The Female Athlete Triad and Relative Energy Deficiency in Sport (RED-S)

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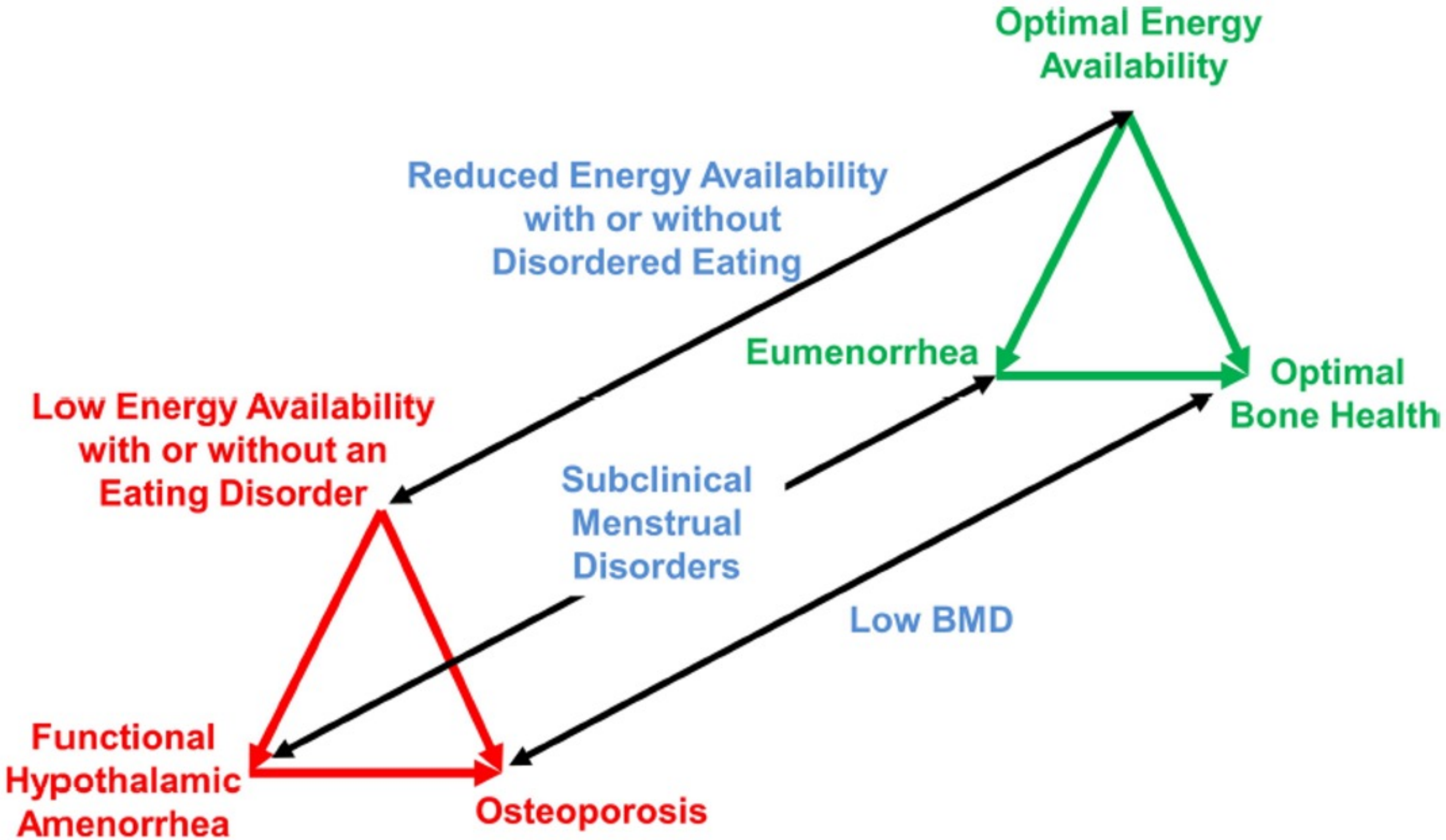
Boston Children's Hospital
Until every child is well™

HARVARD MEDICAL SCHOOL
TEACHING HOSPITAL

Disclosures

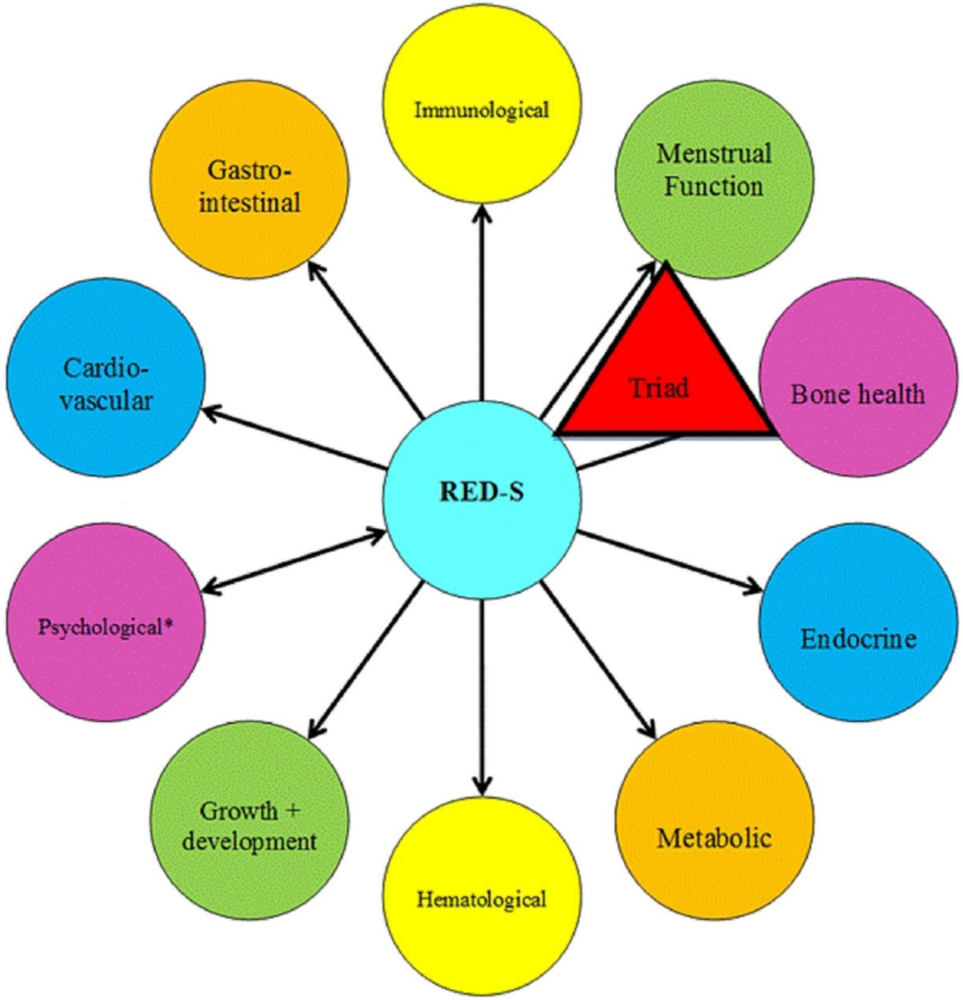
- Member- International Olympic Committee's Relative Energy Deficiency in Sport (IOC RED-S) and Female Athlete Working Groups
- Paid consultant and speaker:
  - Gatorade Sports Science Institute
  - Hologic

