Women’s Health Issues in Sports: Another Look at The Female Athlete Triad

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Objectives

- Define the female athlete triad and RED-S
- Discuss components of triad and RED-S
- Discuss long and short term effects of these conditions
- Discuss the multidisciplinary approach to treatment of these issues
- Discuss return to play considerations
Female Athlete Triad Definition

△Low energy availability (EA) with or without disordered eating (DE)
△Menstrual dysfunction (MD)
△Low bone mineral density (BMD)
Relative Energy Deficiency in Sport (RED-S)

- Impaired physiological function resulting from relative energy deficiency affecting:
  - metabolic rate
  - menstrual function
  - bone health
  - Immunity
  - protein synthesis
  - cardiovascular health
  - psychological health
How common is it?

△ Systematic Review of 65 studies n= 10,498 ages 21.8±3.5 yrs
  • Triad Conditions in 9 studies including n= 991
△ Prevalence of 1 condition: 16%-60%
△ Prevalence of 2 conditions: 2.7%-27%
△ Prevalence of all 3 conditions: 0-15.9%
△ Lean Sport vs Non Lean Sport
  • High prevalence rates of menstrual dysfunction and low BMD
Energy Deficiency & Physiology
Determining Energy Optimization/Deficiency

\[ \Delta \text{Overt Low EA: BMI} < 17.5 \text{ kg/m}^2 \text{ or } <85\% \text{ of expected body weight (IBW)} \]
\[ \Delta \text{Low EA} < 30 \text{ kcal/kg FFM} \]
\[ \Delta \text{Optimal EA} \geq 45 \text{ kcal/kg FFM} \]

\[ \Delta \text{IBW} = 100 \text{lbs for first 5’} + 5 \text{lbs per inch above 5’} \]

\[ \Delta \text{Fat Free Mass (FFM): via DXA, air displacement, calipers, bioelectrical impedance} \]
Endocrine Response to Energy Deficiency
Eating Disorders and Disordered Eating
Eating Disorders

△DSM-V Diagnoses

- Anorexia
- Bulimia
- Binge ED
- Other or Unspecified Feeding/ED

△Risk Factors:

- Dieting, depression, personality factors, pressure to lose weight, frequent weight cycling, early start of sport-specific training, overtraining, recurrent and non healing injuries, inappropriate coaching behavior
Screening Questions

**Screening questions**

- Have you ever had a menstrual period?
- How old were you when you had your first menstrual period?
- When was your most recent menstrual period?
- How many periods have you had in the past 12 months?
- Are you presently taking any female hormones (estrogen, progesterone, birth control pills)?
- Do you worry about your weight?
- Are you trying to or has anyone recommended that you gain or lose weight?
- Are you on a special diet or do you avoid certain types of foods or food groups?
- Have you ever had an eating disorder?
- Have you ever had a stress fracture?
- Have you ever been told you have low bone density (osteopenia or osteoporosis)?
Menstrual Dysfunction

- Anovulation
- Amenorrhea
- Luteal dysfunction
- Oligomenorrhea
History and Examination

Initial Investigation (based on H&P)
- LH, FSH, hCG
- Prolactin
- TSH, free T4
- Estradiol, testosterone (total and free), DHEA/S ± 8AM 17(OH) progesterone
- Progesterone challenge test
- ± Pelvic ultrasound

Uterine pathology or outflow tract disorder
Disorders of sexual differentiation

Rule out Pregnancy

Low to normal gonadotropins
- Negative progesterone challenge test
- Possibly ↑ prolactin

Normal gonadotropins
- Possibly ↑ LH/FSH
- ↑ Total/free testosterone
- Positive progesterone challenge test

↑ Gonadotropins
- Negative progesterone challenge test

Abnormal TSH, prolactin, DHEA/S or 8 AM 17(OH) progesterone

FINDINGS

D I A G N O S I S

Hypothalamic-pituitary etiology
- Rule out outflow tract obstruction if not done so previously
- Consider FHA (prolactin typically not elevated)*

Chronic anovulation/PCOS

Primary ovarian insufficiency

Specific investigation of endocrine disorder
Bone Health
What about those Bones?

