An Evidence-Based Approach To Relative Energy Deficit in Sport (RED-s)

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Certified Athletic Trainer

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Disclosures

- Financial Partners or Donations = NONE!
- Own and operate a private practice for nutrition counseling and consulting services for more than 16 years
- Teach an on-line graduate sports nutrition class for The College of St. Elizabeth in Morristown, NJ
- Serve on the advisory board for The College of St. Elizabeth’s Department of Food and Nutrition & Dietetic Internship programs
- Serve on advisory board for Cedar Crest College’s Department of Nutrition Didactic Program and Dietetic Internship
Workshop Learning Objectives

Each participant will be able to:

- Identify the differing components of the female athlete triad verses the relative energy deficit in sport (REDS).
- Explain how the impacts of starvation relate to an athletic population and its impacts to an athlete’s body systems.
- Identify current best-practices for evaluating an athlete suspected of having RED-s.
- Utilize evidence-based criteria within pre-participation assessment for REDs.
- Institute an evidence-based decision-making process for an athlete’s playing status and/or return to play which addresses their full physiology to correct a relative energy deficit and eliminate further medical implications.
In Years Past...

- Used to be considered “normal” for female athletes to lose their menstrual cycles
- Loss of menses was supposed to be a good measure that you were training “hard enough”
- In the 1997...
  - The American College of Sports Medicine (ACSM) released the Female Athlete Triad Position Stand
  - Components of the triad were identified as:
    - Disordered Eating
    - Amenorrhea
    - Osteoporosis

Key Updates To The Triad in 2007

- **A Continuum**
  - Energy availability, menstrual function, and eventually bone mineral density change in response to training volume, intensity phase of training, stress level, and nutritional status.

- Low percent body fat is not always a reliable indicator

- Clinical eating disorder diagnosis not always present

- Functional hypothalamic amenorrhea due to insufficient energy availability is often inadvertent yet impacts occur rapidly

- Measurable changes in bone mineral density, and bone fractures, take time to develop, present, treat and resolve

- Hormonal replacement therapy does not resolve bone mineral density issues in most cases and does not correct energy availability

2007 The Updated Female Athlete Triad Position Stand, ACSM

What’s Missing...

- We need a means of assessment:
  - For energy balance not solely based on menstrual cycles in females
  - Which does not exclude male athletes
  - Which includes a comprehensive look at total body physiology & functions
Progression of the Continuum...

Health Consequences of Relative Energy Deficiency in Sport (RED-S)

Progression of the Continuum...

Potential Performance Effects of Relative Energy Deficiency in Sport

(“Aerobic and anaerobic performance”)

So, Let's Talk Energy

**Energy:** Defined as the capacity to do work, and in the case of the human body, this work is of a biological and physical nature

- Cellular processes
- Synthesis of compounds
- Growth & Development
- Reproduction
- Activities of Daily Living
- Exercise (Skeletal muscle contractions)

**The Energy Balance Equation**

- “Simple” version = Energy In vs. Energy Out
- Hypothalamus integrates a host of signals from the liver, gut, and adipose tissue to regulate energy expenditure and the initiation, termination, and frequency of eating
Energy Expenditure

Four components to total daily energy expenditure

- **Resting Metabolic Rate (RMR)** The energy expended while lying supine in a post-absorptive, awakened state for cellular processes necessary to maintain life
  - 70-75% of daily energy expenditure

- **Thermic Effect of Food (TEF)** The increase in energy expenditure above RMR in response to the ingestion of food
  - Approx 10% of energy ingested; Fats have lowest TEF 3%, Carbohydrates 5-10% TEF and Protein 20-30% TEF
Energy Expenditure

Four components to total daily energy expenditure

- **Non-Exercise Activity Thermogenesis (NEAT)**: The Energy expenditure from physical activity which is not considered exercise, such as ADL or fidgeting.

- **Exercise Energy Expenditure (ExEE)**: The most variable component to energy expenditure, exercise is defined as volitional movement done for the purpose of improving or maintaining one or more features of either health or performance-related physical fitness.
  - Up to 30% of daily energy expenditure however in athletes this factor can increase greatly.
Energy Availability

- The starting point for RED-s...
  The amount of dietary energy remaining for other body functions AFTER exercise training

- Impacts from other areas:
  - Activities of Daily Living
  - Cellular Maintenance
  - Thermoregulation
  - Growth
  - Reproduction
Energy Availability (EA)

\[(\text{EI} - \text{EEE}) / \text{kg FFM}\]

\[\text{EI} = \text{Dietary Energy Intake}\]
\[\text{EEE} = \text{Exercise Energy Expenditure}\]
\[\text{FFM} = \text{Fat Free Mass (*body comp needed)}\]

Calculating Fat Free Mass
- TANITA
- BodPod
- Girth measurement body fat equations
- Calipers

Energy Availability (EA) Example

\[
\text{(EI - EEE)} / \text{kg FFM}
\]

\[
\begin{align*}
\text{EI} &= \text{Dietary Energy Intake} & 1800\text{kcal/day} \\
\text{EEE} &= \text{Exercise Energy Expenditure} & 1200 \text{ kcal/day “practice”} \\
\text{FFM} &= \text{Fat Free Mass} & 140\# \text{ with body fat}\% 20\% \\
& & 112\# \text{ FFM} / 2.2 \text{ kg} = 50.91 \text{ kg}
\end{align*}
\]

\[
\frac{1800 - 1200}{50.91} \text{ kcal/kg energy availability}
\]

11.79 kcal/kg energy availability

Energy Availability is reduced by...

