

Female Athlete Series

Female Athlete Triad



Boston Children's Hospital
Sports Medicine

bostonchildrens.org/sportsmed
617-355-3501

Female athlete triad: Staying on track

The female athlete triad (triad) is a continuum of three intertwined health issues: energy availability (caloric balance), menstrual function and bone health.

At the positive end of the continuum, female athletes ingest enough quality calories to account for their energy expenditure from daily activities and exercise (energy availability); they have normal monthly menstrual cycles, and they have bone density that is equal to or better than their sedentary counterparts because of their weight-bearing exercise.

At the extreme negative end of the continuum, poor caloric intake combined with exercise and activity leads to low energy availability, which may lead to a loss of menstrual cycle, low bone density and, ultimately, osteoporosis. Low bone density and osteoporosis put athletes at risk for stress fractures and full fractures. Thus, a problem with any one aspect of the triad may be cause for concern.



Low energy availability

Female athletes—especially those involved in sports that emphasize leanness, like ballet, gymnastics, figure skating, lightweight rowing and running—are at risk for developing eating disorders because of pressures to maintain a low body weight, or because of poor guidance about nutrition and weight loss. Sometimes, this can lead to serious energy deficiency.

Fortunately, knowing the difference between healthy and harmful dieting can help ensure that the athlete gets optimal nutrition. Healthy dieting is considered a modest lowering of daily calories, while harmful dieting (or disordered eating) includes restrictive behaviors like skipping meals, using laxatives, bingeing and purging. Ideally, an athlete doesn't "diet" at all, because she has the tools to keep a healthy body weight and has the energy her athletic body needs to perform and function properly.



Low energy availability can result from full-blown eating disorders, or it may simply be that the athlete isn't getting the calories necessary for the high-caloric expenditure of sport.

The prevalence of clinical eating disorders among elite female athletes ranges from 16 to 47 percent, compared to the 10 percent of nonathletic females. Disordered eating and caloric deficiency are even higher. Maintaining healthful eating habits and a healthy mindset, and keeping a supportive network can help female athletes stay healthy.



Menstrual dysfunction

When an athlete stops getting her period, it may be for a few reasons. Sometimes, it is due to over-exercising, experiencing extra stress and not getting enough good nutrition, which can reduce estrogen and other hormone levels in the body. But there are also other medical reasons women and girls lose their periods. These include pregnancy, polycystic ovarian syndrome, and pituitary abnormalities. Therefore, menstrual irregularity should be addressed by your doctor.

Common types of menstrual irregularities in female athletes:

- **Primary amenorrhea:** When a female has normal secondary sexual characteristics, such as breast development, but no period by age 15 or 16
- **Secondary amenorrhea:** The absence of menses for three or six months in a female who previously had menses
- **Oligomenorrhea:** Menstrual periods occurring at intervals greater than 35 days, with fewer than 9 periods in a year
- **Functional hypothalamic amenorrhea:** An absence of menses, commonly associated with exercise and stress (when other causes of absence of menses have been ruled out)

Women who participate in sports that emphasize leanness are at least **10 times more likely to experience menstrual irregularities**, but the triad can happen to any female athlete. Eating a healthful diet and being careful not to over-exercise can help prevent this.



Decreased bone mineral density

Healthy athletes tend to have higher bone mineral density than nonathletic females, likely because regular physical activity—like weight-bearing exercise—contributes to bone strength.

Athletes with the triad, however, can have reduced bone strength, which can cause stress fractures or even osteoporosis at a young age. Appropriate caloric intake maintains normal hormone levels; and various hormones, including estrogen, are important for building and maintaining bone. Adolescence is a particularly important time for girls to get adequate nutrition and have normal menstrual function, because 90 percent of a woman's peak bone mass is acquired by the age of 18. If low bone mineral density is detected and treated early enough, an athlete may be able to regain bone mass. But if treatment is delayed, bone density may never again approach the normal range.

Healthy estrogen and other hormone levels keep bones from breaking down, so menstrual cycles and bone mass density are closely tied: Despite regularly performing weight-bearing exercises, **an amenorrheic athlete is two to four times more at risk for a stress fracture** than an athlete who gets regular periods.



Complications of the female athlete triad

- ▶ Menstrual dysfunction can lead to infertility.
- ▶ Low levels of estrogen can result in increased risk of cardiovascular disease.
- ▶ Women with the triad have decreased immune function.
- ▶ Many athletes with low bone mineral density or menstrual irregularities suffer from stress fractures.
- ▶ Low energy availability can cause nutritional deficits and negatively impact the body's ability to build bone, maintain muscle mass and recover from injury.
- ▶ Women with the triad have increased risk of depression, low self-esteem and various anxiety disorders.

Treating the female athlete triad

- ▶ One of the biggest challenges in detection and treatment of the triad is overcoming the psychological component. Athletes are often determined and competitive, with perfectionist tendencies, so changing their mentality, diet and exercise might seem difficult at first—especially if they are under pressure from coaches and teammates.
- ▶ The goal of treatment isn't to make athletes less competitive or less effective in their sports. It's simply to help them increase their energy availability, resume a regular menstrual cycle and regain healthy bone density.
- ▶ Decreasing risk of injury and improving exercise recovery, which occurs with treatment of the triad, can actually make an athlete more competitive.





Taking charge: from recovery to victory

Preventing the female athlete triad

Be aware of your risk. If you compete in weight-class sports and aim to reduce your weight before a competition, or if your sport emphasizes leanness or aesthetics, like gymnastics, ballet, figure skating, lightweight rowing or running, you may be at a higher risk. But keep in mind that any female athlete may suffer from components of the triad.

Recognize pressures and reach out for support. If you feel pressured to reduce your weight for a sport or to use harmful dieting methods before a competition, ask your doctor for help communicating with your coach and other athletic community members to prioritize your health.

Talk to your doctor (see below) about your weight, competitive pressures, menstrual cycle, stress fractures, exercise and eating habits and overall health.

Talking to your doctor

Even if you don't think you are experiencing an element of the triad, it's a good idea to talk to your doctor regularly about your exercise, eating and menstrual habits. Your pre-participation physical is a great opportunity to do this, since you may learn something new about yourself before your season begins.

TELL your doctor

- if you experience even one element of the triad
- if you have to monitor your weight for a sport
- if you fear weight gain
- if you have had a stress fracture
- if you've had irregular periods

ASK your doctor

- about your risk of getting one of the three elements
- for healthy fueling techniques to increase your energy
- if you could benefit from a DXA (dual-energy x-ray absorptiometry) test, which can measure your bone mineral density
- to speak to your coach if you need more support maintaining a healthy diet or activity level



Boston Children's Hospital

Until every child is well™

Reviewed by Kathryn Ackerman, MD, MPH, Boston Children's Hospital
This sheet is part of the Female Athlete Series, which is a suite of educational materials to help female athletes live the healthiest lives possible while competing. For more materials on enhancing athletic performance, call 617-355-3501 or visit bostonchildrens.org/sportsmed.