The Female Athlete Triad



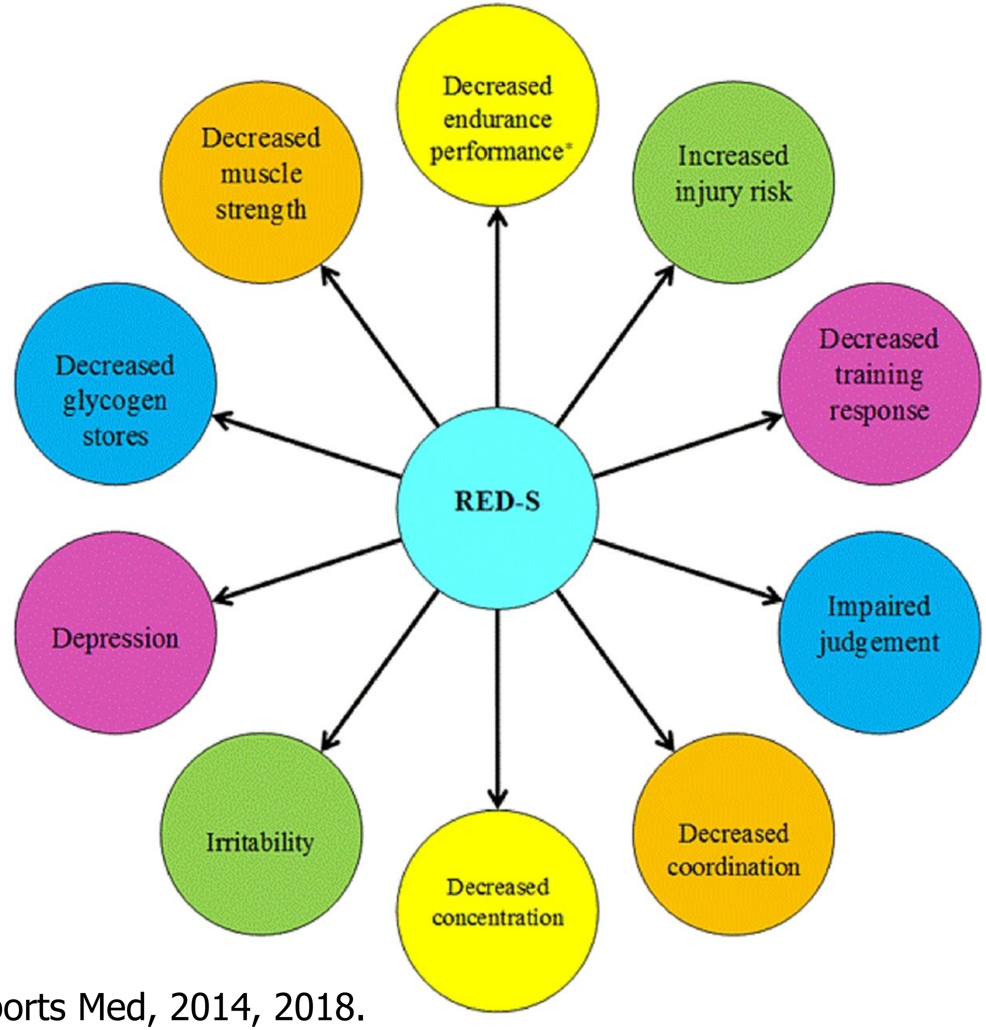
Nattiv A, et al. Med Sci Sports Exerc, 2007.
De Souza MJ, et al. Br J Sports Med, 2014.

Health Consequences of RED-S



Mountjoy M, et al. Br J Sports Med, 2014, 2018.

Potential Performance Effects of RED-S



Mountjoy M, et al. Br J Sports Med, 2014, 2018.

Low Energy Availability

- **Energy Availability (EA):**
  - Dietary energy intake (EI)- Exercise energy expenditure (EEE) normalized to fat-free mass (FFM): **EA= (EI- EEE)/FFM**
  - Ex. **EI**= 2000 kcal/d, **EEE**= 600 kcal/d, **FFM**= 51 kg

    (2000-600)/51 = 27.5 kcal/kg of FFM/d

- **Exercise energy expenditure:** energy expended during exercise in excess of energy that would have been expended in non-exercise activity during same time interval

30

30 kcal/kg/FFM per day needed at a minimum. 45 may be ideal. Likely personal variation.

Loucks AB and Thuma JR. JCEM, 2003.

Low Energy Availability

- **Eating disorder:** clinical mental disorder defined by DSM-5
- **Disordered eating:** various abnormal eating behaviors

Disordered Eating (DE) and Eating Disorders (EDs) in Athletes

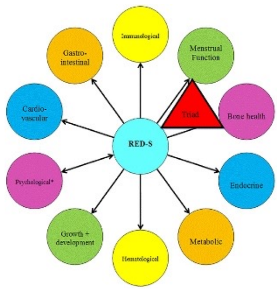
- Prevalence of DE/EDs is higher among athletes than non-athletes
  - Higher risk in female than male athletes
  - Higher risk among athletes in leanness sports

Smolak L, et al. Int J Eat Disord, 2000.

Prevalence of Low Energy Availability/Eating Disorders

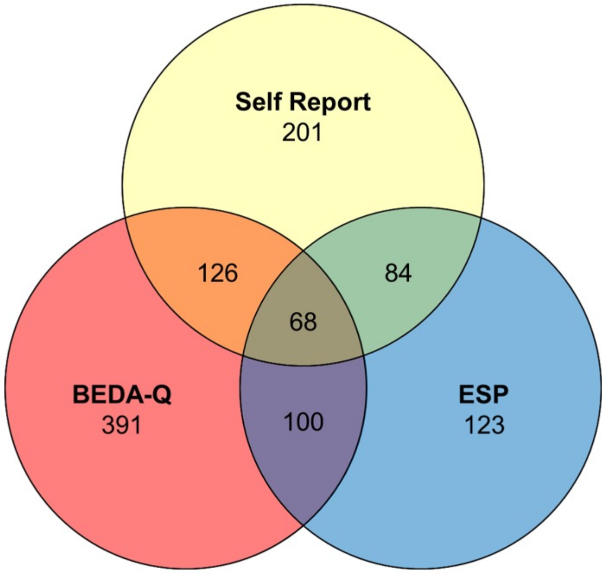
- 15 to 62% of female high school and college athletes have disordered eating
  - How the questions are asked?
  - What's being asked?
  - Who's asking?

Joy E, et al. BJSM, 2016. Ackerman KE, et al. Br J Sports Med, 2018.



Disordered Eating

- Survey of 1000 female sport medicine clinic patients (age 15-30 years, ≥4 hrs/wk of exercise)
  - Surrogate markers of Low EA:
    - Self-report or DE/ED, BEDA-Q, ESP
  - 84.5% response rate
  - **ED/DE: 47.3%**



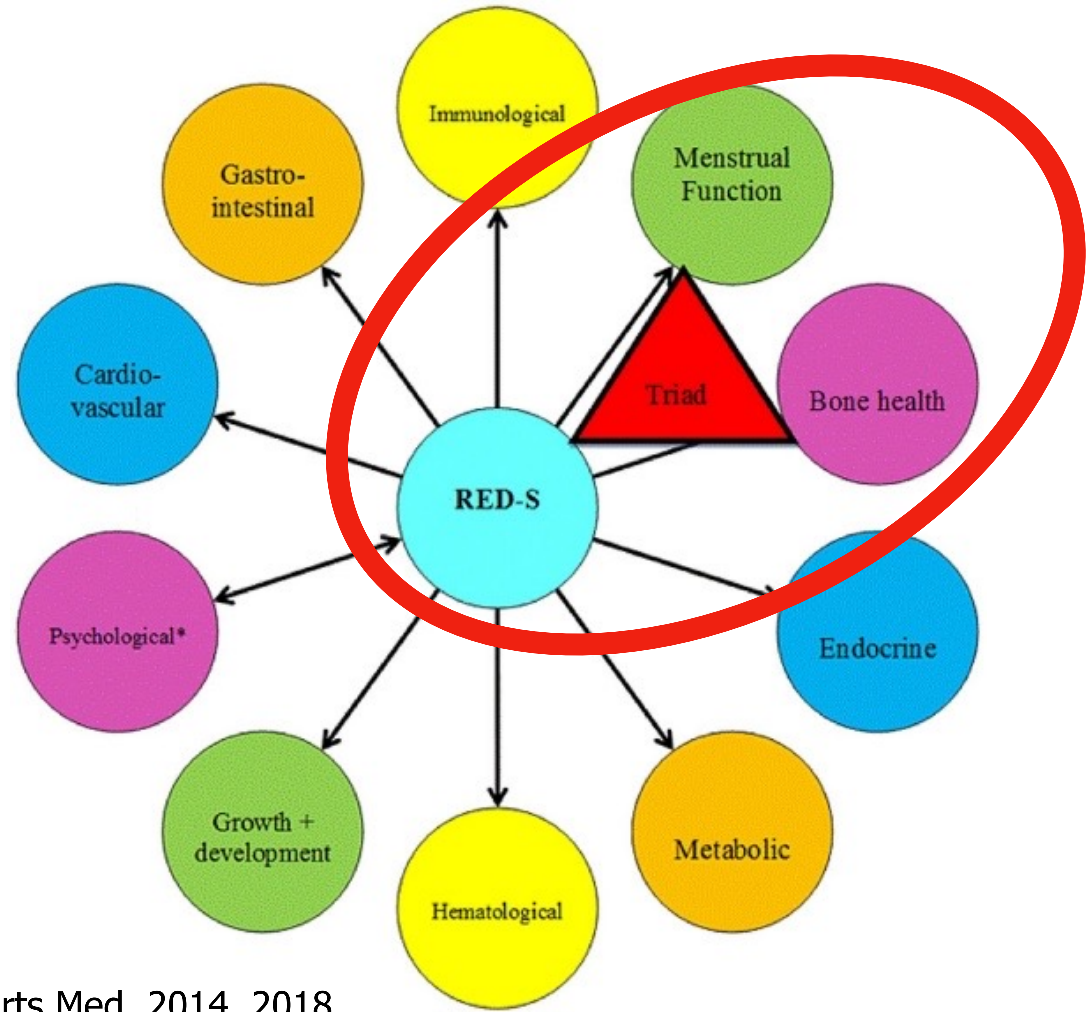
Norris, ML. Int J Eat Disord, 2016.