**Cortical vs. Trabecular**
- Cortical- accumulate from conception – 3rd decade
- Trabecular- peak mass achieved 2nd decade

ΔAge 12-16 years= women gain **40%** of their adult bone mass

ΔWomen attain >95% of total BMD by age 18

Δ1% bone mineral density (BMD) loss per year starting in early 30’s
Peak Bone Mass

Δ Determined by genetics, nutritional factors, exercise, puberty, and hormonal status

Δ Body weight
Δ Calcium and Vitamin D
Δ Physical activity
Δ Puberty - Late menarche ≥15 years old
Δ Hormonal Status - estrogen deficiency
Bone Mineral Density

△Use Z scores in children, adolescents and pre-menopausal women

△Screen per Triad risk stratification (next slide)

△May require BMD testing every 1-2 years

<table>
<thead>
<tr>
<th>Sites</th>
<th>Females ≥ 20y</th>
<th>Children, adolescents, Female &lt;20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wt bearing site: PA spine, total hip, femoral neck</td>
<td>PA lumbar spine bone mineral content (BMC) and areal BMD</td>
<td></td>
</tr>
<tr>
<td>Non wt bearing site if unable (Radius)</td>
<td>Whole body less head if possible BMC and BMD</td>
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<tr>
<td></td>
<td>Adjust for growth or maturational delay</td>
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<td></td>
<td>Report height adjusted Z score</td>
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</tbody>
</table>
Who Needs a Dual Energy X-ray Absorptiometry?*

Either one or more of the following

- History of eating disorder
- BMI \( \leq 17.5 \text{ kg/m}^2 \), <85% estimated weight, or recent weight loss of \( \geq 10\% \) in 1 month
- Menarche \( \geq \) age 16 years
- <6 menstrual cycles over a 12-month period
- Two prior stress injuries, one high-risk stress injury, or a low-energy nontraumatic fracture
- Z-score of < -2 at least 1 year from baseline DXA

Or two or more of the following

- History of \( \geq 6 \) months of disordered eating
- BMI 17.5 to 18.5 kg/m\(^2\), <90% estimated weight, or recent weight loss of 5% to 10% in 1 month
- Menarche age between 15 and 16 years
- 6 to 8 menstrual cycles over a 12-month period
- One prior stress injury
- Z-score between -1 and -2 at least 1 year from baseline DXA

Additional considerations

- History of \( \geq 1 \) central or \( \geq 2 \) peripheral long-bone traumatic fractures in the presence of 1 or more of the above risk factors
- \( \geq 6 \) months of medication use that may impact bone health
- Repeat testing every 1 to 2 years to evaluate treatment and look for ongoing bone loss
**TABLE 4 Evaluation for Low BMD (BMD < -1.0)**

- Serum 25-hydroxyvitamin D
- Serum calcium
- Complete blood count with differential
- Thyroid-stimulating hormone
- Parathyroid hormone
- Bone-specific alkaline phosphatase
- 24-h urine for calcium
- Screening for cortisol excess: morning cortisol or 24-h urine for cortisol
- Celiac disease: serum tissue transglutaminase antibodies, total IgA, tissue transglutaminase IgG (in the IgA-deficient adolescent)
- Markers of bone formation and resorption: serum osteocalcin and urine N-telopeptide
- Reproductive hormone evaluation: estradiol, FSH, LH in girls, testosterone in boys

FSH, follicle-stimulating hormone; IgA, immunoglobulin A; IgG, immunoglobulin G; LH, luteinizing hormone.

**Work up for Low Bone Mineral Density <-1.0**
Diagnosis of Low BMD and Osteoporosis

Table 2.
Definition of low BMD and osteoporosis in children and adolescents (aged 5 to 19).

The diagnosis of osteoporosis in children and adolescents requires the presence of both a clinically significant fracture history and low BMC or low BMD.

- A clinically significant fracture history is one or more of the following:
  - Long bone fracture of the lower extremities
  - Vertebral compression fracture
  - Two or more long-bone fractures of the upper extremities

- Low BMC or BMD<sup>a</sup> is defined as a BMC or areal BMD z-score that is less than or equal to −2.0, adjusted for age, gender, and body size, as appropriate.

Source: Lewiecki et al. (64).

<sup>a</sup> The ACSM defines low BMC or BMD as a z-score that is less than −1.0 in female athletes in weight-bearing sports (86).

Table 3.
Definition of low BMD and osteoporosis in premenopausal women.

- The diagnosis of osteoporosis in premenopausal women cannot be diagnosed on the basis of BMD alone.

