

Relative Energy Deficiency Syndrome

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AOASM

Disclosures

None

Background

Family Medicine/Sports Medicine

San Diego State University Director of Women's Athletic Medicine

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Consulting Team Physician University of San Diego

Overview

- Discuss components of Relative Energy Deficiency in Sport (REDS)
- Discuss etiology of REDS
- Review how to approach diagnosis of REDS
- Review the initial treatment of REDS

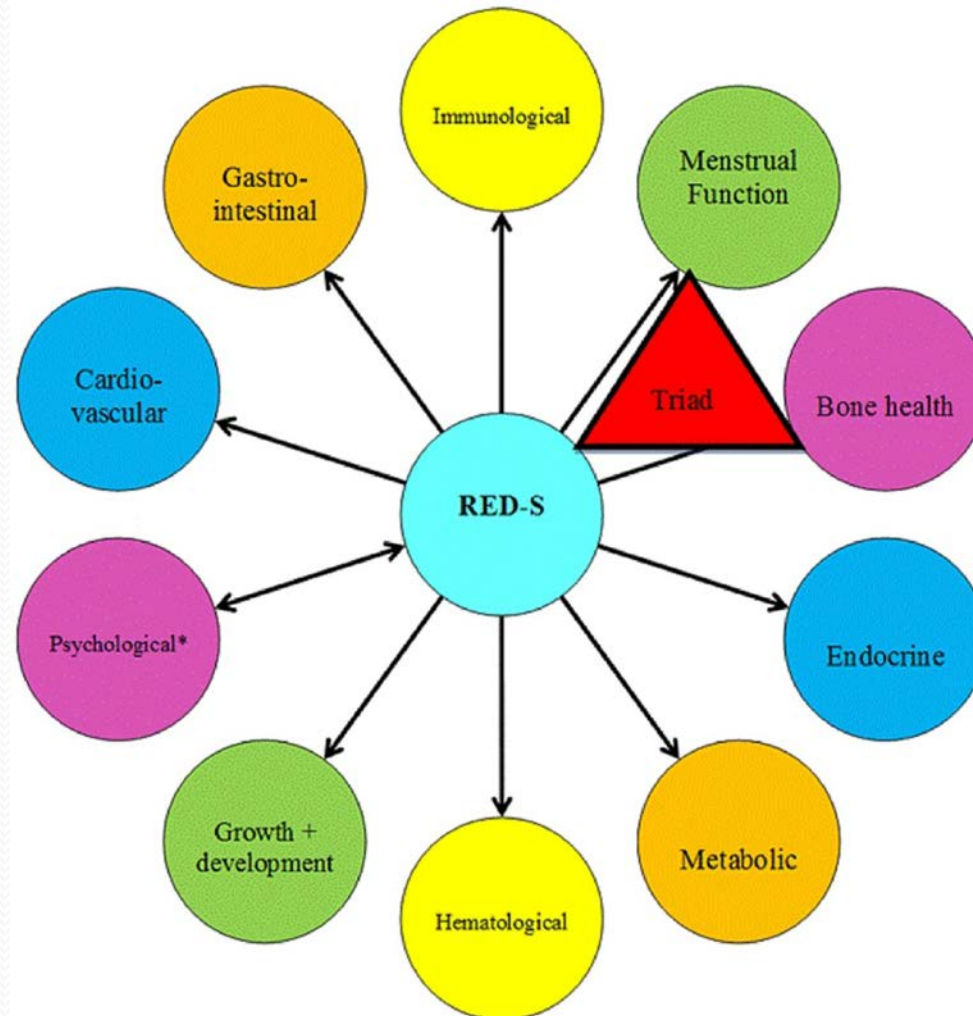
Objectives

- By the end of the lecture, the participant will be able to:
 - Describe the components of REDS
 - Delineate a diagnostic approach to REDS
 - Initiate a treatment plan for REDS
 - Understand the long term health consequences of REDS