▶ Increased EEE above EI
  ○ Changes in training volume

▶ Inadvertent impacts on energy intakes
  ○ Nutrition as an afterthought
  ○ Timing of training session conflicting with eating opportunities
    ▪ Short time between training sessions
    ▪ Time, money constraints
    ▪ Back loading intakes

▶ Dysfunctional Eating Behaviors
  ○ Dieting, Sub-clinical and clinical eating disorders

Causes of Low Energy Intakes

Unintentional Low Intakes
Intentional meeting body composition or weight loss goal

DSM-V Eating Disorder
Disordered Eating
Health Consequences of 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
Energy Availability & Performance

- **Under-fueled training sessions**
  - Decreased ability to fully participate & benefit from training
  - Inconsistent performance

- **Delayed recovery from training & performance**
  - Increased muscle recovery time
  - Increased risk for fatigue-related injuries

- **Change in hormonal responses to training**
  - Decreased estrogen levels (bone protection)
  - Long-term jeopardy of peak bone mass potential
  - Increased cortisol, epi- & norepi stress response, inflammatory response
  - Depressed immune function
Performance Impacts from REDs

Potential Performance Effects of Relative Energy Deficiency in Sport

*Aerobic and anaerobic performance

Starvation State: 
**Minnesota Starvation Study**

- World War II
- November 1944 to December 1945
- “After you’ve not had food for a while your state of being is just numb. I didn’t have any pain. I was just very weak. One’s sexual desires disappeared“ says Sutton
- Men lost 25% of their body weight
- Anxiety and Depression


Starvation and Fuel Use

<table>
<thead>
<tr>
<th>Time of Starvation</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 fed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 fasted</td>
<td></td>
<td></td>
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<tr>
<td>20 early starved</td>
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</tr>
<tr>
<td>40 late starved</td>
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</tbody>
</table>

- **Origin of Blood Glucose**
  - Exogenous
  - Hepatic Glycogen; Gluconeogenesis
  - Hepatic & Renal Gluconeogenesis
  - Renal & Hepatic Gluconeogenesis

- **Tissues Using Glucose**
  - All
  - All except liver. Muscle & Adipose tissue at diminished rates
  - Brain and RBCs; Small amount by muscle
  - Brain at a diminished rate; RBCs normal

- **Major Fuel of Brain**
  - Glucose
  - Glucose
  - Glucose; Ketone Bodies
  - Ketone Bodies; Glucose

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A. http://www.nbs.csudh.edu/chemistry/faculty/nsturm/CHE452/24_Glucose%20Homeostas.html
B. Annu. Rev. Nutr. 2006.26:1-22. Downloaded from arjournals.annualreviews.org by jmd on 10/29/15
Humans Adapt to Fuel Deprivation

- A) Before a fast
- B) Following three weeks of starvation

- The process of keto-adaptation prevents the ongoing catabolism of lean mass to provide glucose
- Even a small amount of glucose infusion decreases ketoacid and ammonia nitrogen excretion
- Down regulation of metabolic rate
- Assess for urinary ketones

Ketones

- Ketone bodies are three water-soluble molecules that are produced by the liver from fatty acids during periods of low food intake (fasting) or carbohydrate restriction for cells of the body to use as energy instead of glucose
  - Inefficient back up energy
- The three endogenous ketone bodies: acetone, acetoacetic acid, beta-hydroxybutyric acid
- Acetoacetate and beta-hydroxybutyrate can be reconverted to acetyl-CoA to produce energy, via the citric acid cycle
- Uses in the heart, brain and muscle (but not the liver)
Brain Adaptation

- Brain adapts to using ketones as fuel - but not in the short run
- Keto-adaption starts at day 2-5 depending on activity

Prolonged Starvation

- Increased
  - **Glucagon**
    - Increases glucose in bloodstream
    - Opposite to insulin
  - **Cortisol**
    - Increased in response to stress which increases blood sugar through gluconeogenesis
    - Suppresses the immune system
    - Aids in the metabolism of fat, protein, and carbohydrate
    - Decreases bone formation
  - **Epinephrine**
    - Also known as adrenaline
    - Important role in the fight-or-flight response by increasing blood flow to muscles, output of the heart, pupil dilation, and blood sugar
  - **Antidiuretic hormone**
    - Prevents the production of dilute urine
    - Fluid controls

Prolonged Starvation

- Increased
  - **Aldosterone**
    - Steroid hormone critical to blood pressure regulation
    - Causes the conservation of sodium & secretion of potassium
    - Causes increase in water retention
    - Causes increase in blood pressure and blood volume
  - **Thyroid hormone**
    - Thyronines act on every cell in the human body by:
      - Increasing basal metabolic rate
      - Affect protein synthesis
      - Assist regulation of long bone growth and neural maturation
      - Increase the body's sensitivity to catecholamines (such as adrenaline) by permissiveness
    - Regulate protein, fat, and carbohydrate metabolism
    - Affect how cells use energy
    - Stimulate vitamin metabolism

Prolonged Starvation

- Decreased
  - Insulin
  - Sex Hormones

  Decrease glucose in blood stream
  Male and Females; Non-essential

Changes in Metabolic Rate

Normal Metabolism—Nonstressed System
Normal Nutrient Intake

- Efficient pathway to energy for carbohydrates, fat
- Adequate oxygen available for energy production
- Protein intake is used for protein synthesis and maintaining lean mass

Normal metabolic rate
25–30 kcal/kg/d

ENERGY DEPOT
FAT MASS

Excess calories → Need more energy

Pathway to energy

Carbohydrates
55%–60% kcal

Pathway to protein synthesis

Fat
25%–30% kcal

Hormones are balanced

Protein
5%–10% kcal

Intact skin

Prevents heat and water loss

Anabolic and catabolic stimuli

LEAN MASS COMPARTMENT
Protein synthesis adequate to maintain physical and metabolic machinery

Metabolism Response to Starvation (Short Term)
No Injury or “Stress” (Protective Adaptation Occurs)

- Overall energy needs decrease
- Metabolic rate decreases 20–25 kcal/kg/d
- Energy from fat storage >90% of kcal
- Energy from protein <10% for gluconeogenesis
- Protein stores protected

Lower metabolic rate
20–25 kcal/kg/d

LEAN MASS
Minimal catabolism to meet glucose needs

ENERGY DEPOT
FAT, FATTY ACID

90% kcal → Ketones

ENERGY PRODUCTION

Oxygen

Glucose
Pyruvate

Gluconeogenesis (10% kcal)

For obligate users (brain)

Urea

Micronutrients needed

Alanine
Amino Acids

Protein synthesis

Hormone adaptation preserves protein

Erosion minimal

http://www.medscape.org/viewarticle/432384_4
Starvation & Fuel Use Summary

- If more than 4 hours passes between exogenous fueling then one can start to cross into the underfueled state.
- From 2-24 hours, one’s body can begin to switch to glycogen and gluconeogenesis pathways for fueling.
- Carbohydrate fueling at intervals of every 2 to 4 hours maintains glucose use in all of one’s body tissues.
- “Fats burn in a carbohydrate flame” - Nancy Clark, RD
Starvation & Fuel Use Summary

- Consuming inadequate energy through CHOs can cause protein breakdown (catabolism) and losses of lean mass as well as impair organ function and cell structures.