- A BMD z-score of less than or equal to −2.0<sup>a</sup> is defined as “below the expected range for age.”

- A BMD z-score above −2.0 is “within the expected range for age.”

- Osteoporosis is diagnosed if there is a BMD z-score of less than or equal to −2.0 plus secondary causes of osteoporosis.

Source: Lewiecki et al. (64).

<sup>a</sup> ACSM defines low BMC or BMD as a z-score that is less than −1.0 in female athletes in weight-bearing sports (86).
Parallels in Men
Male Athletes

△Low energy availability with or without disordered eating, hypogonadotropic hypogonadism, low bone mineral density

△Nutritional deficits common in cyclists, jumpers, judo, wrestling, horse racing, light weight rowers, endurance athletes

△25% higher prevalence of ED in lean sport male athletes than non

△Labs: lower sperm count, reproductive hormones (LH, FSH), estradiol, testosterone, leptin, insulin

• When these values fall outside the normal levels they affect bone health
BMD in Men

- Peak bone mass accrual between ages 13-15 years
- Highest bone mass by age 20 years
- Endurance and weight class male athletes have highest prevalence of impaired bone health
  - Low spine BMD in male cyclists and runners
- Male athletes with recurrent bone stress injuries or initial injury to the pelvis, sacrum, femoral neck consider nutritional and hormonal evaluation
Long and Short Term Effects
Performance Effects

- Decreased muscle strength
- Decreased endurance performance
- Increased injury risk
- Decreased training response
- Impaired judgement
- Decreased concentration
- Decreased coordination
- Irritability
- Depression
- Decreased glycogen stores
Disordered Eating Effects

- Dehydration
- Electrolyte imbalance
- GI problems
- Potential for WADA prohibited substances
Long term bone health

ΔAthletes in weight bearing sports should have 12-15% higher BMD than sedentary

ΔDisordered eating are 2-7X higher risk of fracture in adulthood

ΔSecondary amenorrhea: increased incidence of stress fractures, lower BMD pelvis and lumbar

ΔStress fractures associated with lean sports and menstrual dysfunction

ΔShort term bone losses can persist- hard to “catch up”

ΔRisk of osteoporosis in post menopausal related to peak bone mass achieved and rate of bone loss
Stress Injuries and Fractures

Common in lower extremities
- Tibia
- Metatarsals
- Fibula, navicular, sesamoid, sacrum, femur, ribs

Osteopathic considerations:
- Structural: leg length ≠, pes cavus/planus, foot varus/valgus
- Biomechanical: high Q angle

Other risk factors:
- Smaller muscle size, sudden increase in training, nutritional/energy deficits

Incidence of bone stress injury (BSI) significantly associated with low bone mass BMD <-1.0, BMI <21 and exercising >12h/week

Risk of BSI with single risk factor of triad 15-20% and >2 risk factors 30-50%
Cardiovascular Health

ΔEndothelial Dysfunction

ΔIncreased total cholesterol and LDL

ΔTherefore could be at risk for developing cardiovascular disease
Screening Tools
Screening for RED-S and Female Athlete Triad

- Screen for Eating Disorders with questionnaire(s)
- If show signs of low EA- dietary logs, estimate energy expenditure
- Menstrual history- labs as indicated- shown previously
- Assess BMD as indicated
Eating disorder questionnaires

- Δ3 factor eating
- Δ Eating disorder examination questionnaire
- Δ LEAF-Q – Low Energy Availability in Females
## Dietary Log

### Sample Food Journal

<table>
<thead>
<tr>
<th>Date: 12/1/2013</th>
<th>CIRCLE ONE: Weekday</th>
<th>Weekend</th>
</tr>
</thead>
</table>

#### Breakfast
- Scrambled eggs with salt and pepper
- Whole wheat toast with margarine
- Coffee with non-dairy creamer
- Minute Maid Orange Juice

<table>
<thead>
<tr>
<th>Time of day: 8:00 am</th>
<th>Amount/Serving size: 2 eggs, 1 slice/1 tablespoon, 1 cup (8 oz/2 tablespoons, 1/2 cup (4 oz)</th>
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</table>

#### Lunch
- Subway sandwich: Italian bread, turkey, American cheese, lettuce, tomato, pickles, and mayonnaise.
- Baked potato chips (plain)
- Diet coke

