



The Female Athlete Triad in Adolescent Athletes

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The number of teenage girls participating in sports has dramatically increased in the last few decades (Brown et al., 2017). With increased sports participation, the positive effects of physical activity have become obvious (Thein-Nissenbaum & Hammer, 2017). However, a set of health-related problems specific to female athletes, known as the female athlete triad (triad), has emerged. This fact sheet will cover what the triad

is, why the triad occurs, and triad prevention and treatment.

What is the Triad?

The female athlete triad is a condition characterized by low energy availability with or without disordered eating, menstrual dysfunction, and low bone mineral density (Nattiv et al., 2007). Figure 1 includes additional definitions and

Figure 1.

Components of the Female Athlete Triad

Low Energy Availability

- Occurs when the energy (calories) needed by the body for both regular body functions and exercise are greater than the energy from food consumed (Brown et al., 2017; Nattiv et al., 2007).
- May occur with or without an eating disorder (Thein-Nissenbaum & Hammer, 2017; Nattiv et al., 2007).
- May occur because the athlete is unaware of the daily calories needed to train (Thein-Nissenbaum & Hammer, 2017).
- May also occur when the athlete purposefully reduces caloric intake, exercises excessively, or does both (Thein-Nissenbaum & Hammer, 2017).

Menstrual Dysfunction

- Generally, occurs when there is low energy availability (Brown et al., 2017).
- May include infrequent menstruation, no menstruation, lack of ovulation (ovaries releasing an egg), and improper formation of the uterus lining (Kelly et al., 2016).

Low Bone Mineral Density

- May result in abnormal bone development, slow bone growth, and brittle and fragile bones (Brown et al., 2017).
- Poses increased risk of to injury and fracture (Brown et al., 2017).
- May result in higher risk of lifelong bone health problems because about 90% of bone growth is attained by age 18 (Brown et al., 2017).

information about the components of the triad. Not all the components need to be present simultaneously for the athlete to experience negative health consequences (Nattiv et al., 2007; Brown et al., 2017).

Why the Triad Occurs

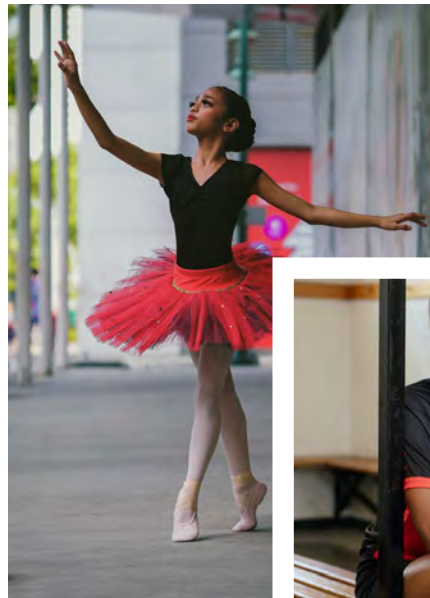
Low energy availability generally drives the triad's other components, including menstrual dysfunction and low bone mineral density (Nattiv et al. 2007; Brown et al., 2017). When exercise occurs without sufficient energy intake, negative consequences related to the reproductive, bone, and cardiovascular health of the adolescent athletes can occur. Since adolescence is a critical time for bone growth, the triad may affect the health of teenage athletes more than adult athletes (Kelly et al., 2016). As low energy availability is the primary cause of the female athlete triad, adjusting energy use and availability is the main intervention (American College of Obstetricians and Gynecologists, 2017).

Other Possible Consequences of Low Energy Availability

Some research suggests that low energy availability may influence the health of more body systems, affecting both male and female athletes. Low energy availability may also increase the risk for poor mental health, impaired metabolism, a weakened immune system, and damaged growth and development (Mountjoy et al., 2014).

Triad Prevention and Treatment

Parents and coaches can play an important role in triad prevention and treatment. Triad knowledge is generally low among young female athletes, so parents and coaches are key in helping educate them (Brown et al., 2014). It is important that parents and coaches teach their athletes about the energy demands during training to prevent insufficient caloric intake (Academy of Nutrition and Dietetics, 2018). One study showed that even a 10-minute educational video (watch the video here: <https://www.youtube.com/watch?v=W4Hrrl3rgL4>) can greatly improve triad knowledge in female athletes (Krick et al., 2019).



It is also important that parents and coaches create an environment that supports growing athletes (Academy of Nutrition and Dietetics, 2018). A healthy environment promotes healthy eating patterns that include a wide variety of foods and does not promote a certain weight or body type. A nourishing eating pattern contains a variety of carbohydrates, protein, and fruits and vegetables and does not eliminate any food group. See Figure 2 for more information on healthy eating patterns for athletes.

Figure 2.

Recommended Foods to Eat for Competing Athletes, Adapted from Bingham et al., 2015

- Eat breakfast, lunch, and dinner with one to three snacks per day.
- Fill your plate with whole foods like fruits, vegetables, nuts, beans, lean meats, dairy and whole grains.
- Refuel your body after exercise to help with recovery.
- Hydrate with water.
- Eat a variety of colorful foods to incorporate more nutrients.



Figure 3.

Snacks High in Protein and Carbohydrate

- Greek yogurt and fresh fruit.
- String cheese and whole grain crackers.
- Banana/apple with peanut butter.
- Mixed fresh vegetables and hummus.
- Dried fruit and a nut trail mix.

Figure 4.

Easy Eating Pattern Ideas for Athletes, Adapted from Bingham et al., 2015

- One-third carbohydrates (rice, pasta, whole grains).
- One-third protein (lean meats, beans, lentils, nuts, dairy products).
- One-third fruits and vegetables.
- Eat more (especially more carbohydrates) on days with more/higher intensity physical activity.

Figure 5.

Screening Questions for the Female Athlete Triad, Adapted from Kelly et al., 2016

1. Do you worry about your weight or body composition?
2. Do you limit or carefully control the foods that you eat?
3. Do you try to lose weight to meet weight or image/appearance requirement in your sport?
4. Does weight affect the way you feel about yourself?
5. Do you worry that you have lost control over how much you eat?
6. Do you make yourself vomit or use diuretics or laxatives after you eat?
7. Do you currently or have you ever suffered from an eating disorder?
8. Do you ever eat in secret?
9. What age was your first menstrual period?
10. Do you have monthly menstrual cycles?
11. How many menstrual cycles have you had in the last year?
12. Have you ever had a stress fracture?

Figures 3 and 4 offer more easy-to-follow, healthy eating pattern and snack ideas for athletes. Include protein and carbohydrates in each snack to maintain energy and repair muscles. Experts recommend an annual triad screening before participation on any sports team. A coach or parent may ask an athlete screening questions; if an athlete answers “yes” to any of the questions, contact health professionals for further evaluation (Kelly et al., 2016). Figure 5 provides a list of screening questions to assess an athlete’s risk for the triad.

Ask for Help!

If an athlete is having difficulty eating enough or maintaining a healthy weight range, seek help from a registered dietitian or other qualified health professional (Bingham et al., 2015). The following links provide more information on the prevention and treatment of the female athlete triad.

- <https://familydoctor.org/condition/female-athlete-triad/>
- <https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2017/06/female-athlete-triad>
- <https://www.femaleandmaleathletetriad.org/>



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