- In the course of an overnight fast, nearly all reserves of liver glycogen and most muscle glycogen have been depleted.

- After 3 days of fasting, liver release ketone bodies (from fat oxidation) as alternative fuel to the brain; Gluconeogenesis provides glucose to RBCs and brain.

Recovery Is A Hypermetabolic State

- As much as 40% decrease to metabolic rate
- The hypermetabolic state (Re-feeding)
- The increase in metabolic rate reflects an increase in energy demands
- This demand persists for weeks to months even after complicated surgery or tissue damage
- Increased calories are required

http://www.medscape.org/viewarticle/432384_4
How Much Energy Do We Need?

- Normal Metabolic rate: 25-30 kcal/kg FFM/day
- Goal for Athletes (Gold Standard) approx. 45 kcal/kg FFM/day
- Disruptions occur ≤ 30 kcal/kg FFM/day
- 30 kcal/kg FFM/day corresponds to the energy expended in resting metabolism in healthy adults

Prolonged Starvation RED-s Disruptions

- **Cardiorespiratory**
  - Heart Palpitations
  - Arrhythmias (EKG)
  - SOB
  - Edema
  - POTS
  - Syncope

- **Endocrine**
  - Amenorrhea or Oligomenorrhea
  - Loss of libido
  - Low bone mineral density
  - Infertility

- **Gastrointestinal**
  - Gastroparesis
  - Delayed gastric emptying & Early satiety
  - Constipation
  - Gastroesophageal Reflux (GERD)
  - Decreased hunger

- **Hematological**
  - Glucoregulatory hormones do not maintain normal plasma glucose concentrations below energy availability of 30 kcal/kg FFM per day
  - Low RBC count
  - Anemia
Prolonged Starvation RED-s Disruptions

- **Immune**
  - Low WBC count
  - Increased risk for illness or injury
  - Poor wound healing

- **Growth and Development**
  - Loss of height/stature progression
  - Lack of physical development (Tanner stages)
  - Cold intolerance

- **General**
  - Fatigue, Weakness
  - Hot flashes, Sweating Episodes
  - Not just weight loss - may be weight maintenance or failure to gain in children or adolescents

- **Psychological**
  - Can occur prior to the energy restriction or as consequence to post-restriction
  - Decreased focus / brain function
  - Anxiety
  - Depression
Mental Health

- Depression
- Anxiety
- Body dissatisfaction
  - Body Dysmorphic Disorder
- Binge Eating Disorder
- Obsessive exercise

Remember, it’s not about “food” or “weight”
Behaviors are symptoms of their disordered thinking

Physiological Consequences Associated with Energy Restriction:

**What are Athletes Concerned About?**

- **Performance Issues**
  - Fatigue
  - Inability to finish workout
  - Getting “slower” “weaker”
  - Focus and concentration lost

- Coaches and ATs hear “I need to train more” not “I'm underfueled”

- These findings should launch your assessment

**ASK!**
Four-Step Nutrition Care Process for Achieving Goals

- **Nutrition Assessment & Reassessment**
  - The RDN collects and documents information such as food or nutrition-related history; biochemical data, medical tests and procedures; anthropometric measurements, nutrition-focused physical findings and client history.

- **Nutrition Diagnosis**
  - Data collected during the nutrition assessment guides the RDN in selection of the appropriate nutrition diagnosis (i.e., naming the specific problem).

- **Nutrition Intervention (Action Plan)**
  - RDN selects the nutrition intervention that will be directed to the root cause (or etiology) of the nutrition problem and is aimed at alleviating the signs and symptoms of the diagnosis.

- **Nutrition Monitoring & Evaluation**
  - The final step where RDN determines if the patient/client has achieved, or is making progress toward, the planned goals.

http://www.eatrightpro.org/resources/practice/nutrition-care-process
Nutrition Assessment

- Dietary Intake and Red Flag screens
- Can you calorie count?
  - Lost art, now you can get the APP!
  - Athletes are often better at it than professionals
- Food allergies
- Gluten restricted for no reason
- Veganism / Vegetarianism
- Eating Alone
- Leaving the table for bathroom
Eating Disorder Assessment Tools

General Population

- **Eating Attitudes Test (EAT)**
  - *See Copy*

- **Eating Disorder Examination Questionnaire (EDE-Q)**
  - Historically considered the gold standard in ED/DE assessment
  - *See Copy*

- **Eating Disorder Inventory (EDI)**
  - 64 questions with 8 subscales
  - 20 minutes to complete, 20 minutes to “grade”
Eating Disorder Assessment Tools

Athletic Population

- Female Athlete Screening Tool (FAST)
  - See copy
  - 33-item questionnaire developed specifically for female athletes
  - Approximately 15 min to complete and validated in collegiate populations with subjects from both Division I and III NCAA schools

- Athletic Milieu Direct Questionnaire (AMDQ)
  - 119 item, self-report questionnaire to screen for eating disorders and disordered eating in female athletes

- Survey of Eating Disorders among Athletes (SEDA)
  - 33-item self-report questionnaire mentioned in the NATA recommendations
  - 30+ years old, is based on outdated diagnostic criteria, and lacks recent validation


Eating Disorder Assessment Tools

**Athletic Population**

- **Health, Weight, Dieting, and Menstrual History Questionnaire**
  - 54 item, self-report questionnaire
  - Test items are composed of four categories including musculoskeletal health, menstrual history, dieting behaviors, and weight history

- **College Health-Related Information Survey (CHRISY73)**
  - 32 item, self-report screening test for male and female collegiate athletes based on the Juvenile Wellness and Health Survey
  - Has not been validated

- **BEDA-Q**
  - Screening tool not included in the NATA position stand due to the timing of its publication
  - Developed in elite high school female athletes (ages not reported) in three phases.
  - Version 2 had 95% confidence interval

The Panel recommends asking these screening questions at the time of the sport preparticipation evaluation.

