

# Fueling for Success: Relative Energy Deficiency in Sport

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# Disclosure

I have the following financial relationships to disclose:  
Abbvie, Speaker's Bureau, Migraine

*All relevant financial relationships have been mitigated*


# Objectives

- Define and discuss epidemiology of Relative Energy Deficiency in Sport (RED-S).
- List current gaps in care related to identification of RED-S for recreational athletes and orthopedic patients.
- Describe members of the multidisciplinary team for treatment of RED-S.
- Identify body systems impacted and consequences of RED-S.
- Review how nutrition affects rehabilitation outcomes for athletes.

# DEBUNKING MYTHS

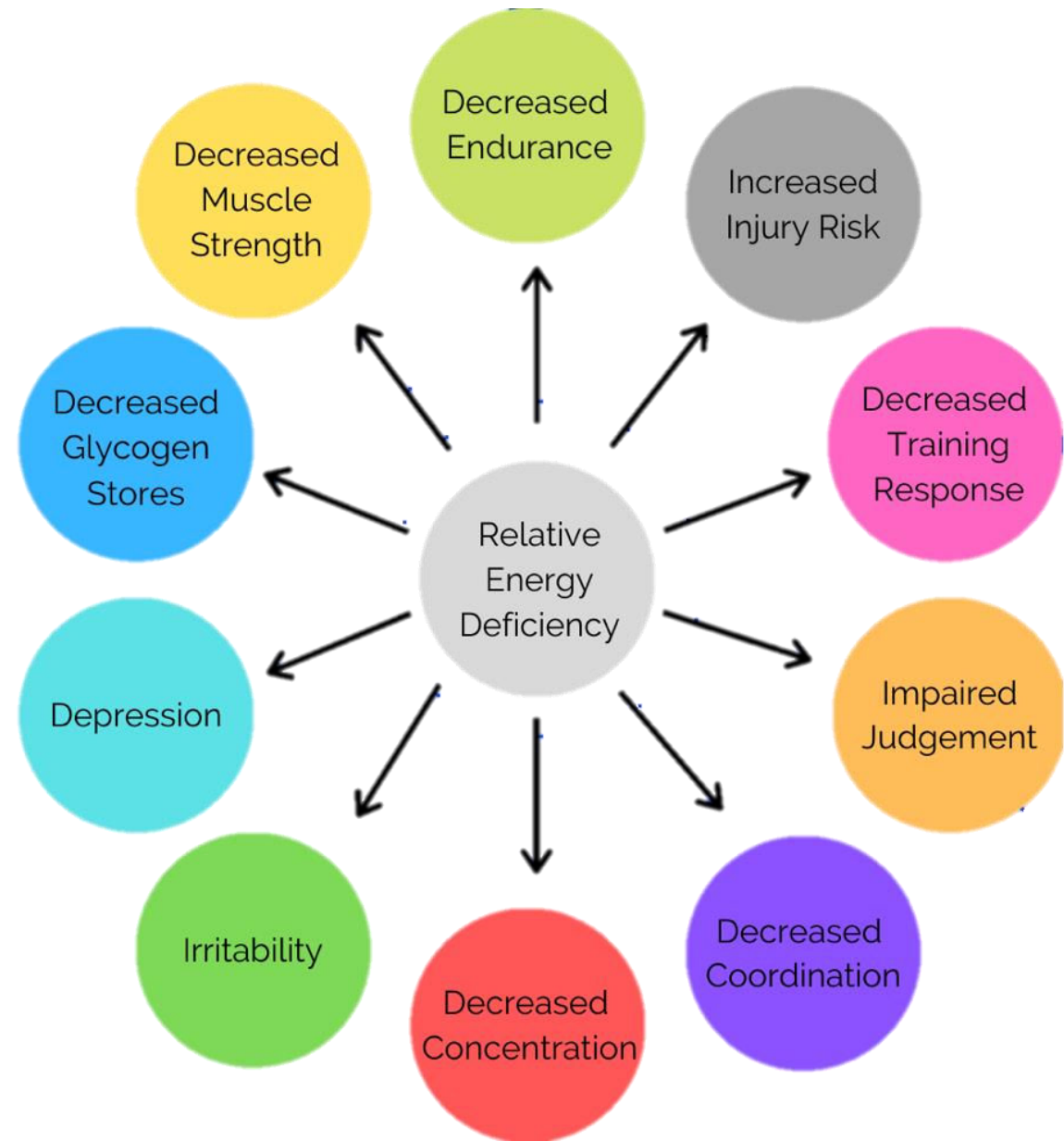
- Is there an “ideal” nutrition strategy for athletes?
- Are only competitive athletes at risk for RED-S?
- Losing your period is a normal part of training
- I don't want to gain weight while I am injured, so I will cut back on intake
- I eat multiple times a day, so I can't be in an energy deficit

# Key Components for Athlete Nutrition

1. There is no ideal nutrition approach for athletes, it is both individual and sport-specific
  2. Under-fueling can lead to multiple physiologic changes and health issues
  3. Supplements can be beneficial, but these should be individualized and assessed for safety/quality
  4. An ortho rehabilitation treatment plan should include nutrition discussion
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# What is RED-S?

