

The IOC consensus statement: beyond the Female Athlete Triad-Relative Energy Deficiency in Sport (RED-S)

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Introduction

At the heart of the International Olympic Committee (IOC) remains the major goal of protecting athletes. The IOC gathered an expert panel to provide these current updates to the 2005 IOC Consensus Statement on the Female Athlete Triad. The triad had previously been described as the combination of disordered eating (DE) and irregular menstrual cycles which potentially lead to decreases in endogenous estrogen and other hormones which may result in low bone mineral density. The current IOC working group presented an extensive, more comprehensive designation reclassified as “Relative Energy Deficiency in Sport” (RED-S). This syndrome denotes impaired physiological ability and goes beyond the triad of Energy Availability (EA), menstrual function and bone health. RED-S is more of a pattern resulting from relative energy deficiency that affects many aspects of bodily function including metabolic rate, menstrual function, bone health, immunity, protein synthesis as well as cardiovascular and psychological wellbeing. Furthermore, it is marked that comparative energy deficiency also afflicts men.

Background

- Eating Disorders (ED) are common in elite athletes, occurring in 20% and 13% of females (adult; adolescent respectively) and 8% and 3% of male elite athletes. The prevalence can differ between sports significantly.
- RED-S can have severe negative effects on an athlete’s overall health and performance by having serious short and long-term implications on many body systems. Long-term low EA may cause an athlete to develop nutrient deficiencies; causing potential anemia, chronic fatigue as well as increased risk of infections and illnesses.
- RED-S may also have an adverse effect on for bone health. Peak bone mass usually occurs at age 19 years and 20.5 years in women and men respectively.
- Low EA has been linked to poor bone health in both female and male athletes by effecting the normal hormonal balance to either form bone (osteoclastic activity) or build bone due to the osteogenic response to athletic activity. All of these deficiencies leading to low bone mineral density (BMD).
- Dietary insufficiencies and lower BMD are known to lead to an increased risk in stress fractures in both female and male athletes.

Screening and diagnosis

- While symptoms of RED-S may be subtle, in order to prevent the long-term effects and improve performance, early detection is critical.
 - Annual screening for RED-S should take place every year as part of normal Periodic Health Examination (PHE).
 - Any signs of DE/ED, weight loss, lack of normal growth and development, menstrual dysfunction, recurrent injuries and illnesses, decreased performance or mood changes should lead to a more extensive examination.
 - Determining EA (the pivotal component of RED-S) requires a few key components
 - EI – Energy intake (frequently gathered by retrospective food diary)
 - EEE – Exercise energy expenditure (frequently gathered by exercise log and predictive tables)
 - FFM – Fat free mass (usually measured by dual-energy X-ray absorptiometry (DXA) and anthropometry).
- EA = EI – EEE relative to FFM (kcal/kg FFM/day)**
- DXA scans should be performed in any athletes who show low EA, DE, ED or amenorrhea over a 6 month period. In the adolescent athletes a whole body (excluding head) DXA scan should be done.
 - Reassessment of BMD for athletes at risk is recommended via DXA scan every 12 months in adults and at a minimum of 6 months in adolescents.

Recommendations to address RED-S

Treatment strategies for RED-S and low EA should involve a plan to increase EI while decreasing the amount of EEE to allow the body sufficient time to recover. Increased caloric intake with energy-rich supplements have shown some benefit in addition to inserting a day of rest into the athletes training regimen.

For females with low EA-associated disruption of their menstrual cycle, weight gain is normally the most effective treatment. Oral contraceptives are not suggested to regulate the menstrual cycle as they may mask the symptoms of low EA.

Relative Risk for RED-S



HIGH RISK <i>(no start)</i>	<ul style="list-style-type: none"> • Anorexia nervosa or other eating disorders • Medical (psycho/physiological) conditions related to low energy • Extreme weight loss techniques which lead to dehydration induced hemodynamic instability
MODERATE RISK	<ul style="list-style-type: none"> • Prolonged low BF% (measured by DXA or anthropometry) • Substantial weight loss (5-10% in 1 month) • Attenuation of expected growth • Menstrual cycle abnormalities • Reduced BMD (from prior or Z-score < -1 SD) • History of 1 or more stress fracture associated with low EA • Eating disorder / ECG abnormalities / lab abnormalities • Prolonged energy deficiency • Eating disorder impacting other teammates • Lack of training progress
LOW RISK	<ul style="list-style-type: none"> • Appropriate healthy eating habits • Normal hormonal function • Healthy BMD

Return to Play Model



HIGH RISK <i>(red light)</i>	<ul style="list-style-type: none"> • No Competition • Supervised training only (when cleared for adapted training) • Clear agreement/alignment with athlete (ie. written contract)
MODERATE RISK <i>(yellow light)</i>	<ul style="list-style-type: none"> • May compete once medically cleared (suggested under supervision) • May train under specifically agreed upon treatment/training plan
LOW RISK <i>(green light)</i>	<ul style="list-style-type: none"> • Cleared for full sport participation

For more information and to utilize the benefits the **Relative Energy Deficiency in Sport (RED-S) Clinical Assessment Tool (CAT)** has to offer, please visit <https://bjism.bmj.com/content/bjsports/49/21/1354.full.pdf>