- 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 hormone replacement (estrogen, progesterone, oral 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)?
### Pre-Season Nutrition Assessment

- **Screening for Eating Disorders esp. High Risk Sports**

- **BEDA-Q: Brief Eating Disorder in Athletes - Questionnaire**

<table>
<thead>
<tr>
<th>Always</th>
<th>Usually</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel extremely guilty after overeating.</td>
<td></td>
<td></td>
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<tr>
<td>I am preoccupied with the desire to be thinner.</td>
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<tr>
<td>I think that my stomach is too big.</td>
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<tr>
<td>I feel satisfied with the shape of my body.</td>
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<td></td>
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<tr>
<td>My parents have expected excellence of me.</td>
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<tr>
<td>As a child, I tried very hard to avoid disappointing my parents and teachers.</td>
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<td></td>
</tr>
</tbody>
</table>

- Are you trying to lose weight now? Yes No
- Have you tried to lose weight? Yes No
- If yes, how many times have you tried to lose weight? 1-2 times 3-5 times >5 times

BEDA-Q Rating

Version 2: Highest possible score 18 points

Positive scores are rated as follows (reverse-scored items are weighted in the opposite manner):
- 3 points - always
- 2 points - usually
- 1 point - often
- 0 points - sometimes
- 0 points - rarely
- 0 points - never

Nutritional Intervention

- Progression necessary due to potential for refeeding concerns
  - Add 500 calories at a time
- Liquids better tolerated than solids
- Reassess vitals at minimum weekly
  - Refeeding can have multiple concerns
  - Gradual improvements in HR
  - Improving body temperature
  - Correcting any nutrients imbalances from lab work
    - Iron, Vitamin D, Phosphorous, electrolytes, etc...
- Monitor blind weights - must be consistent towards recovery goals
- When weight plateaus, add an additional 500 calories
Nutrition Intervention

How Much Energy Do We Need?

- Normal Metabolic rate: 25-30 kcal/kg FFM/day
- Energy Availability Goal for Athletes (Gold Standard) approx. 45 kcal/kg FFM/day
- Disruptions occur ≤ 30 kcal/kg FFM/day
- 30 kcal/kg FFM/day corresponds to the energy expended in resting metabolism in healthy adults

Nutrition Intervention

Is Exercise OK?

- Medical Concerns about exercise in treatment and recovery
  - Might prolong energy imbalance
  - Increase risk for organ damage
  - Undermine weight gain
  - Increased cardiac risk
  - Increase risk of injury
Medical Clearance for Adding Exercise in Treatment

- BMI
- DEXA
- EKG
- Blood Pressure / Pulse, Postural VS
- Comprehensive Metabolic Panel (CMP)
- Magnesium, Phosphorous
- Urinalysis
- Complete Blood Count (CBC)

Nutrition Intervention

Returning To Sport

- Work with a “team”: AT, RD, MD in treatment planning
  - Sport psychologist very beneficial
  - Clinical ED diagnosis should be mandated to work with a counselor / therapist
- Set goals for return to sport and/or maintenance of participation
- Monitor safety
- Energy availability is greater than 45 kcals/kg FFM
  - Test exercise load and eating to assure energy balance / weight stabilization
- Ideal = No stress fractures, menstrual dysfunction or “disruptions”
Decision-Based Return-to-Play (RTP) Model for the Female Athlete Triad

- RTP decision is determined by the primary care or team physician
- Based on a complex and comprehensive synthesis of health status, cumulative risk assessment, participation risk, sport and decision modifiers.

Abbreviations:
- 25(OH) Vit D, 25-hydroxyvitamin D
- BMI, body mass index
- BP, blood pressure
- CBC, complete blood count
- DXA, dual-energy X-ray absorptiometry
- ED, eating disorder
- OCD, obsessive compulsive disorder
- TFTs, thyroid function tests
- TSH, thyroid stimulating hormone

# Female Athlete Triad: Cumulative Risk Assessment


<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>MAGNITUDE OF RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Factors</td>
<td>Low Risk = 0 points each</td>
</tr>
<tr>
<td>Moderate Risk = 1 point each</td>
<td></td>
</tr>
<tr>
<td>High Risk = 2 points each</td>
<td></td>
</tr>
<tr>
<td>Low EA with or without ED/DE</td>
<td>No dietary Restrictions</td>
</tr>
<tr>
<td>Some dietary restrictions; Current/PMH ED/DE</td>
<td></td>
</tr>
<tr>
<td>Meets DSM-V criteria for ED</td>
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</tr>
<tr>
<td>Low BMI</td>
<td>BMI &gt;18.5 or &gt;90% IBW or weight stable</td>
</tr>
<tr>
<td>BMI 17.5&lt;18.5 or &lt; 90% IBW or 5-10% wt loss/month</td>
<td></td>
</tr>
<tr>
<td>BMI &lt; 17.5 or &lt; 85% IBW or &gt;10% wt loss/month</td>
<td></td>
</tr>
<tr>
<td>Delayed Menarche</td>
<td>Menarche &lt; 15 y/o</td>
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<tr>
<td>Menarche 15 to &lt;16 years</td>
<td></td>
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<tr>
<td>Menarche &gt;16 years</td>
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<tr>
<td>Oligomenorrhea and/or Amenorrhea</td>
<td>&gt;9 menses in 12 months</td>
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<tr>
<td>6-9 menses in 12 months</td>
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<tr>
<td>&lt;6 menses in 12 months</td>
<td></td>
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<tr>
<td>Low BMD</td>
<td>Z-score &gt;=-1.0</td>
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<td>Z-score -1.0 &lt; -2.0</td>
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<tr>
<td>Z-score &lt;-2.0</td>
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<tr>
<td>Stress Reaction / Fracture</td>
<td>None</td>
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<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>&gt;2; &gt;1 high risk or of trabecular bone sites</td>
<td></td>
</tr>
<tr>
<td>Cumulative Risk (total each column, then add for total score)</td>
<td>_____ points +</td>
</tr>
<tr>
<td>_____ points +</td>
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<tr>
<td>_____ points = _____Total Score</td>
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Female Athlete Triad: Clearance and Return-to-Play (RTP) Guidelines by Medical Risk Stratification

