 - Depression thought to be 2ndry to fatigue
- Tends to lead to risk seeking supplement use: energy, muscle dysmorphia, or doping effect.

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Potential Performance Effects of Relative Energy Deficiency in Sport ("Aerobic and anaerobic performance).

Wargo Mounjoy et al. Br J Sports Med 2014;48:491-497

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Is it an Eating Disorder or just the drive for performance?

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Is it RED-S or is an Eating Disorder?

RED-S <ul style="list-style-type: none">▶ Energy imbalance appears to be secondary to a lack of awareness of energy needs.▶ Identifies how performance has been impacted▶ Values information and support▶ Will do ANYTHING to get back to their sport!	Eating Disorder <ul style="list-style-type: none">▶ Unable to make necessary changes due to rise in anxiety▶ Becomes even more rigid around behaviors▶ Struggles to believe anything is wrong▶ Unable to do what is needed to get back to sport.
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FINDING YOUR SWEET SPOT
Optimizing Energy Balance
How to Avoid RED-S (Relative Energy Deficit in Sport) by Optimizing Your Energy Balance
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Thank you!

ANY QUESTIONS?

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