

# Female Athlete Series

## Bone Health



Boston Children's Hospital  
Sports Medicine

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### Why should young athletes care about their bones?

Healthy athletes typically have a higher bone mineral density than those of sedentary individuals, but excessive exercise and over-training can leave female athletes with a negative energy balance, ultimately putting their bone health and their reproductive health at risk.

Fortunately, healthy eating habits and careful attention to training regimens can keep female athletes growing in the healthiest way possible, while also keeping them in top shape for years to come.

### How does energy availability impact bone health?

Quite simply, energy availability is what's left of your dietary energy after exercise. Athletes should eat enough healthy calories to give them energy for exercise, growth and development, and other normal physiological functions.

When athletes overtrain by substantially increasing the volume or intensity of physical activity, or don't have enough dietary energy for these physiological functions, they develop sustained fatigue and an increased risk of premature osteoporosis, weakening bones and increasing risk of fracture. Paying careful attention to training regimens and maintaining a positive energy balance can help athletes maximize their bone health and overall energy.



### How do bone health and menstrual cycles relate?

When a girl doesn't have enough energy left for her body's normal functions, it disrupts her hormones, which ultimately can impact her bone and reproductive health. Without the proper energy balance, girls can experience primary amenorrhea (getting their periods later than age 15 years old) or secondary amenorrhea (a prolonged absence of their period), which is unhealthy.

Athletes, especially those in sports that emphasize leanness and a certain physique, may assume that getting their bodies to this state is a positive way to go from normalcy to excellence. But in fact, they are hurting their bodies, and potentially hurting their chances at future competition.

To stay competitive for as many years as possible, athletes can optimize their bone health and use their healthy bodies to build strength and reduce risk of fracture by 50 to 80 percent. As long as overtraining and undereating doesn't occur, these hormones should function normally.

*For more information about how menstrual cycles impact female athletes, check out the Female Athlete Series Guide on Menstrual Cycles.*

### Mindset matters

It can be complicated for female athletes to recognize when their bodies need help, especially when they're losing weight and feeling happy about their slimmer shape. They might have difficulty imagining the long-term consequences of low energy availability or secondary amenorrhea, and assume that their behavior is a healthy devotion to their sport, coach, or teammates.

Coaches, parents and other authorities in the athletic community should be aware of these difficulties, and encourage female athletes to get proper nutrition, which will build stronger bones, increase energy levels, and ultimately fuel healthy competition.

**Girls accumulate 90 percent of peak bone mass by the age of 18, and regular physical activity helps maximize bone mass even into adulthood. Playing high-impact, weight bearing exercise for more than four hours a week can help improve stability and strength, while reducing risk of stress fractures and premature bone loss.**

## Measuring bone health

Learning as much as possible about bone health can help female athletes detect or prevent problems early on. Talking to a doctor can help determine whether there is an underlying bone disorder, a nutritional malabsorption issue (like celiac disease) or a dietary deficiency, such as vitamin D. Athletes who suffer from multiple fractures or stress fractures may have an underlying bone problem that requires assessment.

A DXA (dual-energy x-ray absorptiometry) scan is a painless, non-invasive procedure that measures soft tissue and bone, and is the most widely used method to measure bone mineral density. Female athletes should talk to their doctor about how the scan can provide information to help them ward off bone health issues, and build strength for a lifetime.



## Eating for success

Female athletes should eat enough healthy calories to fuel their exercise, growth and development, and other physiological functions. For adolescent female athletes, consuming at least 1,300 mg of calcium per day and increasing levels of vitamin D can reduce risk of stress fractures, infectious illness, inflammation and impaired muscle function. Adult premenopausal women need slightly less calcium (about 1000 mg), but also require good sources of D.

*For more information about how female athletes can eat optimal nutrition, see our Female Athlete Series Guide to Nutrition.*

### Ways to add more calcium

- Add fortified milk to cereal and oatmeal
- Eat fruit with yogurt for a calcium-rich dip
- Add cheese to sandwiches
- Include broccoli or beans in meals
- Make a fruit smoothie with milk or yogurt
- Eat salads with dark green, leafy vegetables like lettuce, spinach, kale and broccoli
- Choose calcium fortified orange juice



### Ways to add more vitamin D

- Spend 20 minutes daily in direct sunlight
- Even in the winter, add a short walk outside to your morning routine
- Eat fatty fish, like wild caught salmon, once a week
- Pack canned light tuna for lunches
- Drink fortified milk or orange juice
- Take a daily supplement
- Cook a whole egg, rather than just egg whites
- Choose fortified cereal



**Boston Children's Hospital**

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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](http://bostonchildrens.org/sportsmed).