<table>
<thead>
<tr>
<th>Time of day: 12:30 pm</th>
<th>Amount/Serving size: 2 inches, 1 small bag, 16 oz</th>
</tr>
</thead>
</table>

#### Dinner
- Grilled chicken breast
- Baked potato (with skin) topped with sour cream
- Lettuce salad = mixed greens with carrots and red cabbage (Dole® brand), tomatoes, cucumber
- Light ranch dressing (Kraft)

<table>
<thead>
<tr>
<th>Time of day: 6:30 pm</th>
<th>Amount/Serving size: 8 oz (deck of cards), 1 medium/2 tablespoons, 2 cups, 2 tablespoons</th>
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</thead>
</table>

#### Snacks
- 10:00 am: Strawberry yogurt (Yoplait®) 6 oz
- 1:00 pm: Apple 1 small
- 4:00 pm: Ben & Jerry’s Vanilla ice cream with 1/2 cup (1 oz) fresh raspberries
- 9:00 pm:  |

<table>
<thead>
<tr>
<th>Time of day: 10:00 am</th>
<th>Amount/Serving size: 6 oz, 1 small, 1/2 cup (1 oz)</th>
</tr>
</thead>
</table>

**Estimated Daily Water Intake:** 64 ounces
Dietary Calculations

- IBW= 100lbs for first 5’+ 5lbs per inch above 5’
- Basal Metabolic Rate= IBW (lbs) x 10
- Daily Caloric need for active= IBW(lbs) x 20
- Ages 9-18y:

\[
EER = 135.3 - (30.8 \times \text{age [years]}) + PA \times \\
[(10 \times \text{weight[kg]}) + (934 \times \text{height[m]})] + 25
\]

\[
PA = \text{metabolic equivalent} \times \text{wt (kg)} \times \text{duration (h)}
\]

- Sedentary= 1
- Active= 1.31
- Low activity=1.16
- Very Active= 1.56
Example Dietary Calculation- 15 y, 5’4”, 125 lbs

\[ \Delta \text{IBW} = 100 \text{lbs} + (4 \times 5 \text{lbs}) = 120 \text{ lbs} \]

\[ \Delta \text{Basal Metabolic Rate} = 120 \ (\text{lbs}) \times 10 = 1200 \text{ calories} \]

\[ \Delta \text{Total Daily Caloric Estimate} = 120 \ (\text{lbs}) \times 20 = 2400 \text{ calories} \]

\[ \Delta \text{Ages 9-18y:} \]

\[ \text{EER} = 135.3 - (30.8 \times 15) + 1.31 \times [(10 \times 56.699) + (934 \times 1.6256)] + 25 = 135.3 - 462 + 1.31 \times (566.69 + 1518.3104) + 25 = 2429 \text{ kcal/day} \]
Baseline Statistics

\( BW: 55 \text{ kg} \quad Body \text{ fat: } 18\% \quad FFM: 45.1 \text{ kg} \)
\( EI: 2000 \text{ kcal} \)

\textit{Daily exercise: 1 hr at 7 min/mile pace (12.3 METs)}
\[ EEE = \text{MET} \times BW \times \text{hrs of exercise} = 12.3 \text{ kcal/(kg} \cdot \text{h}) \times 55\text{kg} \times 1\text{h} = 676.5 \text{ kcal} \]

\textit{Baseline EA:}
\[ EA = (EI - EEE)/FFM = (2000 - 676.5)/45.1 = 29.3 \text{ kcal/kg FFM} \]

\textit{Goal Intake to achieve EA of 45 kcal/kg FFM:}
\[ EI = (EA \cdot FFM) + EEE = (45 \cdot 45.1) + 676.5 = 2706 \text{ kcal} \]

\textit{EI after intervention to meet recommended intake:}
\[ 8\text{g/kg BW of CHO} = 1760 \text{ kcal} \]
\[ 1.7 \text{ g/kg BW of PRO} = 374 \text{ kcal} \]
\[ 1 \text{ g/kg BW of fat} = 495 \text{ kcal} \]
\[ = 2629 \text{ kcal} \]
Physical Exam Findings

- ΔLow BMI
- ΔWeight Loss
- ΔOrthostatic Hypotension
- ΔLanugo
- ΔHypercarotenemia
- ΔParotid gland swelling
- ΔRussell’s sign
- ΔBradycardia
- ΔHypothermia
- ΔColor changes of feet and hands
- ΔArrhythmia
Treatment Considerations
Treatment Considerations

- **Treatment** involves a multi-disciplinary approach!

