Welcome: A Few Things to Note

1. Participants will be muted upon entry and videos turned off

2. For technical assistance, please use the chatbox

3. You will receive an email approximately 1 month requesting feedback/impact on this presentation

4. Visit www.nceedus.org/training to view other training opportunities

NCEED Grant Statement
Funding for this center’s initiative was made possible by Grant No. H79SM081924 from the Substance Abuse and Mental Health Services Administration (SAMHSA). Any views communicated or shared in written and recorded resource materials or publications and by presenters do not reflect the official policies of the Department of Health and Human Services, nor does the mention of organizations, or commercial or private practices imply endorsement by the National Center of Excellence for Eating Disorders (NCEED) or the U.S. Government.
Relative Energy Deficiency in Sport (REDS) and Eating Disorders in Athletes

June 31, 2023

Rachael Flatt, M.A.
Disclosures

- National Science Foundation Graduate Research Fellowship Program
  - Grant # DGE-1650116
Objectives

After taking this webinar, individuals will be able to:

1. Describe REDS and the association with eating disorder psychopathology
2. Determine which athletes may be at risk for REDS and what screening measures to consider using
3. Provide psychoeducation about the potential consequences of REDS
Agenda

▪ History and background on REDS

▪ Links between REDS and eating disorders

▪ Screening for REDS

▪ Treatment and consequences of REDS
History and Background on Relative Energy Deficiency in Sport
What is the history of REDS?

- Originated from the Female Athlete Triad

- Developed by the Women’s Issue Task Force of the American College of Sports Medicine (ACSM) in 1992

- All three components had to be present simultaneously for a diagnosis

From Matzkin et al., 2015
What is the history of REDS? (cont’d)

- Updated model of the Female Athlete Triad from ACSM in 2007

From De Souza et al., 2014
What is REDS?

“The syndrome of REDS refers to impaired physiological function including, but not limited to, metabolic rate, menstrual function, bone health, immunity, protein synthesis, cardiovascular health caused by relative energy deficiency.”

Mountjoy et al., 2014
Background on REDS

- Prevalence estimates range from 22-58%
  - Preliminary data suggest prevalence is higher in females than males

- Low energy availability is derived from either:
  - Not enough caloric intake
  - Excessive energy expenditure

- Energy availability is calculated by subtracting the energy consumed (kcal) from the energy ingested (kcal) and dividing this value by the fat free mass (FFM)
  - Generally accepted clinically low range is <30 kcal/kg FFM

- Ideal energy availability in athletes supports homeostatic functioning AND athletic performance

Logue et al., 2020
Impact on energy demands

From Keay & Francis, 2019
Systems that are affected due to REDS

Figure 1  Health consequences of Relative Energy Deficiency in Sport (RED-S) showing an expanded concept of the Female Athlete Triad to acknowledge a wider range of outcomes and the application to male athletes (*Psychological consequences can either precede RED-S or be the result of RED-S)." 14

From Mountjoy et al., 2014;2018
Links between REDS and Eating Disorders
Do REDS and eating disorders always show up together?

Not always! Athletes with REDS don’t necessarily meet criteria for an eating disorder. However, eating disorders increase the risk of an athlete having REDS.
Low Energy Availability (LEA) and overlap with disordered eating behaviors

- Not enough caloric intake
  - Restriction
    - Anorexia Nervosa, Bulimia Nervosa, Binge Eating Disorder, ARFID, OSFED, Orthorexia
  - Fasting
    - Anorexia Nervosa, Bulimia Nervosa, Binge Eating Disorder, OSFED
  - Vomiting after eating
    - Anorexia Nervosa, Bulimia Nervosa, Purging Disorder, OSFED

- Excessive energy expenditure
  - Excessive/compulsive exercise
    - Anorexia Nervosa, Bulimia Nervosa, OSFED
How do REDS and eating disorders differ from overtraining syndrome?

- Overtraining syndrome (OTS): persistent lack of recovery/inadequate rest after repetitive, intense training leading to long-term performance decrement
  - Typical primary complaint is **persistent underperformance without another identifiable cause**

- Shared symptoms with REDS and eating disorders:
  - Fatigue
  - Weight loss
  - Awakening w/o feeling refreshed
  - Loss of motivation
  - Poor concentration
  - Depressed mood
  - Irritability

**Key differentiators:** rule out disordered eating behaviors and low energy availability

Carrard et al., 2022; Cadegiani et al., 2020; Meeusen et al., 2013
Screening for REDS
Which athletes should be screened for REDS?