Ackerman KE, et al. Br J Sports Med, 2018.

Age of Onset of DE/ED

- Adult elite athletes diagnosed with DE/EDs report having started dieting and developing problems during puberty/adolescence
  - Peak onset is adolescence, when females especially experience rapid changes in body composition and shape

RED-S/Triad



Mountjoy M, et al. Br J Sports Med, 2014, 2018.

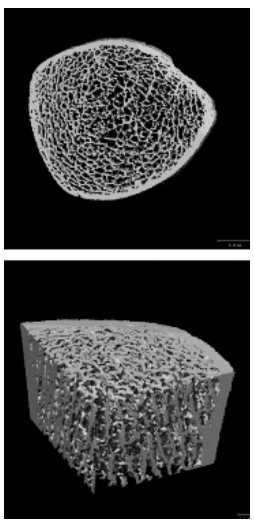
Interrelationship of Components of the Triad

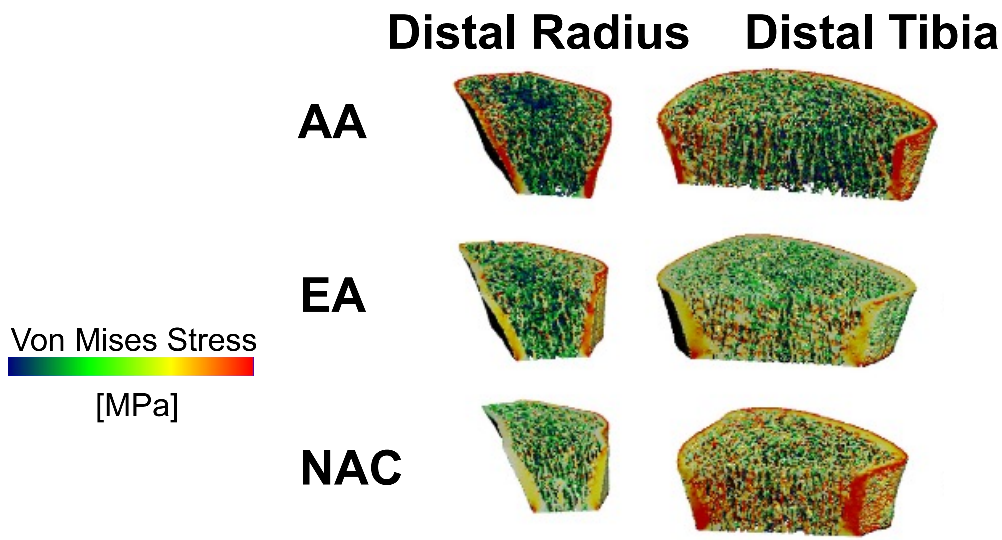
- Low energy availability
  - ↓ **BMI, fat mass, & lean mass**
  - ↓ **in FSH, LH, estradiol, androgens**
  - ↓ **insulin, glucose, IGF-1, T_3, and leptin**
  - ↑ **in fasting PYY, ghrelin, cortisol, and GH resistance**

Gordon C, et a. JCEM, 2017.
Ackerman K and Misra M. "Neuroendocrine Abnormalities in Female Athletes" in The Female Athlete Triad- A Clinical Guide, 2015.

Bone Density and Structure in Adolescent Athletes

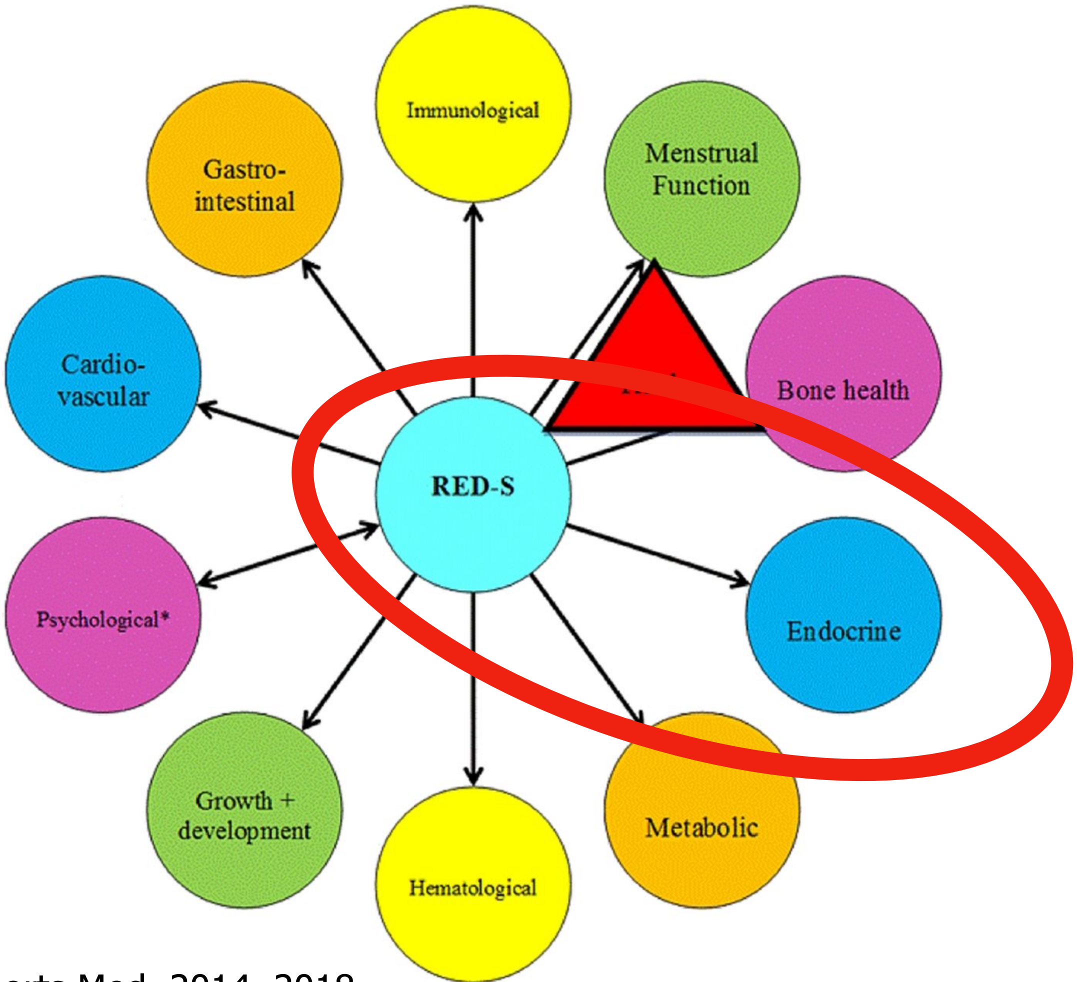
- Athletic activity → ↑ cross-sectional bone area at tibia
- **Amenorrhea in athletes →**
  ↓ trabecular # & ↓ cortical thickness →
  ↓ trabecular & total BMD → decreased stiffness and failure load → higher risk of bone stress injury





Ackerman KE, et al. J Clin Endocrinol Metab, 2011; Ackerman KE, et al. Bone, 2012; Ackerman KE, et al. Med Sci Sports Exerc, 2015.

RED-S Health Consequences



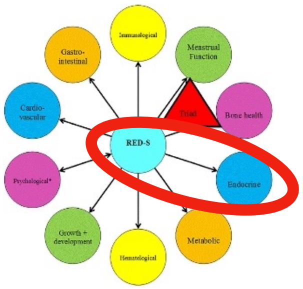
Mountjoy M, et al. Br J Sports Med, 2014, 2018.