REDS

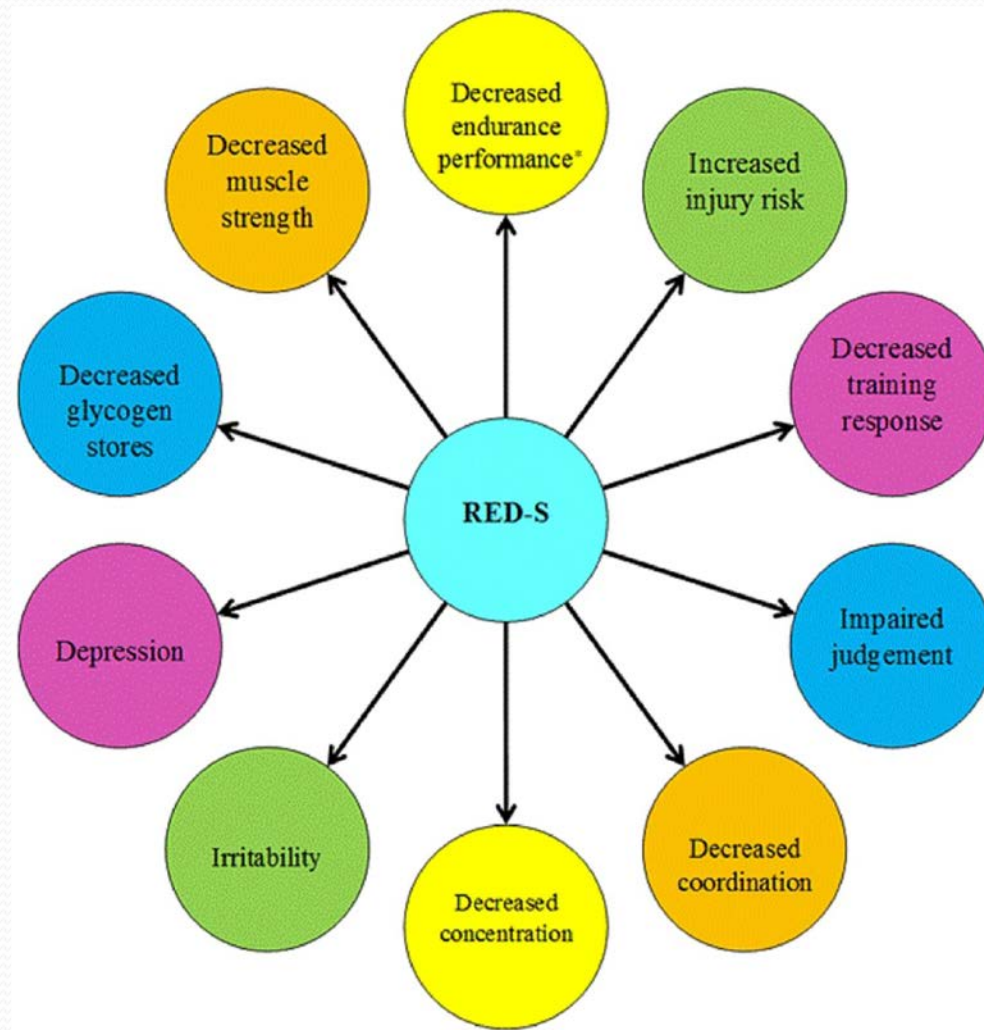
- Relative Energy Deficiency Syndrome
- Energy Availability (EA) = Energy Intake (EI) - Energy Output (EO)
- When EA is consistently low for weeks to months, athletes will exhibit signs and symptoms of REDS

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

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



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

REDS: Disordered Eating

- REDS *may* be a sign of disordered eating
- Disordered eating is a continuum
 - Balance between appropriate eating and exercise
 - Ranges from ‘healthy dieting’ to extreme weight loss methods such as restrictive diets
 - *Clinical eating disorders*
- Many athletes are at risk