- Every athlete!
- Those who endorse:
  - Excessive/compulsive exercise
  - Eating disorder symptoms and/or meet criteria for an eating disorder, particularly anorexia nervosa
  - Participation in leanness sports (judged sports, aesthetic sports, weight-class sports, and endurance sports)
  - Recent weight loss
  - Trouble gaining weight during growth and development
  - Delayed or lack of normal growth and development
  - Recent injuries and illnesses
  - Decreased performance
  - Endocrine dysfunction

Torstveit et al., 2019; Mountjoy et al., 2015
What should I use to screen for REDS?

- REDS assessment tools
  - REDS Clinical Assessment Tool (REDS CAT)
  - Low Energy Availability in Females Questionnaire (LEAF-Q)
  - Low Energy Availability in Males Questionnaire (LEAM-Q)
  - REDS Specific Screening Tool (RST *note – not validated in males yet)

- Disordered eating behavior and eating disorder assessments
  - BEDA-Q
  - EDE-Q
  - EDI

- Meal logs
- Training logs
- Weight and BMI measurements
- Medical history
- Various medical diagnostic tests (e.g., hormone panels, electrocardiograms, metabolic rate, etc)
  - **important to consider potential screening differences for athletes whose gender is different from the sex assignment at birth

Lundy et al., 2022; Melin et al., 2014; Mountjoy et al., 2015; Sim et al., 2021
## Risk Assessment Model

<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></td>
<td></td>
</tr>
<tr>
<td>- Other serious medical (psychological and physiological) conditions related to low energy availability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Use of extreme weight loss techniques leading to dehydration induced hemodynamic instability and other life threatening conditions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Prolonged abnormally low % body fat measured by DXA* or anthropometry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Substantial weight loss (5 – 10 % body mass in one month)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Attenuation of expected growth and development in adolescent athlete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Low **EA of prolonged and/or severe nature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Abnormal menstrual cycle: functional hypothalamic amenorrhea &gt;3 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- No menarche by age 15y in females</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Reduced bone mineral density (either in comparison to prior DXA or Z-score &lt; -1 SD).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- History of 1 or more stress fractures associated with hormonal/ menstrual dysfunction and/or low EA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Healthy eating habits with appropriate EA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Healthy functioning endocrine system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Healthy bone mineral density as expected for sport, age and ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Healthy musculoskeletal system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Severe ECG abnormalities (i.e. bradycardia)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Athletes with physical/ psychological complications related to low EA+/ - disordered eating;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Diagnostic testing abnormalities related to low EA +/- disordered eating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Prolonged relative energy deficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Disordered eating behavior negatively affecting other team members</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Lack of progress in treatment and/or non-compliance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mountjoy et al., 2015
Treatment and Consequences of REDS
Treatment Overview

- Work with a team consisting of:
  - Dietitian – re-establish balanced eating habits
  - Mental health care professional – address underlying issues (e.g., anxiety, eating disorder)
  - Physician – monitor and treat athlete’s physical health conditions

- Gather baseline data

- Address caloric deficit/energy deficiency
  - If disordered eating/eating disorder is present, use evidence-based psychological treatments (i.e., FBT, CBT-E)
  - If necessary, pursue pharmacological and supplement treatments (can be helpful in reducing risk for stress fractures)

- Monitor menstrual irregularities for athletes AFAB

- Maintenance strategies and relapse prevention
Explaining the performance consequences of REDS

Figure 2  Potential Performance consequences of Relative Energy Deficiency in Sport (*Aerobic and anaerobic performance).  

From Mountjoy et al., 2018
Future research and practice recommendations

▪ Develop better understanding of shared and unique risk factors and presentations for athletes based on demographic and sport characteristics.

▪ Determine if and how ED treatment should differ in the presence of REDS.

▪ Develop better understanding of the shared and unique pathology of and treatment recommendations for REDS, eating disorders, and overtraining syndrome.

▪ If there is a concern for an ED, screen for REDS, and vice versa!

▪ Disseminate REDS and ED psychoeducation simultaneously.
Key References


Thank you! Questions?