- **Exercise Restriction**

- **Nutrition** - increase 20-30% over baseline needs or to gain 0.5kg every 7-10 days; refer to sports nutritionist for education; optimize Calcium/Vitamin D intake
  - Calcium 1000-1500 mg/d; Vitamin D 32-50 ng/mL 600-2000 IU/d

- **Psychological Counseling**

- **Medications**
  - Psych
  - Estrogen
Treatment of FHA

△ Lack of response x 1 year to nonpharmacological, BMD<-2.0, without significant fracture history, one additional Triad risk factor

△ Oral Contraceptives NOT 1st line!!!!

△ Transdermal estradiol is a potential treatment
  • 100 µg twice weekly + 2.5 mg progesterone x 10 days per month
  • May start at 50µg x 1 m d/t side effects
  • Progesterone range: 5-10 mg medroxyprogesterone acetate or 100-200 mg micronized progesterone 10-12 days/m

△ No good data on testosterone, DHEA, leptin, rhIGF-1, replacement
Treatment of Low Bone Mineral Density

Consider pharmacological therapy with lack of response to non-pharmacological therapy x 1 year, clinically significant fracture history and:

• BMD Z score ≤ −2.0
• BMD Z score between -1.0 and -2.0 with ≥ 2 Triad risk factors

Consult with Endocrinologist/Metabolic bone disease specialist for treatment

• Bisphosphonate, denosumab, teriparatide

Recheck BMD every 6-12 months
Treatment in Men

- Recommend ball sport/high-impact multidirectional loading sport for at least 2 years during adolescence
- Correct underlying pathology, increase energy availability!
- Calcium and Vitamin D supplementation
- Testosterone replacement
- Bisphosphonates
- Teriparatide
- Denussomab
- Strontium ranelate
Risk Stratification
Table 1 Relative Energy Deficiency in Sport risk assessment model for sport participation (modified from Skårderud et al.)

<table>
<thead>
<tr>
<th>High risk: no start red light</th>
<th>Moderate risk: caution yellow light</th>
<th>Low risk: green light</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Anorexia nervosa and other serious eating disorders</td>
<td>- Prolonged abnormally low % body fat measured by DXA or anthropometry using The International Society for the Advancement of Kinanthropometry ISAK or non-ISAK approaches</td>
<td>- Healthy eating habits with appropriate energy availability</td>
</tr>
<tr>
<td>- Other serious medical (psychological and physiological) conditions related to low energy availability</td>
<td>- Substantial weight loss (5–10% body mass in 1 month)</td>
<td>- Normal hormonal and metabolic function</td>
</tr>
<tr>
<td>- Extreme weight loss techniques leading to dehydration induced haemodynamic instability and other life-threatening conditions</td>
<td>- Attenuation of expected growth and development in adolescent athlete</td>
<td>- Healthy BMD as expected for sport, age and ethnicity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Healthy musculoskeletal system</td>
</tr>
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</table>

- Abnormal menstrual cycle: FHA amenorrhoea >6 months
- Menarche >16 years
- Abnormal hormonal profile in men
- Reduced BMD (either from last measurement or Z-score < −1 SD).
- History of 1 or more stress fractures associated with hormonal/ menstrual dysfunction and/or low EA
- Athletes with physical/psychological complications related to low EA/ disordered eating - ECG abnormalities - Laboratory abnormalities
- Prolonged relative energy deficiency
- Disordered eating behaviour negatively affecting other team members
- Lack of progress in treatment and/or non-compliance