REDS: Disordered Eating

- Prevalence of disordered eating is about 20% and 13% among adult and adolescent female elite athletes
- Prevalence is about 8% and 3% among adult and adolescent male elite athletes
- Prevalence differs significantly among sports

REDS: Hormonal Imbalance

- Menstrual cycle ranges 21-45 days in adolescents, 21-35 days in adults
- Primary amenorrhea is no menarche by age 15
- Secondary amenorrhea refers to the absence of 3 consecutive cycles post menarche
- Oligomenorrhea is a cycle greater than 45 days

REDS: Hormonal Imbalance

- Secondary amenorrhea prevalence is estimated between 2-5% in collegiate women, and as high as 69% in dancers, 65% in long-distance runners
- Primary amenorrhea in collegiate athletes is 7% overall, 22% in cheerleading, diving, and gymnastics

REDS: Hormonal Imbalance

- Reduction in EA may disrupt the LH pulsatility
- Disruption in LH pulsatility leads to alteration of GNRH which leads to altered menstrual cycle
- *Functional Hypothalamic Amenorrhea*
 - Can occur over even as short as 1 month period of low EA
 - Most commonly I see it 2-3 months after onset of low EA, takes up to 3-6 months to return to normal menses after improvement in EA

REDS: Hormonal Imbalance

- Low EA can affect the following hormones:
 - Insulin
 - Cortisol
 - Growth Hormone
 - Insulin-like growth factor-1 (IGF-1)
 - T₃
 - Grehlin
 - Leptin
 - *Think of this complex interplay of hormones and why so many systems are affected*

REDS: Nutrition

- Athletes should consume a minimum of 45 kcal/kg/FFM/day
 - For example a 150 lb (68kg) athlete with 20% body fat has a free fat mass (FFM) of 120 lbs (54.5kg)
 - This athlete should consume 45 kcal x 54.5 each day= 2,452 kcals/day
- Those who consume < 30 kcal/kg/FFM/day are at risk for REDS
 - In this patient example that would be: 1,635 kcals/day