Endocrine Changes with RED-S

	Females	Males
Hypothalamic-Pituitary-Gonadal Axis		
LH	↔, ↓	↑, ↔, ↓
FSH	↔	↓
Estradiol	↓	↓
Testosterone	↑, ↔, ↓	↔, ↓
Progesterone	↓	
Energy Homeostasis, Appetite		
Resting metabolic rate	↓	↓
Leptin	↓	↓
Adiponectin	↑, ↔	
Ghrelin	↑	↔
Peptide YY	↑	↑
Oxytocin	↓	↓
Insulin	↓	↓
Amylin	↓	

	Females	Males
Hypothalamic-Pituitary-Adrenal Axis		
Cortisol	↑, ↔	↔
Hypothalamic-Pituitary-Thyroid Axis		
TSH	↔	↔
T3	↓	↓
Free T3	↓	↓
T4	↑, ↔, ↓	↓
Free T4	↔, ↓	↓
Growth Hormone and IGF-1 Axis		
GH	↑	↑
IGF-1	↔, ↓	↑, ↓
IGF binding protein-1	↑	↑

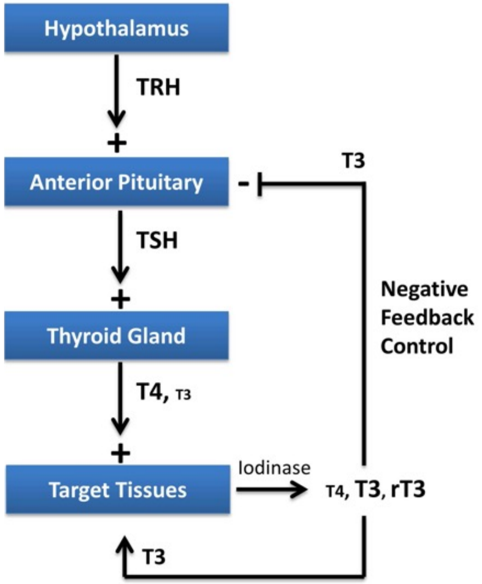
Elliott-Sale K, et al…Ackerman KE. IJSNEM, 2018.



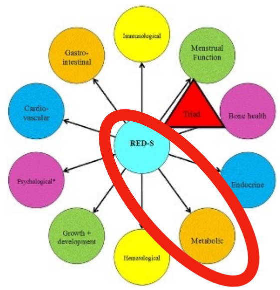
RED-S → Endocrine

T3

- Thyroid
  - 32 subject cross-sectional study: **lower** T4 & **T3 in AA** vs. EA and HC
  - 27 subjects: AA, EA, and HC
    - **TSH response to TRH stimulation was blunted in AA** vs. EA
  - 27 eumenorrheic non-athletes:
    - 4 days of exercise but different energy availabilities
    - **↓ in T3 and free T3** between 19 and 25 kcal/kg FFM/day
    - ↑ in T4 and rT3 between 10.8 and 19 kcal/kg FF/day



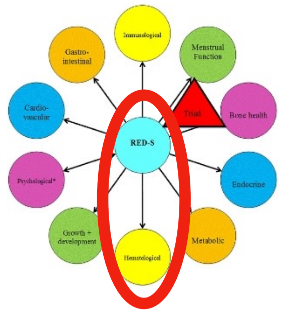
Harber VJ, et al. Can J Appl Physiol, 1998.
Loucks AB and Health EM, A J Phys, 1994.
Loucks AB, et al. J Clin Endocrinol Metab, 1992.



RED-S → Metabolic

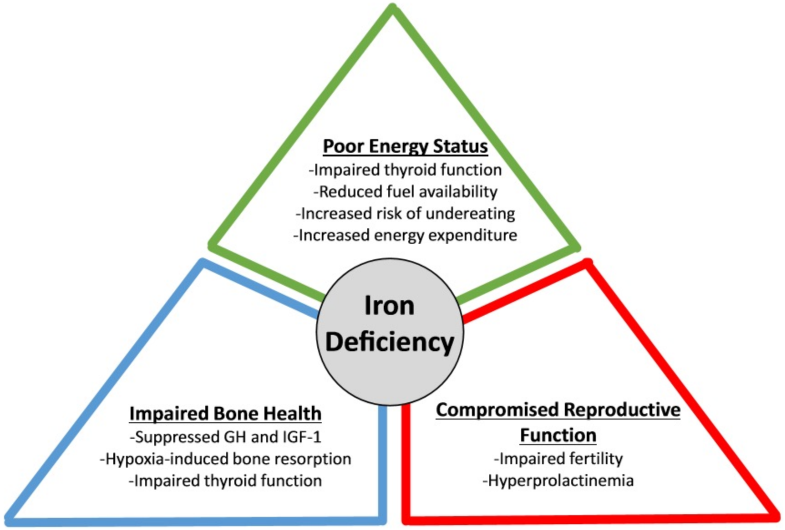
- Metabolic Rate
  - Small study of normal weight women (n=25)
    - different exercise and caloric intake alterations for 3 months
  - **SEV: -1062±80 kcal per day (n=9), MOD: -633±71 kcal per day (n=7), or BAL: (n=9)**
  - Weight loss occurred in SEV (3.7kg) and MOD (2.7kg), but significantly less than predicted (SEV: 11.1kg; MOD: 6.5kg)
  - **RMR ↓ by 6±2% in MOD**
  - In SEV, RMR did not change for entire group, but those whose RMR ↓ lost more weight and had a higher baseline RMR than those whose RMR did not ↓
  - Expected changes in leptin, T3, IGF-1, and ghrelin occurred only in SEV
  - **The energy deficit and adaptive changes in RMR explained 54% of weight loss**

Koehler K, et al. Eur J Clin Nutr, 2017.

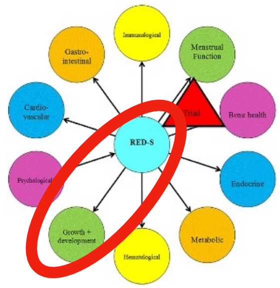


RED-S → Hematological (↔)

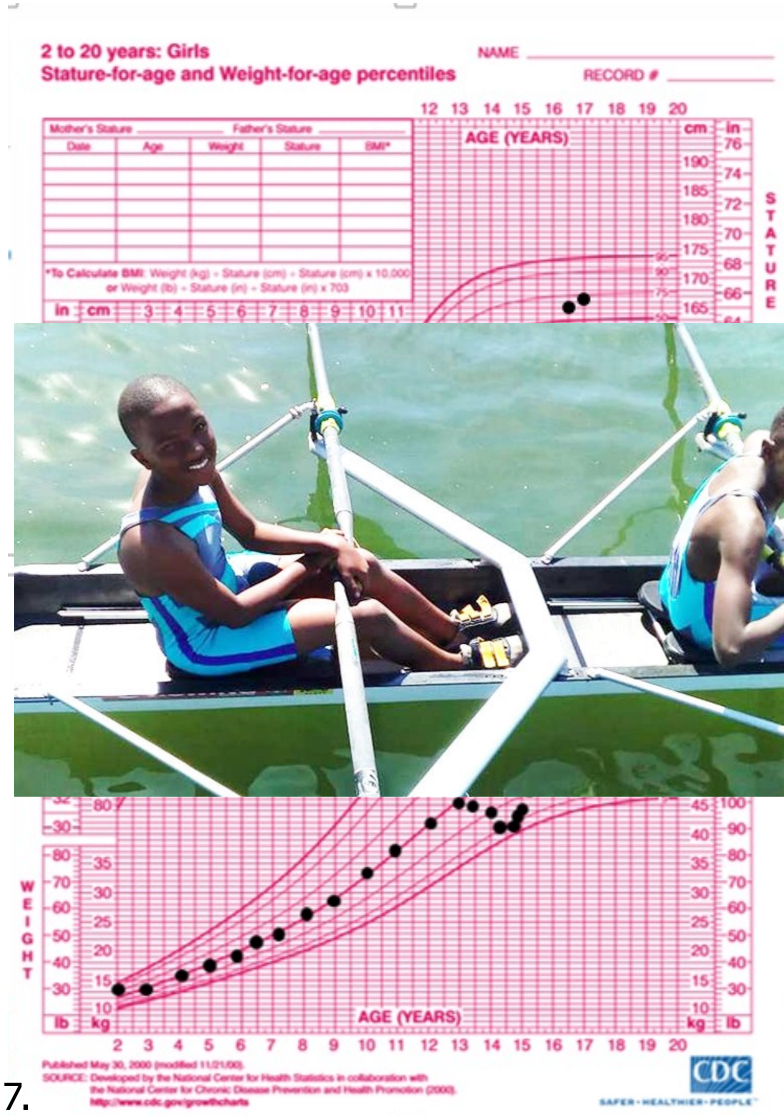
- Many athletes with reduced energy availability have iron deficiency
- Iron deficiency may worsen the hypometabolic state associated with decreased energy availability
  – T4 synthesis & T4→T3 conversion
- Iron deficiency may **promote** energy deficiency
  – Shifts ATP production from oxidative phosphorylation to anaerobic pathways
- Iron needed for reproductive function
  – Follicular development and corpus luteum function
- Bone health may be further impaired by iron deficiency



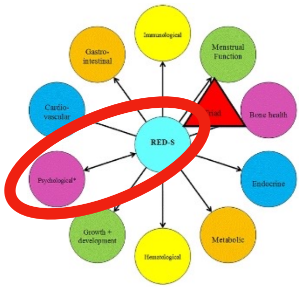
Petkus DL, et al. Sports Med, 2017.