*Cumulative Risk Score determined by summing the score of each risk factor (low, moderate, high risk) from the Cumulative Risk Assessment

<table>
<thead>
<tr>
<th>Cumulative Risk Score *</th>
<th>Low Risk</th>
<th>Moderate Risk</th>
<th>High Risk</th>
</tr>
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<tbody>
<tr>
<td>Full</td>
<td>0-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provisional / Limited Clearance</td>
<td>2-5</td>
<td>□ Provisional</td>
<td>□ Limited</td>
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<tr>
<td>Restricted from Training / Competition</td>
<td>&gt; 6</td>
<td></td>
<td>□ Restricted from Training / Competition - Provisional □ Disqualified</td>
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</tbody>
</table>
The RED-s Decision-based Return-to-Play Model

Table 3
(modified from Creighton et al143)

<table>
<thead>
<tr>
<th>Steps</th>
<th>Risk modifiers</th>
<th>Criteria</th>
<th>Red-S Specific Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Evaluation of health status</td>
<td>Medical factors</td>
<td>Patient demographics, Symptoms, Medical history, Signs, Laboratory tests, Psychological health, Potential seriousness</td>
<td>Age, sex, Recurrent dieting, Menstrual health, Bone health, Weight loss/fluctuations, Weakness, Hormones, electrolytes, ECG and DXA, Depression, anxiety, Disordered eating/eating disorder, Abnormal hormonal and metabolic function, Stress fracture</td>
</tr>
<tr>
<td>Step 2 Evaluation of participation risk</td>
<td>Sport risk modifiers</td>
<td>Type of sport, Position played, Competitive level</td>
<td>Weight sensitive, Jeanness sport, Individual vs team sport, Elite vs Re-creational</td>
</tr>
<tr>
<td>Step 3 Decision modification</td>
<td>Decision modifiers</td>
<td>Timing and season, Pressure from athlete, External pressure, Conflict of interest, Fear of litigation</td>
<td>In/out of season, travel, environmental factors, Desire to compete, Coach, team owner, athlete family and sponsors, If restricted from competition</td>
</tr>
</tbody>
</table>

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

Table 3: The Relative Energy Deficiency in Sport Return-to-Play Model (modified from Skårderud et al, 2012)

<table>
<thead>
<tr>
<th>High risk red light</th>
<th>Moderate risk yellow light</th>
<th>Low risk: green light</th>
</tr>
</thead>
<tbody>
<tr>
<td>▶ No competition</td>
<td>▶ May compete once medically cleared under supervision</td>
<td>▶ Full sport participation</td>
</tr>
<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>
</tr>
<tr>
<td>▶ Use of written contract (see sample)</td>
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</tr>
</tbody>
</table>

Nutritional Assessment

**REDs: Green Light or Low Risk**

- Healthy eating habits
- Normal hormonal and metabolic function
- Healthy BMD
- Healthy musculo-skeletal system
- Absence of POTS

This is where we want athletes to be!

Nutrition Assessment

**REDs: Moderate Risk**

- Prolonged abnormally low % body fat or weight loss >5-10% in one month
- Abnormal menstrual cycle: Functional Hypothalamic Amenorrhea (FHA) > 6 months
- Menarche > 16 years
- Abnormal Hormone profile in men
- Reduced bone mineral density (BMD)
  - History of one or more stress fractures associated with hormonal/menstrual dysfunction and/or low energy availability (EA)
- Athletes with physical/psychological complications related to low EA / disordered eating
  - ECG abnormalities, lab abnormalities, etc...
- Prolonged relative energy deficiency
- Disordered eating behavior negatively affecting other team members
- Lack of progress in treatment and/or non-compliance

Nutritional Assessment

**REDS: High Risk**

- Anorexia nervosa and other serious eating disorders
- Other serious medical conditions related to low energy availability
  - Diagnosis
  - Physiological and/or psychological
    - Example: Repeat stress fractures, Syncope
- Extreme weight loss techniques leading to dehydration induced hemodynamic instability and other life-threatening conditions

RED-s Implications for Sports Nutrition

- Underfueled athletes
- Distance runners, Wrestlers, Ballerinas
- Nutrition Assessment and Intervention needs to be comprehensive!
  - Hypothermia
    - Less than 97.5 degrees, cool hands & feet
  - Bradycardia (less than 50 bpm women, 40 bpm men)
    - Defined as less than 60 beats per minute
  - POTS (postural orthostatic tachycardic syndrome)
    - Lightheaded, dizzy, syncope
    - Lying to standing, HR changes 30 bpm
  - Urinary Ketones (Use keto strips)
    - Increase in urine specific gravity - ketones increase specific gravity
  - Weight is one variable but **not the only one**
Treatment Approach Within Athletics

- Team Approach
- Experienced RD with CSSD
- Education for Athletes and Coaches (Separately)
  - Female Athlete Forum
  - Help connect normal physiological functions with optimal performance
  - Help individuals and teams to find their own “recipe” for fueling success
  - Dispel Eating Disorder label
- Regularly assess risk for subclinical ED
- Consider Treatment Contracts
Treatment Contracts

- Team physician support is critical
- Athletes in the moderate-risk and high-risk categories should receive a written contract that is reviewed and presented to them by the team physician after their initial evaluation.
- Although a verbal contract may be sufficient, it is recommended to utilize a written contract.
- The goal of the written contract is to:
  - Specify the criteria necessary for ongoing or future clearance and return to play for the athlete with the multidisciplinary team members
  - To ensure a shared understanding of how the clinical status of the athlete will be followed with each member of the multidisciplinary team.

http://bjsm.bmj.com/content/suppl/2014/03/11/48.7.491.DC1/bjsports-2014-093502supp.pdf
Treatment Contracts

The team physician coordinates the treatment goals with each multidisciplinary team member, and includes:

- The specific recommendations in the contract
- The requested frequency of visits
- Expectations for each team member

The team physician then reviews the recommendations with the athlete, and answers any questions.

- In the case of the written contract, athlete and team physician sign the contract after it is discussed
- Written contract which can be modified based on the athlete's clearance status.