BMD, bone mineral density; DXA, dual-energy X-ray absorptiometry; EA, energy availability; FHA, functional hypothalamic amenorrhoea; ISAK, International Society for the Advancement of Kinanthropometry
<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Low Risk = 0 points each</th>
<th>Moderate Risk = 1 point each</th>
<th>High Risk = 2 points each</th>
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<tbody>
<tr>
<td>Low EA with or without DE/ED</td>
<td>No dietary restriction</td>
<td>Some dietary restriction‡;</td>
<td>Meets DSM-V criteria for</td>
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<tr>
<td>Low BMI</td>
<td>BMI ≥ 18.5 or ≥ 90% EW** or weight stable</td>
<td>BMI 17.5 &lt; 18.5 or &lt; 90% EW or 5 to &lt; 10% weight loss/month</td>
<td>BMI ≤ 17.5 or &lt; 85% EW or ≥ 10% weight loss/month</td>
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<tr>
<td>Delayed Menarche</td>
<td>Menarche &lt; 15 years</td>
<td>Menarche 15 to &lt; 16 years</td>
<td>Menarche ≥ 16 years</td>
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<tr>
<td>Oligomenorrhea and/or Amenorrhea</td>
<td>&gt; 9 menses in 12 months*</td>
<td>6-9 menses in 12 months*</td>
<td>&lt; 6 menses in 12 months*</td>
</tr>
<tr>
<td>Low BMD</td>
<td>Z-score ≥ -1.0</td>
<td>Z-score -1.0*** &lt; -2.0</td>
<td>Z-score ≤ -2.0</td>
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<tr>
<td>Stress Reaction/Fracture</td>
<td>None</td>
<td>1</td>
<td>≥ 2; ≥ 1 high risk or of trabecular bone sites†</td>
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<tr>
<td>Cumulative Risk (total each column, then add for total score)</td>
<td>_____ points +</td>
<td>_____ points +</td>
<td>_____ points = _____ Total Score</td>
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Return to Play Considerations
<table>
<thead>
<tr>
<th>Steps</th>
<th>Risk modifiers</th>
<th>Criteria</th>
<th>Red-S-specific criteria</th>
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<tbody>
<tr>
<td>Step 1</td>
<td>Medical factors</td>
<td>Patient demographics</td>
<td>Age, sex (see Yellow light column of table 1)</td>
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<tr>
<td>Evaluation of health status</td>
<td></td>
<td>Symptoms</td>
<td>Recurrent dieting, menstrual health, bone health</td>
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<td>Medical history</td>
<td>Weight loss/fluctuations, weakness</td>
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<td>Signs</td>
<td>Hormones, electrolytes, ECG and DXA</td>
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<td>Laboratory tests</td>
<td>Depression, anxiety, disordered eating/eating disorder</td>
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<td>Psychological health</td>
<td>Abnormal hormonal and metabolic function</td>
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<td>Potential seriousness</td>
<td>Stress fracture</td>
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<tr>
<td>Step 2</td>
<td>Sport risk modifiers</td>
<td>Type of sport</td>
<td>Weight sensitive, leanness sport</td>
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<tr>
<td>Evaluation of participation risk</td>
<td></td>
<td>Position played</td>
<td>Individual vs team sport</td>
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<td>Competitive level</td>
<td>Elite vs Re-creational</td>
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<tr>
<td>Step 3</td>
<td>Decision modifiers</td>
<td>Timing and season</td>
<td>In/out of season, travel, environmental factors</td>
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<tr>
<td>Decision modification</td>
<td></td>
<td>Pressure from athlete</td>
<td>Desire to compete</td>
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<tr>
<td></td>
<td></td>
<td>External pressure</td>
<td>Coach, team owner, athlete family and sponsors</td>
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<tr>
<td></td>
<td></td>
<td>Conflict of interest</td>
<td>If restricted from competition</td>
</tr>
<tr>
<td>High risk red light</td>
<td>Moderate risk yellow light</td>
<td>Low risk: green light</td>
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<td>--------------------</td>
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<td></td>
</tr>
<tr>
<td>No competition</td>
<td>May compete once medically cleared under supervision</td>
<td>Full sport participation</td>
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<tr>
<td>Supervised training allowed when medically cleared for adapted training</td>
<td>May train as long as is following the treatment plan</td>
<td></td>
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<tr>
<td>Use of written contract (see supplementary appendix 1)</td>
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</table>
Step 1: Evaluation of Health Status

Medical Factors

- Patient Demographics (age, ethnicity)
- Symptoms (fatigue, lightheadedness, skeletal pain, weight loss/fluctuations)
- Personal Medical History (Triad risk factors - severity/chronicity, adolescent growth phase, hospitalizations, other medical factors)
- Family History/Genetics (eating disorders, other psychiatric illnesses, menstrual dysfunction, osteoporosis, fracture history)
- Signs (Physical Exam) (bradycardia, low BP/orthostatic, low BMI <17.5, low % body fat, lanugo, Russell sign)
- Lab Tests/ECG/DXA (metabolic panel, CBC, hormonal work up if oligomenorrhea and/or amenorrhea, 25(OH) Vit D if low BM or bone stress injury, TSH and TFTs; ECG if ED; DXA if indicated; X-ray and imaging if suspect bone stress injury)
- Psychological State (depression, anxiety, OCD co-morbidities; severity of illness; athlete’s willingness to participate in treatment; psych testing if indicated)
- Potential Seriousness (ED, other psych hospitalization, chronicity of each Triad spectrum, co-morbidities, bone health evaluation/DXA)