RED-S → Growth & Development



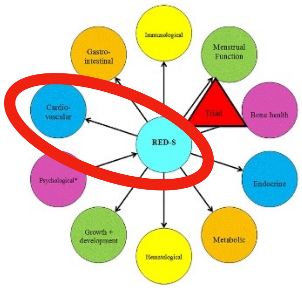
Kapczuk K. Minerva Pediatra, 2017.



RED-S ↔ Psychological

- **Drive for Thinness (DT)** was assessed in exercising and sedentary women (n=52) using the Eating Disorder Inventory
  - Athletes with high DT (vs. athletes and non-athletes with normal DT)
    - Scored higher on questions re: Bulimia, Inefffectiveness, and Cognitive Restraint
    - Experienced more oligo/amenorrhea vs. other 2 groups
    - Had lower REE (kj/kg of FFM) and actual REE/predicted REE; more were classified as "energy deficient" (66% vs. 27% in the other groups)
    - Had lower total T3 and higher ghrelin
  - Significant negative correlation between DT and Total T3, adjusted REE; positive correlation between DT and ghrelin
- **Adult lightweight male rowers**: High levels of cognitive control of eating accompanied with body dissatisfaction under hunger but not satiety

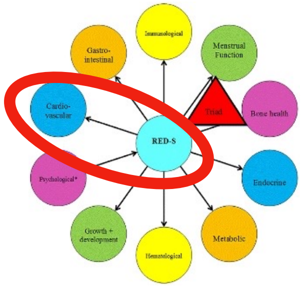
De Souza MJ, et al. Appetite, 2007. Pietrowsky R and Straub K. Eat Weight Disord, 2008.



RED-S → Cardiovascular

- Estrogen stimulates vascular endothelium, leading to increased endothelial-derived nitric oxide (NO) → vasodilation
- NO also has anti-atherosclerotic properties
  - inhibition of platelet aggregation
  - smooth muscle proliferation
  - leukocyte adhesion
  - LDL oxidation
- Estrogen and regular aerobic physical activity are *independently* associated with enhanced synthesis &/or bioavailability of endothelial NO

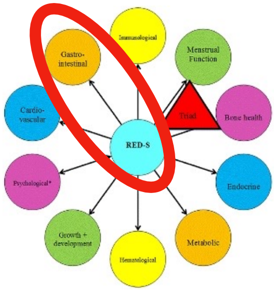
Rickenlund A, et al. J Clin Endocrinol Metab, 2005. O'Donnell E, et al. J Clin Endocrinol Metab, 2011.



RED-S → Cardiovascular

- Flow-mediated dilation (FMD)
  - can assess endothelial function in the brachial artery
  - 95% positive predictive value of abnormal brachial dilation in predicting coronary endothelial dysfunction
  - **FMD lower in AA vs. OA and EA**
    - Serum estrogen levels positively correlated with vascular function
    - Restored vascular function was associated with ↑ estrogen levels in AA who became eumenorrheic

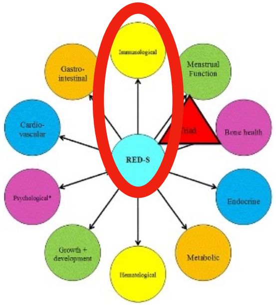
Zeni Hoch A, et al. Med Sci Sports Exerc, 2003.
Rickenlund A, et al. J Clin Endocrinol Metab, 2005.
Yoshida N, et al. Arterioscler Thromb Vasc Biol, 2006.
Hoch AZ, et al. Clin J Sport Med, 2011.



RED-S → Gastrointestinal

- Systematic Review of 123 articles of patients with anorexia nervosa
  - Delayed gastric emptying, increased intestinal transit time, and constipation
  - Elevated liver enzymes
- Our 1000 patient survey
  - 1.5x greater odds of GI complaints with Low EA vs. Adequate EA (95% CI 1.19-1.92, $p<0.0001$)

Norris, ML. Int J Eat Disord, 2016. Ackerman KE, et al. Br J Sports Med, 2018.

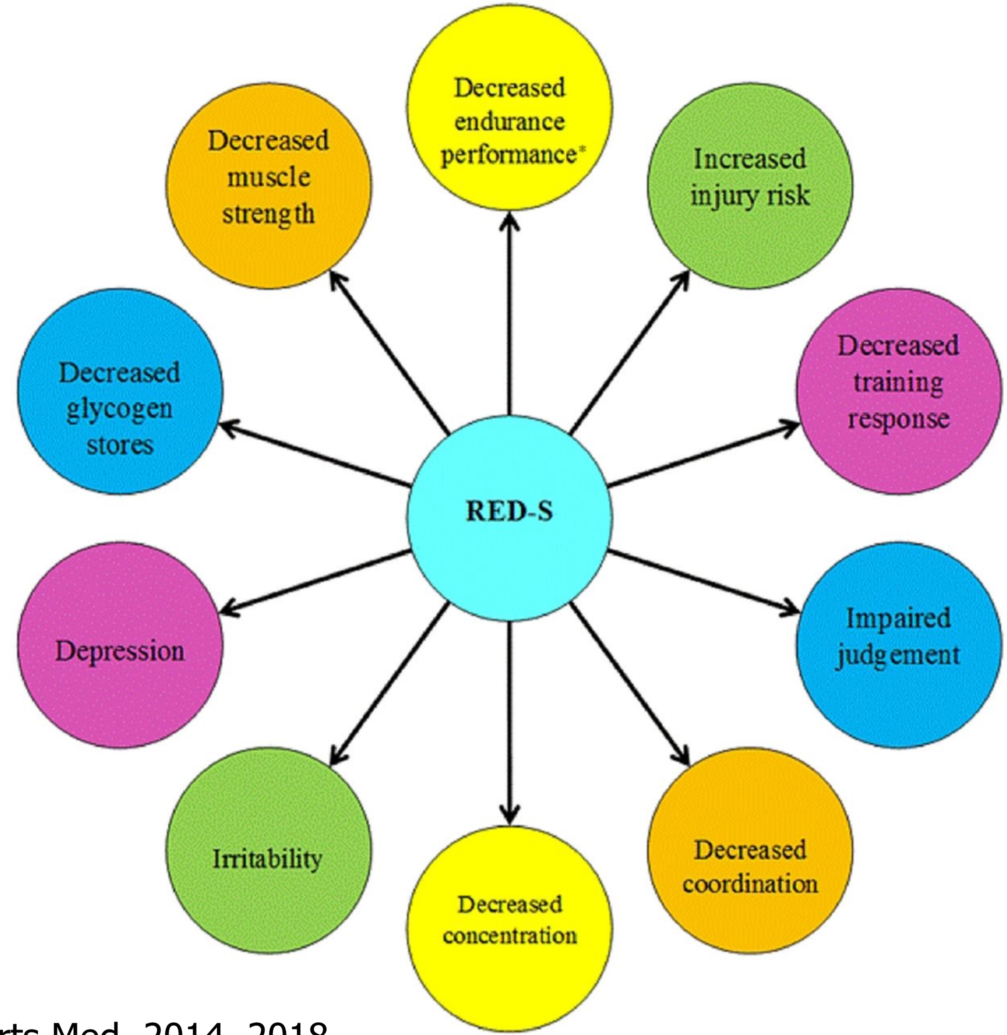


RED-S → Immunological

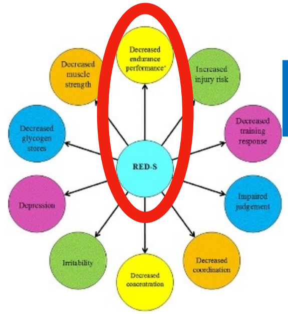
- Athletes with high training loads often experience impaired immune function and frequent URIs
- ↓ salivary IgA correlates to ↑ upper respiratory infections (URIs)
- Salivary IgA correlates with salivary estradiol
- Study of 21 Japanese elite, collegiate runners (13 AA, 8 EA)
  - Salivary IgA levels, serum 17β-estradiol and progesterone, and # of URI symptoms in last month
  - AA had lower levels of serum estradiol and IgA secretion, and more URI symptoms
- Elite Australian athletes prepping for Rio 2016
  - Low EA measured by LEAF-Q
    - ↑ odds of illnesses (e.g.upper respiratory and GI tracts), body aches, and head-related symptoms in prior month

Drew MK, et al. J Sci Med Sport, 2017. Drew M, et al. Br J Sports Med, 2018.

Potential Performance Effects of RED-S



Mountjoy M, et al. Br J Sports Med, 2014, 2018.