SAMPLE

http://bjsm.bmj.com/content/suppl/2014/03/11/48.7.491.DC1/bjsports-2014-093502supp.pdf
Nutrition Monitoring and Evaluation

Get Involved With Data Collection

- Pre-participation Screenings
  - Working to identify those athletes at risk
  - Regular “Performance Enhancement Team” communication
    - RDs, ATs, CSCSs

- Regular, not excessive assessments and interpretation of:
  - Iron status
  - Body Composition (Lean body mass focused)
  - DXA as necessary
  - Hormone assessments (Estradiol, Thyroid, etc...)

- Develop developmental policies regarding:
  - Athlete weighing and body comp data
  - Iron screening protocols
  - Supplements evaluation protocols
Student Athlete Challenges

▶ High Risk Sports
  - Sports With Aesthetic Components such as gymnastics, figure skating, ballet
  - Distance runners

▶ Individual Challenges
  - Limited time and money
  - Perfectionist traits
  - High tendency to compare within sport, gender, events
  - Balancing sport performance and cultural definition of femininity or masculinity
    ▪ Culture of under-eating or therefor under-fueled
    ▪ Masculinity defined by muscle definition or “size”
  - Athletes not educated as to value of normal physiology
  - Perceptions - Skipping periods mean you are “fit and training hard”
    Carbs are “bad”
    “Tabloid” Nutrition
Case Study #1: Chris  

**Nutrition Assessment**

- Summer 2013 “unconsciously dieting” - started to cut out “junk food”
- Had stopped gymnastics and was: **120#, 61.5” (BMI = 22.3), %IBW = 111.63%**
- Client has menstrual cycle about 1-1.5 years prior to weight loss; Currently about 3 years without menses
- Admits to comparing herself and her foods/eating to other athletes and other girls at school
- When eating “healthy” she reported she was encouraged by a coach and “took it to heart”
- She wanted to try to play soccer but feared not being good enough so started to get in “better shape”
Case Study #1: Chris

**Nutrition Assessment**

- Feb 2014 hospitalization x4 days for needed improvements to her hydration status, Mg+, Ph, K+, HR 48, B/P 80/50
- **Low weight = 98# (BMI = 18.22) %IBW = 93%**
- Started to work with therapists but stopped seeing therapist after trying 2 counselors and “didn’t like it”
- Returned to sport Fall 2014 - High school soccer player
- Weight back to **107#** through soccer but still no menstrual cycle
- After soccer season client “cut back” on calories again and started to lose weight again to **102#**
- December 2014 all labs wnl
Case Study #1: Chris

Nutrition Assessment

► Referred Feb 2015 (16 y/o) after being monitored by her pediatrician since Feb 2014

► Dietary Recall estimates 1100-1200 kcal/day

► Exercise recall estimates up to 300 - 500 kcal/day for exercise

► Other compensations = exercise
  o 60 minutes track running 3d/week, ab workouts 45 minutes daily and also consuming large amounts of water + gallon each day

► Feb 2015 = 102#, BMI = 19.0, Body Fat = 15.8% (TANITA-TBF 300-A)

► Energy Availability: 1100-500 / 39.04 = 15.37 - 23.06 kcal/kg FFM

► 46.36 kg x 45 = 2086 kcal/kg + exercise 300 - 500 = 2300 - 2500 kcal/day
Case Study #1: Chris

**Nutrition Diagnosis**

- Medical Dx. Anorexia, Amenorrhea per PCP
- Nutrition Dx. “Slightly” Underweight @ BMI < 18.7 with PMH underweight status (BMI 18.22) with restricted energy intakes and compensatory symptom use of exercise, fluid intakes
Case Study #1: Chris

**Nutrition Intervention**

- Initial 2300 kcal exchange-based meal plan
- All portions stressed as minimum to her goals!
- Achieving at least 40-50 grams of carbohydrate from starch/gains at each meal (x3) daily
- Pre-practice and recovery fueling “snacks” always @ sport or activity defined as at least 30-45g of carbohydrate before practice with 30-45g carbohydrate plus 10g protein after practice.
  - Example: graham crackers, chocolate milk
- Night time snack at least 30-45g carbohydrate with at least 5-10g total dietary fat
- Calories increased to 2800 kcal/day exchange-based meal plan
Case Study #1: Chris

Nutrition Monitoring & Evaluation

- Chris progressed backwards with early interventions to 99.8#, %IBW 92.8%, BMI= 18.6, Body fat = 14.7% in April 2015
- Started to improve weight status achieving 102#, BMI = 19.0, Body fat = 12.0% again by June 2015
- However, by August 2015 no consistent progress
- Decided to not play high school soccer for Fall 2015
- Referred to Hershey Medical Center, Department of Adolescent Medicine and Eating Disorder Center for secondary evaluation
  - CMP revealed low total protein 6.1; Mg 2.0 low
  - TSH normal, FreeT4 and Total T3 low; Slightly low RBC
Case Study #1: Chris

**Nutrition Monitoring & Evaluation**

- Since consult, client has been progressing well
- Exercise reduced to walking 30 minutes, 3d/week (prev up to 2 hours/day cardio)
- Parents have taken control of food choices such as snack options and meal items. Ex. Client chooses pretzels and parents choose muffin
- Recent assessment:
  - September 2015: BMI = 19.4, Body Fat = 15.6%
  - October 2015: BMI = 19.7, Body Fat = 13.9%
  - November 2015: BMI = 20.1, Body Fat = 15.6%
- Goal: Normalization of all labs, normalization of all vitals, resumption of consistent menses
- As of November 2015, all labs and vitals wnl
- No resumption of menstrual cycles to date
- Approximate Weight Goal = 120#, Body Fat >20%, BMI = 22.3
- Client plans to attend college in the Fall 2016 and already starting to get her acceptances
Case Study #2: Samantha

Nutrition Assessment

- Client’s initial session July 2015; Reports attending therapy for Dx. of Anorexia but her goal is to play volleyball at college
- Client is concerned that when coach sees her back at school that she will not “let her play”
- However increased concern over “where” the weigh gain will go on her body as well as concerns over gaining the “right type of weight” led to appt today
- Other medical dx. present include constipation, IBS (chronic), amenorrhea w/ last cycle April/May 2015 (no OBCP)
- Last labs checked Jan 2015 - stated all wnl per client and mother
- Attends college in Massachusetts and has desires to resume Volleyball
- Her anorexia has involved symptom use of: calorie restriction, low CHO intakes, low FAT foods, self-weighing (every AM) and body “checking”
Case Study #2: Samantha