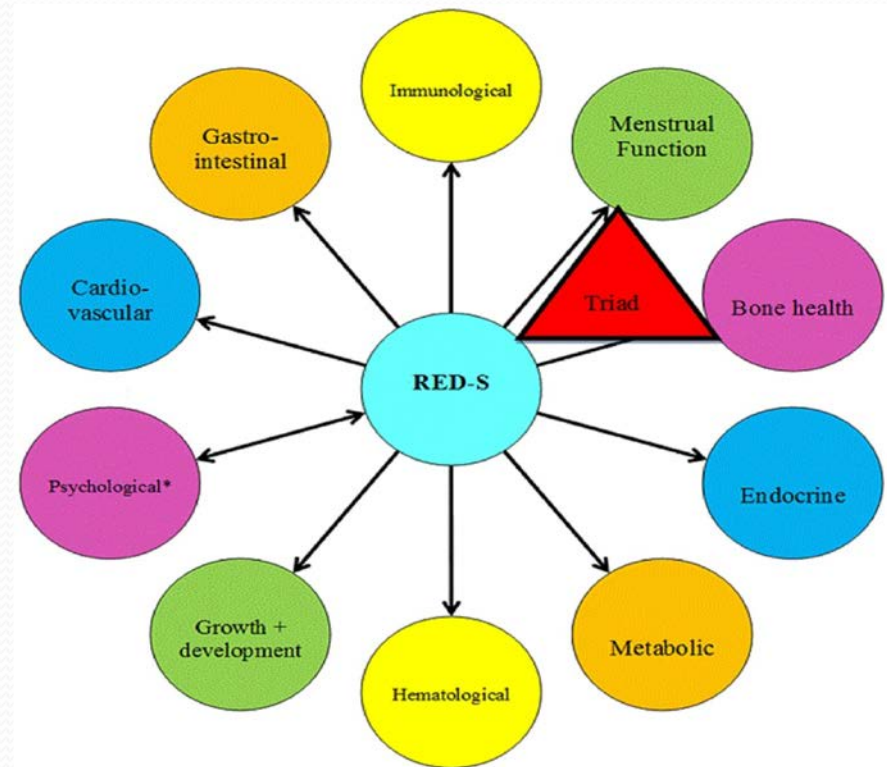
REDS: Nutrition

- Don't try to calculate FFM and kcals/day on the first visit!
- Start with a diet log – get an idea of the athlete's knowledge of nutrition
 - This will also show if the athlete is ready to commit to change
 - It will also show eating patterns, which can help determine if disordered eating is present
- Depending on your resources refer to a nutritionist who is capable of caring for athletes



REDS: Adverse Health Consequences

- Anemia
- Chronic Fatigue
- Weakened Immune System
- CV
- GI
- Endocrine
- Reproductive
- Skeletal
- Renal
- CNS



REDS: Metabolic Consequences

- Lower metabolic rate
- Decrease in growth hormone production
- Irregular or absent menses may have significant emotional impact creating anxiety
- Bone: Peak bone mass occurs around 19 in women and 20.5 in men
- Estrogen increases uptake of Ca^{++} into bone
- Even silent estrogen/progesterone imbalance can lead to negative effects in bone

REDS: Metabolic Consequences

- Low Testosterone can lead to poor bone formation in men
- *Bones of athletes with chronic amenorrhea benefit less from osteogenic effects of exercise*
- Low EA is recognized as independent factor of poor bone health
- Bone loss in athletes may be **irreversible**



REDS: Metabolic Consequences

- Change in bone structure leads to increased risk of stress fracture
- Functional impairment associated with low EA include greater prevalence of viral illness, injuries, reduced responsiveness to training and subsequent performance



REDS: Recognizing Symptoms

- Initial PPE
 - Screening questionnaire for eating habits
 - Screening questionnaire for mood
 - Vital signs including BMI
- Annual follow up
 - Check for major changes in weight/BMI
- Athlete self-report
- Coaching report



REDS: Treatment

- Increase in energy intake
- Decrease in energy output
- Increase oral intake by 300-600 kcal/day on average



REDS: Treatment

- OCP
 - May mask signs of low EA
 - May perpetuate bone loss
- Weight gain
 - *Hard to get athletes to agree to total weight gain*
- Vit D 2000 iu/day
- Calcium 1500mg/day



High risk: no start, red light	Moderate risk: caution yellow Light	Low risk: green Light
Eating disorder	Prolonged abnormally low body fat % Substantial weight loss Attenuation of expected growth	Healthy eating habits with normal EA
Other serious physiologic (psychological or physical) abnormalities related to low EA	Abnormal menses Menarche > 16 yo Hormonal abnormalities in men	Normal metabolic and hormonal function
Extreme weight loss techniques	Physiologic abnormalities associated with low EA (abnormal EKG e.g.)	Healthy BMD and MSK system
	Prolonged REDS Disordered eating behavior Lack of progress/non-compliance	

REDS: Psychological Treatment

- Athlete resistance to treatment increases with severity of the eating problem
 - Refer to a mental health professional skilled in discussing eating disorders
- Consider comorbidities such as depression, anxiety

REDS: Summary

- Identify signs and symptoms
- Rule out primary metabolic and eating disorders
- Initiate nutritional intervention and exercise restriction
- Monitor for and treat psychological symptoms
- Don't forget to consider academic implications
- Team approach to care

Questions?

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References

- Mountjoy M, Sundgot-Borgen J, Burke L, *et al* The IOC consensus statement: beyond the Female Athlete Triad—Relative Energy Deficiency in Sport (RED-S). *Br J Sports Med* 2014;**48**:491-497.