

# Female Athlete Triad or Relative Energy Deficiency in Sports (RED-S): Is There a Difference?



**T**HE FEMALE ATHLETE TRIAD was officially described in 1997, by the Task Force on Women's Issues of the American College of Sports Medicine (ACSM), as a syndrome often observed in physically active girls and women with three distinct medical disorders: disordered eating, amenorrhea, and osteoporosis.<sup>1,2</sup> In 2007, ACSM redefined and changed the terminology used to describe the three interrelated components to energy availability (EA), menstrual function, and bone health.<sup>1,3</sup> ACSM defines the term "energy availability" as the amount of energy left over and available for normal body functions after the energy expended for training is subtracted from the energy taken in from food.<sup>1,2</sup> Energy availability is often decreased in weight-sensitive sports, in which leanness and body weight are important due to their role in performance (cross-country running, cycling), appearance (gymnastics, dance, cheerleading), or a requirement to meet a competition weight category (wrestling, rowing, martial arts).<sup>2</sup> Athletes may be at a greater risk of disordered eating that can lead to decreased energy availability.<sup>2</sup> The 2007 ACSM position asserts that low energy availability is the cornerstone of the metabolic and health consequences associated with the Female Athlete Triad.<sup>4</sup> While the term Female Athlete Triad may be the most commonly referenced aspect of energy availability and performance, the concept of energy deficiency is not unique to women, as noted in more recent research.<sup>2,3,5</sup>

In 2014, the International Olympic Committee (IOC) working group coined the phrase Relative Energy Deficiency in Sports (RED-S)<sup>2,3,5</sup> to emphasize that the syndrome affects all athletes, not just females. According to the IOC, relative energy deficiency implies that low energy availability occurs when an individual's dietary energy intake is insufficient to support the energy expenditure required for health, function, and daily living, once the cost of exercise and sporting activities is taken into account.<sup>3,5</sup> Normal body functioning is impaired in RED-S due to the relative energy deficiency that can affect metabolic rate, menstrual function, bone health, immunity, protein synthesis, and cardiovascular health.<sup>3,5</sup> In addition, RED-S may lead to a gradual reduction in the athletes' performance by a number of factors, including decreased endurance, increased risk of injury, poor response to training, impaired cognitive function, decreased coordination, decreased concentration, irritability, depression, decreased glycogen stores, and decreased muscle strength.<sup>3</sup>

There has been some controversy regarding the IOC 2014 consensus statement within the scientific community. The Female Athlete Triad Coalition has refuted the IOC 2014 consensus statement, "Beyond the Female Athlete Triad—Relative Energy Deficiency in Sport (RED-S)" in a published article in the *British Journal of Sports Medicine*.<sup>6</sup> The Coalition feels the new IOC statement does not place enough emphasis on the Female Athlete Triad model that has been thoroughly researched, and improves the health outcomes of female athletes.<sup>5</sup> By contrast, IOC authors of the 2014 Consensus Statement on RED-S recommend that the sports medicine and sports science communities work together to increase the understanding and awareness of RED-S,<sup>5</sup> broadening the efforts to connect with all athletes. The Female Athlete Triad and the Relative Energy Deficiency in Sports both

provide guidelines to evaluate and monitor athletes. As research regarding RED-S and Female Athlete Triad continues to evolve, sports dietitian nutritionists working with athletes need to understand the complexity of this topic. The athlete needs expert guidance regarding nutrition and its relationship to activity and performance. The sports dietitian nutritionists should address the combined goals of health and fitness, enhanced capacity to train, and optimal athletic performance for all athletes.<sup>7</sup>

## References

1. De Souza MJ, Nattiv A, Joy E, et al. 2014 Female Athlete Triad Coalition Consensus Statement on Treatment and Return to Play of the Female Athlete Triad: 1st International Conference held in San Francisco, California, May 2012 and 2nd International Conference held in Indianapolis, Indiana, May 2013. *Br J Sports Med*. 2014;48(4):289.
2. Academy of Nutrition and Dietetics. Eating Disorders. *Sports Nutrition Care Manual*. [http://www.nutritioncaremanual.org/topic.cfm?ncm\\_category\\_id=22&ncm\\_toc\\_id=255751&ncm\\_heading=nutrition\\_care&ncm\\_content\\_id=112097](http://www.nutritioncaremanual.org/topic.cfm?ncm_category_id=22&ncm_toc_id=255751&ncm_heading=nutrition_care&ncm_content_id=112097). Accessed January 14, 2016.
3. Mountjoy M, Sundgot-Borgen J, Burke L, et al. The IOC Consensus Statement: Beyond the Female Athlete Triad—Relative Energy Deficiency in Sport (RED-S). *Br J Sports Med*. 2014;48(7):491-497.
4. Rosenbloom C, Coleman E. *Sports Nutrition: A Practice Manual for Professionals*. 5th ed. Chicago, IL: Academy of Nutrition and Dietetics; 2012.
5. Mountjoy M, Sundgot-Borgen J, Burke L, et al. Authors' 2015 additions to the IOC consensus statement: Relative Energy Deficiency in Sport (RED-S). *Br J Sports Med*. 2015;49(7):417-420.
6. De Souza MJ, Williams NI, Nattiv A, et al. 2014 Misunderstanding the Female Athlete Triad: Refuting the IOC Consensus Statement on Relative Energy Deficiency in Sport (RED-S). *Br J Sports Med*. 2014;48(20):1461-1465.
7. Rodriguez NR, DiMarco NM, Langley S, et al. Position of the American Dietetic Association, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and athletic performance. *J Am Diet Assoc*. 2009;109(3):509-527.

## Additional Resource:

Sports, Cardiovascular and Wellness Nutrition (SCAN) Dietetic Practice Group. <http://www.scandpg.org/>

This article was written by **Wendy Marcason, RDN**, of the Academy of Nutrition and Dietetics' Knowledge Center Team, Chicago, IL. Academy members can contact the Knowledge Center by sending an e-mail to [knowledge@eatright.org](mailto:knowledge@eatright.org).

<http://dx.doi.org/10.1016/j.jand.2016.01.021>