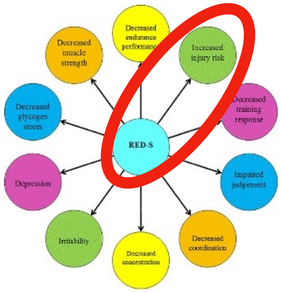


RED-S → Decreased Endurance Performance

- 10 junior elite female swimmers (15-17 years)
  - Cyclic (CYC) or Ovarian suppressed (OVS) based on E_2 and P_4 levels
  - Monitored q2 weeks over 12 weeks
  - OVS had suppressed E_2 and P_4 levels throughout season and had ↓ T3 and IGF-1 at week 12 vs. CYC
  - Energy intake and energy availability lower in OVS
  - **OVS had a 9.8% ↑ in 400m swim time while CYC had an 8.2% ↓**

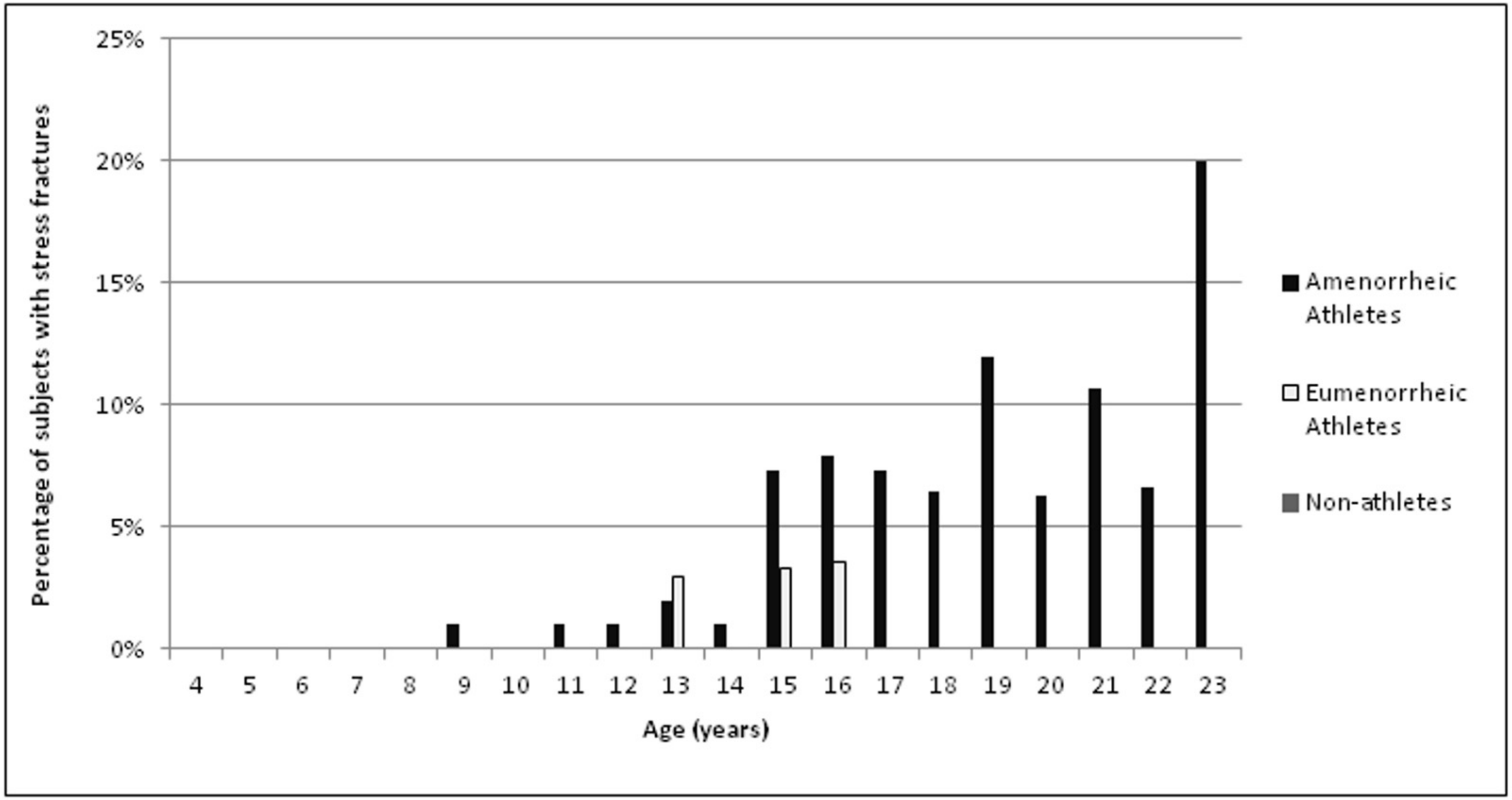
- Survey: 1.47x greater odds of decreased endurance performance with Low EA vs. Adequate EA (95% CI 1.08-2.02, p=0.02)

Vanheest JL, et al. Med Sci Sports Exerc, 2014. Ackerman KE, et al. Br J Sports Med, 2018.

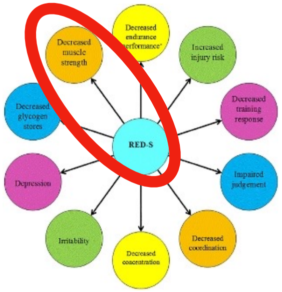


RED-S → Injury Risk

Proportion of AA, EA, and NAC with Stress Fracture each Year



Ackerman KE, et al. Med Sci Sports Exerc, 2015.



RED-S → Decreased Muscle Strength

- Neuomuscular performance assessed in elite amenorrheic athletes (AA) and eumenorrheic athletes (EA)
  - Knee muscular strength and knee muscular endurance worse in AA (11% and 20% ↓) and reaction time was 7% longer vs. EA
  - ↓ leg FFM, glucose, estrogen, T3, and ↑ cortisol levels correlated with the findings

Tornberg AB, et al. MSSE, 2018.

Diagnosing Triad and RED-S

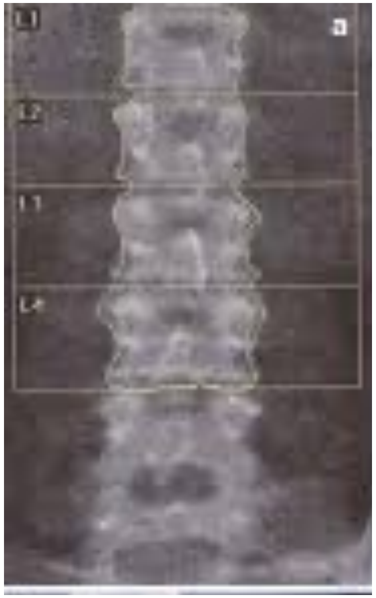
- The medical professional can often spot it, but we need to prove it to the athlete!
  - Signs, symptoms, etc.

- Amenorrhea (low FSH, LH, estradiol), decreased libido, low WBC, low iron/ferritin, low T3, low Vit D, increased LFTs, altered lipids, decreased performance, decreased BMD, low BMI, low fat mass

- Treatment: *NOT OCP*. Improve nutrition, training, and mental health. Transdermal estrogen may be an adjunct option in some women.

Mountjoy M, et al. Br J Sports Med, 2018. Ackerman KE, et al. Br J Sports Med, 2018.