Nutrition Assessment

Objectively:

18 yo/female  
Body Fat% 13.3%

Height 67”  
BMI 17.6

Weight 112.6#  
%IBW 83.4%

Dietary recall estimates calorie intakes approx. 900-1000 kcal/day
EEE approx. 2 hours cardio = 600-1000 kcal/day

Energy Availability = 900 EI - 1000 EEE/ 44.38 = -2.25 kcal/kg

Energy Requirements: 44.38 x45 kcal/kg FFM = 1997 kcal/day

Client needs to gain 1-2# per week = adding 500 kcal = 1# per week

Goal calories = 3000 kcal/day no exercise
Case Study #2: Samantha

**Nutrition Diagnosis**

- Medical dx. include constipation, IBS (chronic), amenorrhea, anorexia
- Nutrition Dx. present include significant underweight with %IBW <85%, restricted energy intakes with compensatory avoidance of CHOs and FATs, body checking
- Also showing tendency to body dysmorphia
- Goal 1-2% wt gain per week (1-2# per week)
Case Study #2: Samantha

Nutrition Intervention

- Initial plan: 3000 kcal meal plan goal
- Spaced 600-700 kcal per meal with 300-350 kcal per snack x3 daily to reach goal
- Placement of Starch/Grain at every meal(snack)
- Inclusive of 3-5 dairy portions/day for calcium sources
- Use of supplements i.e.- Clif bars, Ensure + encouraged at snack times 3x/day
- No exercise recommended
Case Study #2: Samantha
Nutrition Monitoring & Evaluation

- First follow-up x1 week: Added CHO foods such as bagels, pasta, rice, potatoes, bread, subs, cookies and hitting her 3000 kcal goal daily; Dairy portions reached with chocolate milk, smoothies, Greek yogurt
  
  Weight 112.6#  BMI 17.6  Body Fat% 13.3%
  
  Weight 114.6#  BMI 17.9  Body Fat% 13.5% Gain 2.0# x1 week

- Discussed plan as minimum and continue “What can I add to this?” ex: wheat germ to smoothie, peanut butter to apple

- Goal increased to 3500 kcal/day by adding 100 kcal each meal/snack
Case Study #2: Samantha

Nutrition Monitoring & Evaluation

- Second follow up x1 week: Client and mother feel + about her progress and additions - mainly focusing on CHO foods

- C/O “busy” schedule with getting ready for college and not hitting all of her meal/snack times as consistently

<table>
<thead>
<tr>
<th>Weight</th>
<th>BMI</th>
<th>Body Fat%</th>
</tr>
</thead>
<tbody>
<tr>
<td>112.6#</td>
<td>17.6</td>
<td>13.3%</td>
</tr>
<tr>
<td>114.6#</td>
<td>17.9</td>
<td>13.5%</td>
</tr>
<tr>
<td>116.6#</td>
<td>18.3</td>
<td>15.7%</td>
</tr>
</tbody>
</table>

- Client emailed the day after session
  - “Hi Jen! I know we just met yesterday but I just wanted to verify a few things. I want to make sure I should still be eating to put on weight. Or, do you think I can try to maintain my weight at this point. Also, if I want to put on muscle weight should I still be eating more carbs or should I try to increase my protein. Thanks! Sam”
Case Study #2: Samantha 
Nutrition Monitoring & Evaluation

- Third follow-up x1 week: Client feeling + but “busy” schedule continues; Denies any exercise; Client will need to be cleared by medical provider & AT prior to competition; Client has more body dysmorphic complaints “I feel fat”

```
Weight 112.6#  BMI 17.6  Body Fat% 13.3%
Weight 114.6#  BMI 17.9  Body Fat% 13.5%  Gain 2.0# x1 week
Weight 116.6#  BMI 18.3  Body Fat% 15.7%  Gain 2.0# x1 week
Weight 117.6#  BMI 18.4  Body Fat% 12.6%  Gain 1.0# x1 week
```

- Client was leaving for college & volleyball preseason; Client progressing however time-frame not long enough to reach goals; Client experienced no medical changes from initial session; Client asked to have providers on-site at college (AT, RD, MD) be in touch and she will need to sign a release
Case Study #2: Samantha  
Nutrition Monitoring & Evaluation

► Client emailed 20 days after last session...
  
  o “Hi Jen! I hope all is going well! I am emailing you because my trainer at college was wondering if she could get a copy of the nutrition plan you set forth for me so that she can help guide me while I am at school. If you could just email it to me that would be great! Thanks so much for all your help, Samantha”

► After my request for releases...
  
  o “Hi Jen. If you could just send me a copy of the plan I would appreciate it. The trainer said that’s all she wants for now. When I get in to see the nutritionist on campus, I’ll check if she’d like to correspond with you. If she does, I’ll do a release then. Have a great weekend! Samantha”
Case Study #2: Samantha
Nutrition Monitoring & Evaluation

No responses until November 2015:

“Hello Jen, I hope all is going well! I am pretty well up here at college. I just got done with my volleyball season, so things are starting to wind down. I have been meeting with a nutritionist while here on campus as per the request of my coach. Even though I have been eating very well while on campus, I have lost weight and my coach is concerned. I am now on a diet that is trying to put weight on fast, just like I was over the summer. I have no problem gaining weight at this point because I know I need to and it will only be beneficial. I am just a little apprehensive because I have been googling things online and it says that most of the weight I gain back with primarily go to my stomach in the beginning. Is this true? Do I really need to worry about that or will my weight distribution be pretty even. I was wondering and I figured that you would be the best person to ask. Thank you so much for your time and I hope to hear from you soon, Samantha P.S. My mom doesn’t know I am emailing you, so could you please respond to me via this email address!”
Case Study #3: Michael

Nutrition Assessment

- 16 year old male, football and wrestling, 68”
- Getting ready to start junior year in HS and was trying to get ready for football with eating healthy and conditioning
- Usual weight has been 165/172# but client had torn labrum Winter soph year and had limited activity
- Weight dropped to 147# but client has been able to increase back to 153# range; however, goal is to get back to 165/172# again esp. for football
- Client states coaches have been telling him he’s slower, weaker and stressing him to gain weight esp. for football season
Case Study #3: Michael