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# Relative Energy Deficiency in Sport

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Formerly known as the female athlete triad (weight loss, amenorrhea, and stress fracture/osteoporosis)

2009: International Olympic Committee defined RED-S to be inclusive of both genders and identify the constellation of consequences

What's the root cause?

Low energy availability (EA): imbalance of Energy intake (EI) and Energy expenditure (EE)



## Gaps in care

Recreational athletes often do not identify as “athletes”

Under-recognition of relationships among nutrition and related health effects that impact performance and general health

Cultural emphasis on dieting/weight loss

Lack of education for medical providers to identify energy deficits or address nutrition concerns with athletic patients



# Identification

- Screening for RED-S
- Who is at risk?
- Is incidence increasing?
- Communication style
- Labs and tests to consider



# Signs and Symptoms



- GI upset, constipation, bloating
- Amenorrhea
- Frequent injuries
- Stress fracture
- Sleep disturbance
- Hypotension
- Fatigue
- Bradycardia
- Cold intolerance
- Weight changes
- Decreased performance
- Anxiety/Irritable
- Depression
- Hair Loss
- Dry Skin
- Lightheaded/Dizzy

# Labs to Consider

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CBC, CMP, Iron, Ferritin, Lipid Panel, TSH, Vitamin D, B12

Lab Interpretation to Assess for:

- Low iron and/or ferritin (can occur with normal Hgb/Hematocrit)

- Low vitamin D

- Low B12

- Elevated liver enzymes

- Low blood glucose

- Elevated cholesterol

- Low folate (more common in vegetarians/vegans)

- Elevated TSH

# Bone Health

DEXA (Dual-Emission X-ray Absorptiometry): recommended following stress fracture OR amenorrhea for >6 months

Consider for those with disordered eating or oligomenorrhea

Ensure adequate calcium and vitamin D intake

Osteoblasts and Osteoclasts

Can bone density be improved?



# Menstrual Health

Primary amenorrhea

Secondary amenorrhea

There is no specific formula for how or severe long energy deficit needs to be for amenorrhea to occur

Birth control is not recommended as treatment of amenorrhea

FitRWoman app- resource

# Sleep = Recovery

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- Timing of nutrition & exercise
- Avoid evening caffeine, alcohol, excess fluids
- Carbohydrate evening snack
- General under-fueling
- Supplements (e.g. magnesium)



# Injury Risk: The Body Needs Fuel!

## Intake is Needed for:

- Glycogen stores
- Muscle strength
- Mitochondria in muscle fibers
- Ability to recover