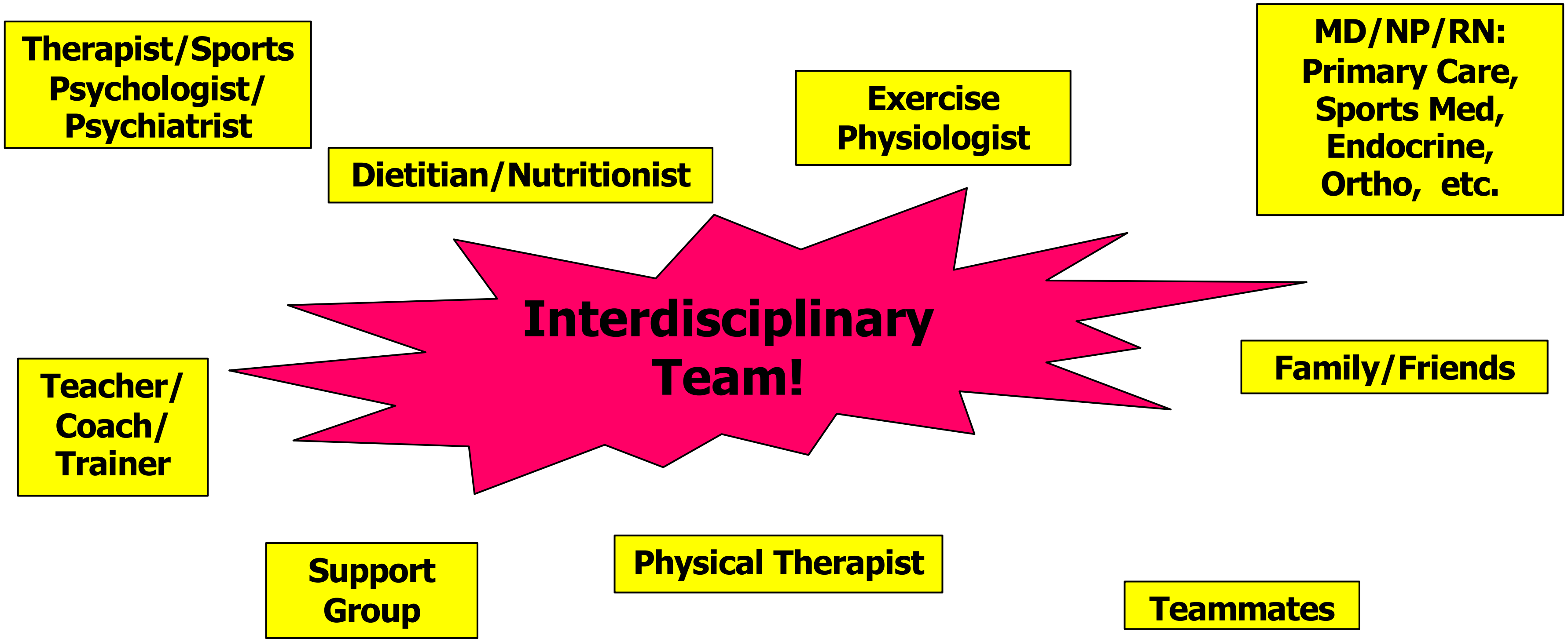
Imaging



- DXA (with bone age in children and adolescents)

- Z-score < -1.0
  - Investigate further

Triad/RED-S Treatment



FATC's Return to Play Approach

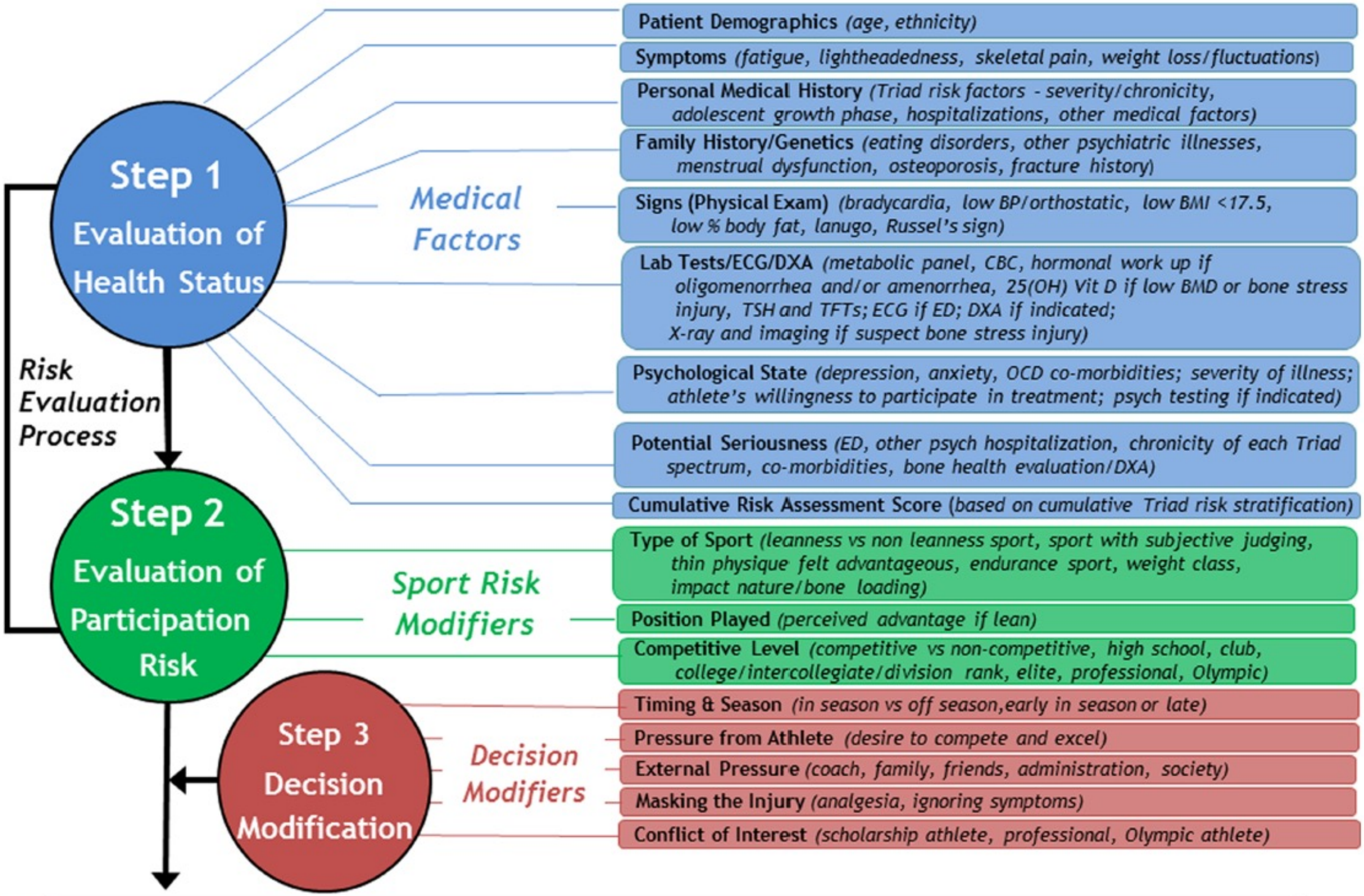
Risk Factors	Magnitude of Risk		
	Low Risk = 0 points each	Moderate Risk = 1 point each	High Risk = 2 points each
Low EA with or without DE/ED	☐ No dietary restriction	☐ Some dietary restriction‡; current/past history of DE;	☐ Meets DSM-V criteria for ED*
Low BMI	☐ BMI ≥ 18.5 **or** ≥ 90% EW** or weight stable	☐ BMI 17.5 < 18.5 **or** < 90% EW **or** 5 to < 10% weight loss/month	☐ BMI ≤17.5 **or** < 85% EW **or** ≥ 10% weight loss/month
Delayed Menarche	☐ Menarche < 15 years	☐ Menarche 15 to < 16 years	☐ Menarche ≥16 years
Oligomenorrhea and/or Amenorrhea	☐ > 9 menses in 12 months*	☐ 6-9 menses in 12 months*	☐ < 6 menses in 12 months*
Low BMD	☐ Z-score ≥ -1.0	☐ Z-score -1.0*** < - 2.0	☐ Z-score ≤ -2.0
Stress Reaction/Fracture	☐ None	☐ 1	☐ ≥ 2; ≥ 1 high risk or of trabecular bone sites†
Cumulative Risk (total each column, then add for total score)	**_____ points +**	**_____ points +**	**_____ points = _____ Total Score**

De Souza MJ, et al. Br J Sports Med, 2014.

FATC’s Return to Play

	Cumulative Risk Score*	Low Risk	Moderate Risk	High Risk
Full Clearance	0 – 1 point	☐		
Provisional/Limited Clearance	2 – 5 points		☐ Provisional Clearance ☐ Limited Clearance	
Restricted from Training and Competition	≥ 6 points			☐ Restricted from Training/ Competition-Provisional ☐ Disqualified

De Souza MJ, et al. Br J Sports Med, 2014.



De Souza MJ, et al. Br J Sports Med, 2014.

IOC's RED-S CAT

HIGH RISK: NO START RED LIGHT	MODERATE RISK: CAUTION YELLOW LIGHT	LOW RISK: GREEN LIGHT
- Anorexia nervosa and other serious eating disorders - Other serious medical (psychological and physiological) conditions related to low energy availability - Use of extreme weight loss techniques leading to dehydration induced hemodynamic instability and other life threatening conditions.	- Prolonged abnormally low % body fat measured by DXA* or anthropometry - Substantial weight loss (5–10 % body mass in one month) - Attenuation of expected growth and development in adolescent athlete	- Appropriate physique that is managed without undue stress or unhealthy diet/exercise strategies
	- Low **EA of prolonged and/or severe nature	- Healthy eating habits with appropriate EA
	- Abnormal menstrual cycle: functional hypothalamic amenorrhea >3 months - No menarche by age 15y in females	- Healthy functioning endocrine system
	- Reduced bone mineral density (either in comparison to prior DXA or Z-score <-1 SD). - History of 1 or more stress fractures associated with hormonal/menstrual dysfunction and/or low EA	- Healthy bone mineral density as expected for sport, age and ethnicity - Healthy musculoskeletal system
- Severe ECG abnormalities (i.e. bradycardia)	- Athletes with physical/psychological complications related to low EA+/-disordered eating; - Diagnostic testing abnormalities related to low EA +/-disordered eating	
	- Prolonged relative energy deficiency - Disordered eating behavior negatively affecting other team members - Lack of progress in treatment and/or non-compliance	

HIGH RISK RED LIGHT	MODERATE RISK YELLOW LIGHT	LOW RISK GREEN LIGHT
- No competition - No training - Use of written contract	- May train as long as he/she is following the treatment plan - May compete once medically cleared under supervision	- Full sport participation

Mountjoy M, et al. Br J Sports Med, 2015.