**Nutrition Assessment**

- Client education initiated for sports nutrition fueling practices, recovery fueling, CHO strategies and discussed energy balance and muscle building at length
- Client expressed concerns about gaining the “right kind of weight” through eating and expressed some fears of “gaining too much fat”
- Parents report that client expresses significant anxiety about eating higher fat & higher calories foods
  - Ex. Used to eat chicken wings with his brother but now won’t touch them
- Parents report getting very frustrated with his lower calorie food choice and overall limits to calorie levels
- Client weighing and measuring his food portions at home
- Client taking 2 protein supplement shakes daily (mixes with water)
Case Study #3: Michael

Nutrition Assessment

- Objectively:
  - 16 y/o Football player  Ht. 68.0”  Weight 155.0#  BMI 23.6  Body Fat% 12.9%
    - %IBW Wt Change @ low BW (147#) @ 14.5% wt loss; Current change 10% wt loss
    - Client po intakes calculated approx. 1900 kcal/day per dietary recall with >40% protein intakes noted

- Irregular labs noted:
  - Low cell counts, low H/H, high AST / ALT, Albumin low, glucose low
  - Urinalysis showing protein and ketones
Case Study #3: Michael

Nutrition Assessment

- **Energy Availability**
  - EEE  approx. 1 hours high intensity cardio daily (no off days) = 1000 kcal/WO/day
    - 1 hour lifting 4-5 days per week = 400 kcal/lift
  - Energy Availability = 1900 EI - 1400 EEE/ 61.37kg FFM = **8.15 kcal/kg**
  - Energy Requirements: 61.37 x45 kcal/kg FFM = 2761 kcal/day
  - Client needs to gain 1# per week; Adding 500 kcal = 1# per week
  - **Goal calories = 3,261 kcal/day (no exercise)**
    - Exercise Limited to 60 minutes daily while alternating cardio 60 minutes, lifting 60 minutes and 1 OFF day per week
    - Goal 3200 kcal + exercise 400 kcal = 3600 kcal/day
Case Study #3: Michael

**Nutrition Diagnosis**

- Medical dx. include hypoglycemia, hypoalbuminemia, anemia
- Elevated ALT AST signifying liver damage / injury
- Nutrition Dx. present include poor energy availability with restricted po intakes, fears of “fat”, potential body dysmorphia, compensatory avoidance of CHOs and FATs, food weighing and measuring, as well as noted elevation to protein composition of dietary intakes
- Goal 1-2% wt gain per week (1-2# per week)
Case Study #3: Michael Nutrition Intervention

- Meal plan 3600 kcal/day
  - 800 calories per meal of 60% CHO balance outlined for each meal
  - 400 kcal per smack x3 each day
- Utilize 30-60g CHO per hour of exercise (Gatorade)
- For ease of digestion, recommended liquid calories (Gatorade, Ensure, Chocolate milk, etc) to be used within every meal and snack
- Exercise Limited to 60 minutes daily while alternating cardio 60 minutes, lifting 60 minutes and 1 OFF day per week
Case Study #3: Michael

Nutrition Monitoring & Evaluation

- Fall was “up and down” with weight status
  - July 154#, 153#  Early August (pre-season football) 158.0#
  - September 152.8#  November 148.8#
- November/December client was referred to a sport psychologist
- Goal for wrestling was to keep weight within 3# per practice (eliminate large ups and downs); Consuming 16-24 fl.oz. for each pound lost during practice
Case Study #3: Michael

Nutrition Monitoring & Evaluation

- March: Client was no longer weighing and measuring his foods **Weight 151.4#**
- April: Lab check “almost normal now” per MD follow up
- June: The next year client was **157/159#** range and increased for football again **160#/162#** range which was maintained through the winter
- July: All labs wnl per client and MD follow-up but still some lingering concerns with ALT/AST levels
- September: Increased trying on desserts and social eating ex. Rita's with friends, desserts at family party
Case Study #3: Michael

Nutrition Monitoring & Evaluation

- June x2 years client was brought back by his parents b/c his weight dropped again 150# and client was now getting ready for college transition; Weight increase to 156# in August prior to leaving for college; Client decided not to wrestle in college and joined the lifting club

- Nutrition goals were 100g CHO per meal and snack (3 meals, 2 snacks), 3-4oz protein each meal, increased use of 100% fruit juice and smoothies (dairy) portions for calorie drinks, limit of 2c cooked or raw veggies per day, and inclusion of at least 10g of added fats to each meal and snack daily.

- Client had full physical prior to college and all measures including liver enzymes were wnl
Summary

- Relative energy deficit in sport encompasses the female athlete triad
- However, REDs expands the assessment areas which are multifaceted
Recommendations to address RED-S

- For the Athlete
  - Educational programs on RED-S, healthy eating, nutrition, EA, the risks of dieting and how these affect health and performance
  - Reduction of emphasis on weight, emphasizing nutrition and health as a means to enhance performance
  - Development of realistic and health-promoting goals related to weight and body composition
  - Avoidance of critical comments about an athlete’s body shape/weight
  - Use of reputable sources of information.
  - Promotion of awareness that good performance does not always mean the athlete is healthy
  - Encouragement and support of appropriate, timely and effective treatment
Recommendations to address RED-S

- Healthcare Professional Recommendations
  - Identification of a multidisciplinary athlete health support team including sports physician, nutritionist, psychologist, physiotherapist and physiologist
  - Education of the medical team in the detection and treatment of the RED-S
  - Implementation of the RED-S Risk Assessment Model in the PHE and the RED-S RTP Model
Find A SCAN RD/CSSD

- Incorporate a “team” approach when assisting your athletes with their nutrition related health and performance goals
- Many loopholes both medically and psychologically
- Set guidelines and adherence will be key to your program’s successful management of RED-s for your athletes
- Use SCAN DPG for finding an RD/CSSD in your area

Sports, Cardiovascular and Wellness Nutrition Group
A Dietetic Practice Group of the Academy of Nutrition & Dietetics (AND)

www.scandpg.org
THANK YOU!

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