Cumulative Risk Assessment Score (based on cumulative Triad risk stratification)

Type of Sport (leanness vs non-lean sport, sport with subjective judging, thin physique felt advantageous, endurance sport, weight class, impact nature/bone loading)

Position Played (perceived advantage if lean)

Competitive Level (competitive vs non-competitive, high school, club, college/intercollegiate/division rank, elite, professional, Olympic)

Timing in Season (in season vs off season, early in season or late)

Pressure from Athlete (desire to compete and excel)

External Pressure (coach, family, friends, administration, society)

Masking the Injury (analgnesia, ignoring symptoms)

Conflict of Interest (scholarship athlete, professional, Olympic athlete)

Step 2: Evaluation of Participation Risk

Sport Risk Modifiers

Step 3: Decision Modification

Decision Modifiers

Return-to-Play Decision
<table>
<thead>
<tr>
<th></th>
<th>Cumulative Risk Score*</th>
<th>Low Risk</th>
<th>Moderate Risk</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full Clearance</strong></td>
<td>0 – 1 point</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Provisional/Limited Clearance</strong></td>
<td>2 – 5 points</td>
<td></td>
<td>☐ Provisional Clearance</td>
<td></td>
</tr>
<tr>
<td><strong>Restricted from Training and Competition</strong></td>
<td>≥ 6 points</td>
<td></td>
<td></td>
<td>☐ Restricted from Training/Competition-Provisional</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>☐ Disqualified</td>
</tr>
</tbody>
</table>
Examples of Contracts

Treatment Contract

(______________ Athlete Name)

The following items are mandatory and must be completed as prescribed. Failure to do so will result in the consequences listed below the requirements. All benefits and consequences are subject to change at any time and at the discretion of the Multidisciplinary Team.

Multidisciplinary Team:

______________ (Physician), ______________ (Mental Health Provider), ______________ (Dietitian).

Requirements:

☐ Meet with ______________ (mental health provider) 1x per week, or as recommended by mental health provider.
☐ Meet with ______________ (dietitian) 1x per week, or as recommended by dietitian.
☐ Meet with Dr. ______________ 1-2x per month, or as recommended by Dr. ______________.
☐ Follow daily meal plan set forth by sports dietitian.
☐ Keep daily workout log updated with specific type, length, and effort.
☐ Weight gain of ___ lbs per week.
☐ Weekly weigh-in with ______________ (name team member), or at time intervals of ___ weeks.
☐ Must achieve minimal acceptable body weight of ___ lbs by ___ (date).
☐ After this date, must maintain weight at or above minimal acceptable body weight.
☐ Limit of ___ workout sessions per week with no one session being more than ___ minutes in length. All activity counts (e.g., biking, running, weight lifting, and swimming).

Benefits:

If ALL requirements are met then clearance to participate in team activities and use of athletic facilities will: ☐ be granted ☐ continue.

Consequences:

If ANY requirement(s) are not met then clearance to participate in team activities and use of athletic facilities will be revoked, and re-instatement will be at the discretion of the team physician and multidisciplinary team.

I, ______________ have read this contract and all of my questions were answered.

______________ Athlete Name
______________ Athlete Signature
______________ Date

______________ Team Physician Name
______________ Team Physician Signature
______________ Date
Other Suggestions

Δ**Entourage:** education, reduce emphasis on weight, develop realistic goals, avoid critical comments about body shape/weight, use reputable sources of info, promote awareness, encourage support/timely treatment

ΔPolicies for coaches on health practice of managing athlete eating behavior, weight and body composition

ΔRule modifications/changes to address weight sensitive issues in sport

ΔResearch more on males, ethnic, and disabled populations
Links

- [https://www.cdc.gov/growthcharts/clinical_charts.htm#Set1](https://www.cdc.gov/growthcharts/clinical_charts.htm#Set1)
Resources