Teenage Female Athlete

- Eating disorder
- No menarche by age 15.5 years
- 2 or more stress fractures
- Fall off growth curve

Teenage Female Athlete

A proposed classification of degree of malnutrition for adolescents and young adults with eating disorders

	Mild	Moderate	Severe
%mBMI[a]	80%–90%	70%–79%	<70%
BMI *z* score	−1 to −1.9	−2 to −2.9	−3 or Greater
Weight loss	>10% Body mass loss	>15% Body mass loss	>20% Body mass loss in 1 year or >10% body mass loss in 6 months

One or more of the terms would suggest mild, moderate, or severe malnutrition.
BMI = body mass index.
[a] Percent median BMI.

Society for Adolescent Health and Medicine, et al. J Adolesc Health, 2015.

Case Scenario #1

- 13 year old dancer referred to me for bone health
  - BMI 13.8, **BMI Z-score -2.62, %mBMI 74.2%**
  - Primary amenorrhea
  - Has had 1 stress fracture
  - Fall off of growth chart
  - “Picky eater”

Female Athlete Triad Coalition's Return to Play Approach

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Low EA with or without DE/ED	☐ No dietary restriction	☐ Some dietary restriction‡; current/past history of DE;	☒ Meets DSM-V criteria for ED*
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Delayed Menarche	☐ Menarche < 15 years	☐ Menarche 15 to < 16 years	☐ Menarche ≥16 years
Oligomenorrhea and/or Amenorrhea	☐ > 9 menses in 12 months*	☐ 6-9 menses in 12 months*	☐ < 6 menses in 12 months*
Low BMD	☐ Z-score ≥ -1.0	☐ Z-score -1.0*** < - 2.0	☒ Z-score ≤ -2.0
Stress Reaction/Fracture	☐ None	☐ 1	☒ ≥ 2; ≥ 1 high risk or of trabecular bone sites†
Cumulative Risk (total each column, then add for total score)	____ **points** +	____ **points** +	8 **points** = 8 **Total Score**

De Souza MJ, et al. Br J Sports Med, 2014.

Case Scenario #1

- Has Adolescent Medicine MD, FBT Therapist, Dietitian
- Mom wants 2nd opinion
- Reinforced messages from other providers
  - United front
- DXA and Bone Age
  - More proof of health detriments
- Slow weight gain, 4 more stress reactions/fractures at once!
- Good Cop/Bad Cop
- HLC STAT!

Case Scenario #2

- 19 yo college runner
  - BMI 19.6
  - Gets 10 menstrual cycles/year since age 15.5 yrs
  - Has had 1 tibia stress fracture
  - Lumbar BMD Z-score of -1.1
  - Denies dietary restriction

Female Athlete Triad Coalition's Return to Play Approach

Risk Factors	Magnitude of Risk		
	Low Risk = 0 points each	Moderate Risk = 1 point each	High Risk = 2 points each
Low EA with or without DE/ED	☐ No dietary restriction	☐ Some dietary restriction‡; current/past history of DE;	☐ Meets DSM-V criteria for ED*
Low BMI	☒ BMI ≥ 18.5 **or** ≥ 90% EW** or weight stable	☐ BMI 17.5 < 18.5 **or** < 90% EW **or** 5 to < 10% weight loss/month	☐ BMI ≤17.5 **or** < 85% EW **or** ≥ 10% weight loss/month
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Low BMD	☐ Z-score ≥ -1.0	☒ Z-score -1.0*** < - 2.0	☐ Z-score ≤ -2.0
Stress Reaction/Fracture	☐ None	☒ 1	☐ ≥ 2; ≥ 1 high risk or of trabecular bone sites†
Cumulative Risk (total each column, then add for total score)	____ **points** +	**3** **points** +	____ **points** = **3** **Total Score**

De Souza MJ, et al. Br J Sports Med, 2014.

Case Scenario #2

- Recommend meeting with sports dietitian
- Check calcium, phosphorus, magnesium, and vitamin D level and make age appropriate calcium and D recommendations
- Recommend gait assessment
- Allow full running if pain-free
- Suggest referral to sports psychologist

Case Scenario #3

- 21 year old lightweight rower. Competes at weight of 129 for 130 lb. weight class in college and wants to train for US team.
  - BMI 19.5
  - 5 periods a year
  - Menarche at age 16
  - Admits to restricting some in high school and restricting carbs to lose weight in-season
  - Had tibia stress fracture in high school with track and had rib stress fracture junior year of college
  - Lumbar BMD Z-score of -1.8

Female Athlete Triad Coalition's Return to Play Approach

Risk Factors	Magnitude of Risk		
	Low Risk = 0 points each	Moderate Risk = 1 point each	High Risk = 2 points each
Low EA with or without DE/ED	☐ No dietary restriction	☒ Some dietary restriction‡; current/past history of DE;	☐ Meets DSM-V criteria for ED*
Low BMI	☒ BMI ≥ 18.5 **or** ≥ 90% EW** or weight stable	☐ BMI 17.5 < 18.5 **or** < 90% EW **or** 5 to < 10% weight loss/month	☐ BMI ≤17.5 **or** < 85% EW **or** ≥ 10% weight loss/month
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Stress Reaction/Fracture	☐ None	☐ 1	☒ ≥ 2; ≥ 1 high risk or of trabecular bone sites†
Cumulative Risk (total each column, then add for total score)	____ **points** +	2 **points** +	6 **points** = 8 **Total Score**

De Souza MJ, et al. Br J Sports Med, 2014.

Case Scenario #3

- Follow-up with sports dietitian to increase caloric and carb intake
- Consider exercise physiologist if available to discuss mild weight fluctuations with training
  - Use DXA results to determine body comp. to see if lightweight rowing after college is realistic and safe
- Metabolic bone work-up
- Recommend sports psychologist to discuss goals and eating
- Consider hormonal therapy down the line if menses do not become more consistent and BMD decreases

Case Scenario #4

- 22 year old college basketball player with significant history of AN. On leave from school to deal with ED.
  - BMI 20.3
  - Menses: none in 1.5 years
  - Menarche age 14.5 years
  - Living at home and weight stable
  - BMD: within normal limits
  - Exercise: restricted by recent inpatient and IOP

Female Athlete Triad Coalition's Return to Play Approach

Risk Factors	Magnitude of Risk		
	Low Risk = 0 points each	**Moderate Risk = 1 point each**	**High Risk = 2 points each**
Low EA with or without DE/ED	☐ No dietary restriction	☐ Some dietary restriction‡; current/past history of DE;	☒ Meets DSM-V criteria for ED*
Low BMI	☒ BMI ≥ 18.5 **or** ≥ 90% EW** or weight stable	☐ BMI 17.5 < 18.5 **or** < 90% EW **or** 5 to < 10% weight loss/month	☐ BMI ≤17.5 **or** < 85% EW **or** ≥ 10% weight loss/month
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Stress Reaction/Fracture	☒ None	☐ 1	☐ ≥ 2; ≥ 1 high risk or of trabecular bone sites†
Cumulative Risk (total each column, then add for total score)	____ **points** +	____ **points** +	**4** **points** = **4** **Total Score**

De Souza MJ, et al. Br J Sports Med, 2014..

Case Scenario #4

- Sports dietitian
- Frequent appointments with sports psychologist
- Allow some exercise as reward for following recommendations and keeping appointments
- Monitor closely with medical appointments
- Consider sports-based ED program

Case Scenario #5- Olympian

- Emphasize performance
- Put a Band-Aid on the problem temporarily
- You can't ban them from participation
- Keep them safe and the hard work starts after the Olympics

Case Scenario #6: Recreational Masters Athlete

- Can't control Return to Play
- Try to determine drive behind the behavior and bring in Therapist ASAP
- Emphasize health and performance consequences
- Long process
- Less easy to find a carrot to dangle in front
  - (your visits?)

Determining if an Athlete with an ED is Appropriate for Outpatient Treatment

- Patient is medically and psychiatrically stable
- During visits, the patient must recognize his or her low weight
- The patient must admit a problem and show motivation towards getting better
- Trust has to be built
- Patient makes progress between visits

Future Directions

- Studies exploring other health and performance effects of low energy availability in female, male, able body and disabled athletes
- Studies determining efficacy of return to play protocols and validation of screening tools
- Definitive hormonal and other therapy studies
- More awareness and prevention programs

Thank you!

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