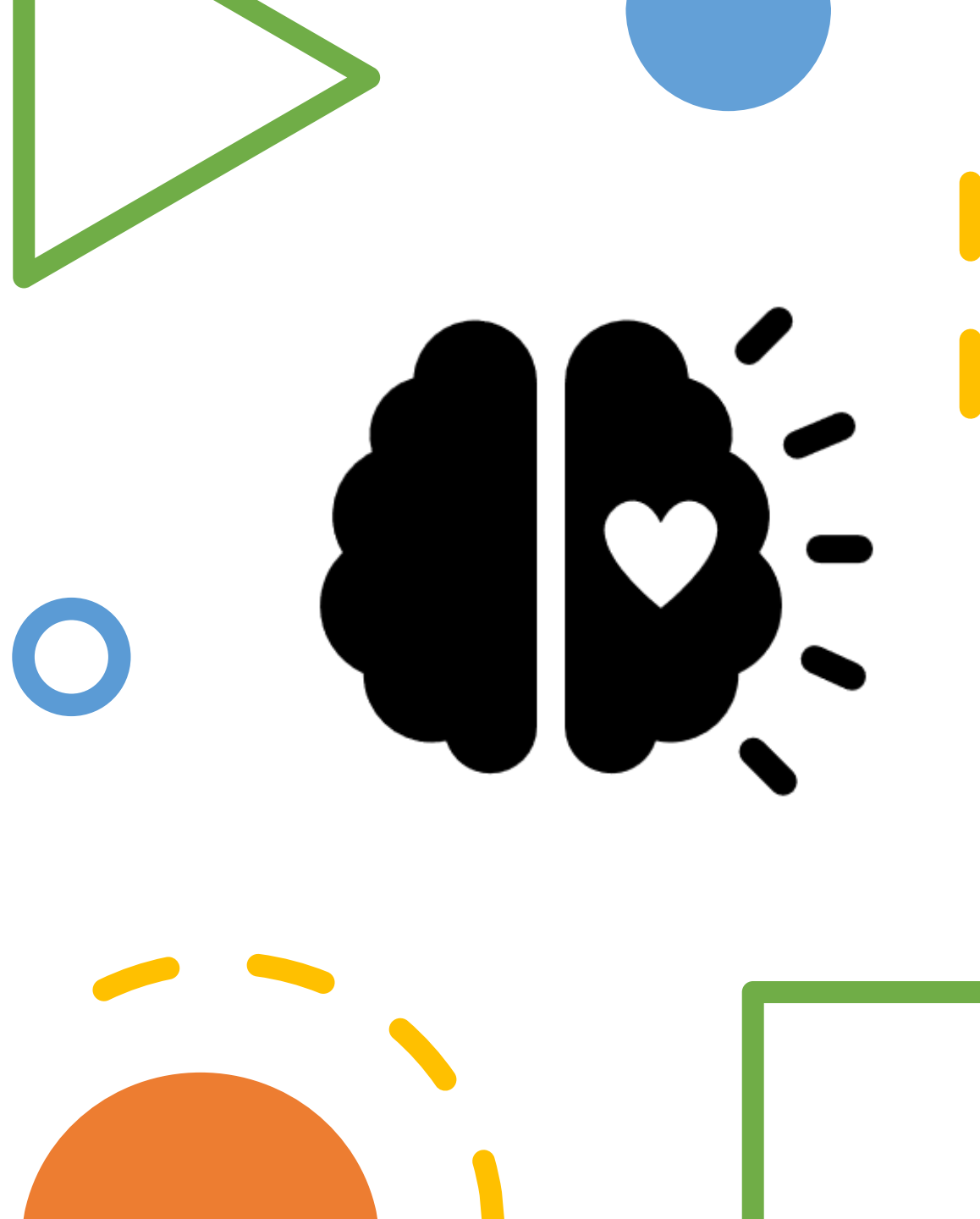


## Inadequate Fueling Leads to:


- Decreased training response
- Difficulty with concentration and coordination
- Mood changes
- Decreased endurance/performance
- Injuries

# Mental Health

- RED-S can occur with or without disordered eating
- Assess for cutting out food groups, social interactions impacted by food, weight changes
- Eating Disorder Screen for Primary Care (ESP)
- SCOFF questionnaire







Disordered eating  
or lack of nutrition  
awareness?

Significant component is the individual's thoughts and feelings about food

Method for assessing = how does the athlete respond to nutrition recommendations?

A person without disordered eating will be motivated to work with a dietician to follow recommendations and increase intake. If there is anxiety and fear associated with increasing calories and weight, disordered eating may be present.



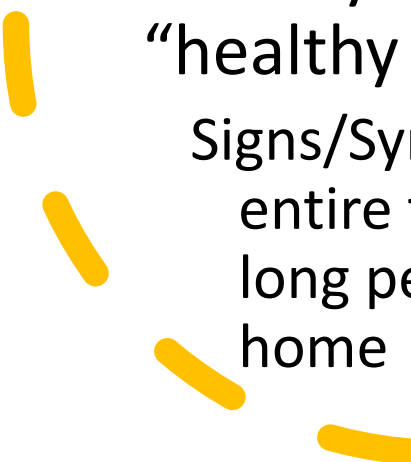
# orthorexia

Term developed in 1998

Obsession with “clean” or “healthful” eating

No formal diagnostic criteria, though often correlated with obsessive-compulsive disorder

Goes beyond balanced awareness of nutrition to unhealthy fixation of “healthy eating



Signs/Symptoms: compulsive checking of food labels/ingredients, cutting out entire food groups, many rules about what is “healthy” to consume, spending long periods of time focused on what will be available to eat when away from home

# RED-S Treatment Team

Registered Dietician

Primary Care Provider

Mental Health Provider/Therapist

Coach

Physical Therapist

\*Not every athlete needs all of these providers for recovery



# Nutrition approaches

Balanced nutrition is beneficial for all athletes

Sport-specific focus should be guided by a registered dietician and/or experienced coach

Periodized nutrition: strategic combination of nutrition + exercise for optimal training and performance

Within a specific sport, there are considerations for pre-workout or race, during workout, and post-workout

# Supplements

Which supplements to utilize should be individualized

How to assess safety and quality of supplements? The following organizations provide quality testing:

1. ConsumerLab.com
2. NSF International: [www.nsf.org](http://www.nsf.org)
3. U.S. Pharmacopeia: [www.usp.org](http://www.usp.org)



# Ortho Rehab

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Applies to sport injury and orthopedic procedures

Nutrition interventions are not commonly included in rehab interventions

Synergistic with other rehab modalities and support healing

Caloric needs after injury

Protein to support muscle repair (amino acid demand)

Bone turnover needs



Rehab:  
nutritional  
targets

Calories

Protein/amino acids

Carbohydrates

Fatty acids

Supplements



# resources

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Find a Registered Dietician via the Academy of Nutrition and Dietetics

<https://www.eatright.org/find-a-nutrition-expert>

For athletes with disordered eating, therapist who specializes in eating disorders

The Eat for Endurance podcast and PHIT for a Queen podcast

*Finding your Sweet Spot* by Rebecca McConville, RD

*Sick Enough* by Jennifer Gaudiani, MD

*No Period, Now What*, Dr. Nicola Rinaldi

*Run Fast Eat Slow* – Cookbook series that includes specific nutrition for athlete issues and healing

*Sport Mom United*- [sportsmomsworld.com](http://sportsmomsworld.com)



# Let's review

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Energy balance is a key component of athlete health and performance

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History regarding nutrition should focus on patient goals and values- ask them to tell you their story

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Energy availability directly impacts sleep, mood, performance, recovery, and multiple body systems

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Significant health consequences can result from RED-S

# references

- Burke, L. M., Jeukendrup, A. E., Jones, A. M., & Mooses, M. (2019). Contemporary Nutrition Strategies to Optimize Performance in Distance Runners and Race Walkers. *International Journal of Sport Nutrition and Exercise Metabolism*, 29(2), 117–129. <https://doi.org/10.1123/ijsnem.2019-0004>
- Coelho, A. R., Cardoso, G., Brito, M. E., Gomes, I. N., & Cascais, M. J. (2021). The Female Athlete Triad/Relative Energy Deficiency in Sports (RED-S). *Revista Brasileira de Ginecologia e Obstetrícia / RBGO Gynecology and Obstetrics*, 43(05), 395–402. <https://doi.org/10.1055/s-0041-1730289>
- Doherty, Madigan, Warrington, & Ellis. (2019). Sleep and Nutrition Interactions: Implications for Athletes. *Nutrients*, 11(4), 822. <https://doi.org/10.3390/nu11040822>
- Gaudiani, J. L. (2019). *Sick enough: A guide to the medical complications of eating disorders*. Routledge.
- Gratwicke, M., Miles, K. H., Pyne, D. B., Pumpa, K. L., & Clark, B. (2021). Nutritional Interventions to Improve Sleep in Team-Sport Athletes: A Narrative Review. *Nutrients*, 13(5), 1586. <https://doi.org/10.3390/nu13051586>
- Kerksick, C. M., Arent, S., Schoenfeld, B. J., Stout, J. R., Campbell, B., Wilborn, C. D., Taylor, L., Kalman, D., Smith-Ryan, A. E., Kreider, R. B., Willoughby, D., Arciero, P. J., VanDusseldorp, T. A., Ormsbee, M. J., Wildman, R., Greenwood, M., Ziegenfuss, T. N., Aragon, A. A., & Antonio, J. (2017). International society of sports nutrition position stand: Nutrient timing. *Journal of the International Society of Sports Nutrition*, 14(1), 33. <https://doi.org/10.1186/s12970-017-0189-4>
- Logue, D. M., Madigan, S. M., Melin, A., Delahunt, E., Heinen, M., Donnell, S.-J. M., & Corish, C. A. (2020). Low Energy Availability in Athletes 2020: An Updated Narrative Review of Prevalence, Risk, Within-Day Energy Balance, Knowledge, and Impact on Sports Performance. *Nutrients*, 12(3), 835. <https://doi.org/10.3390/nu12030835>
- McConville, R (). *Finding Your Sweet Spot: How to Avoid RED-S by Optimizing Your Energy Balance*.
- Sale, C., & Elliott-Sale, K. J. (2019). Nutrition and Athlete Bone Health. *Sports Medicine*, 49(S2), 139–151. <https://doi.org/10.1007/s40279-019-01161-2>
- Smith-Ryan, A. E., Hirsch, K. R., Saylor, H. E., Gould, L. M., & Blue, M. N. M. (2020). Nutritional Considerations and Strategies to Facilitate Injury Recovery and Rehabilitation. *Journal of Athletic Training*, 55(9), 918–930. <https://doi.org/10.4085/1062-6050-550-19>

# Thank you!

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Personal image, Laurel Short