

The Women's Sports Foundation Report Brief: Her Life Depends On It III & the Female Athlete Triad

A basic formula for living a healthy lifestyle is captured in the standard advice to eat well, get plenty of sleep, and exercise on a regular basis. For girls and women who participate in sport and physical activity, the simplicity of that formula belies the important processes that are going on in the female body to ensure overall health.

With the increasing opportunities for girls and women to participate in sport and be more physically active in the aftermath of the passage of Title IX, more research attention was directed toward understanding the co-dependent relationships that exist within the bodies of active females. Critical links between energy levels, menstruation, and bone strength were brought into focus through the framework of the Female Athlete Triad. The Female Athlete Triad consists of three interrelated conditions that, in their most severe form, include low energy availability due to poor nutrition or inadequate caloric intake, a loss or disruption in menstrual cycle, and a weakening of bone density (Nattiv et al., 2007; DeSouza et al., 2014). Although any one of these problems can occur in isolation, an insufficient diet for a woman's level of physical activity represents the catalyst for the Female Athlete Triad.

Triad-related conditions begin to emerge when a female athlete, intentionally or unintentionally, fails to consume enough calories through the food she eats to meet the caloric demands of her sport and or overall energy expenditure. Female athletes may exhibit various behaviors that fall within the spectrum of disordered eating. They can range from skipping meals occasionally to severely restricting calories and engaging in pathological weight control behaviors similar to those of individuals diagnosed with clinical eating disorders such as anorexia nervosa (starving) and bulimia nervosa (binging and purging) (American Psychiatric Work Group on Eating Disorders, 2000).

Although female athletes make conscious decisions at times to cut back on eating and/or engage in excessive physical activity because of poor body image or a high drive for thinness (Sundgot-Borgen, 1994), female athletes may acquire eating disorders or manifest unhealthy eating behaviors inadvertently as a result of heavy training schedules, decreased hunger,



poor knowledge of nutrition, or lack of food availability throughout the day. Regardless of the reason(s), when a female athlete is operating with an energy deficit, her body responds physiologically by trying to conserve energy. Mirroring patterns found in undernourished populations, exercising women with Triad-related conditions have been found to exhibit lower resting metabolism, low body temperature, low body weight, and alterations in metabolic hormone profiles (De Souza & Williams, 2004).

When women who exercise do not consume enough calories to keep up with the physical demands placed on their bodies, they are likely to experience menstrual irregularities. The spectrum of menstrual disturbances observed in female athletes and exercising women can range from subtle changes in the menstrual cycle length to the absence of ovulation and finally to the complete absence of menstruation known as amenorrhea (De Souza & Williams, 2004). Individuals who display severe menstrual disturbances for a prolonged time experience low estrogen levels. Bone loss can result when low estrogen levels are combined with chronic energy deficiencies (Nattiv et al., 2007). In addition to the conditions that make up the Female Athlete Triad, the cardiovascular, endocrine, immune, and gastrointestinal systems can be negatively impacted by the presence of low energy availability and/or low estrogen levels (De Souza et al., 2014).

Facts & Findings

- Among Division III female athletes who completed a survey assessing their eating behaviors (binging, purging, restrictive food choices), exercise behaviors, and attitudes toward body image and weight reduction, 27.7% exhibited risky eating behaviors that could develop into eating disorders. The responses of over a quarter of the female athletes in the study (n=436) situated them on a continuum of risky eating. Nearly 6% of female athletes who completed the survey had a clinical eating disorder (Sears et al., 2012).
- In a study of figure skaters, 24% showed a greater risk of eating pathology. Those skaters tended to be older and had higher body mass indices (BMIs) than the skaters without elevated risk to eating pathology (Dwyer et al., 2012).
- Some pathological eating habits become normalized in elite sporting cultures since it is believed that a certain diet or weight will give the athlete a competitive edge (Williams, 2012).
- Physical activity levels of women who recovered from anorexia did not differ from women who showed no history of pathological eating; however, the BMIs of the recovered women were typically 2 points lower (Dellava et al, 2011).
- As a group, women who exercise exhibit higher rates of amenorrhea (absence of menstrual cycle) or oligomenorrhea (light or infrequent menstrual cycles). The range of menstrual disturbances have been found to fall into a range between 1% to 61%. For non-athletic women, the prevalence of menstrual cycle irregularities is less than five percent (Gibbs et al., 2013).
- Less pronounced menstrual disturbances, such as interruptions in ovulation, occur in approximately half of exercising women (Gibbs et al., 2013).
- The wide ranges of prevalence of menstrual disturbances are attributed to differences between sports in terms of the predisposition of athletes toward leanness, the aesthetic component of scoring, or the high energy demands of a particular sport (Gibbs et al., 2013).
- Physical activity and healthy nutrition improve bone and muscle mass throughout the lifecycle. They prevent osteoporosis by stimulating bone formation, strengthening muscles, and improving balance, all factors associated with reduced fracture rates (Body et al., 2011; Gunendi et al., 2008; Tella & Gallagher, 2014).
- The most critical time for developing bone mass occurs during growth, when hormone levels allow for the accrual of peak bone mass (maximum skeletal strength) (Feskanich et al., 2014; Karlsson et al., 2008). Children and adolescents who are physically active and nutritionally healthy demonstrate higher levels of peak bone mass and a lower risk for developing osteoporosis later in life (Rizzoli et al., 2010).
- When women reach their 30s, slowly declining hormones mirror slower declining bone mass. Once women reach menopause, which is characterized by a rapid decline in hormone levels, bone mass begins to decline sharply (Chahal, Lee & Luo, 2014; Kim et al., 2014). Physical activity and proper nutrition has been shown to decelerate bone loss during these times (Kim et al., 2014).
- The kind of exercise that one engages in makes a difference. Aerobic activity, because of its intensity, and weight-bearing activities that load multiple sites of the body, are ideal for preventing osteoporosis. Sports that involve high ground reaction force (GRF), such as gymnastics, tennis, squash, and running, are shown to create higher bone density than sports that do not present unusual loading patterns, like swimming and cycling (Bieleman et al., 2014; Saravi & Sayegh, 2013).
- In addition to loading patterns, exercise intensity is important for bone mass. Exercises with higher intensities tended to produce better bone mass results (Saravi & Sayegh, 2013). There is now evidence emerging that repeated exposure to long bouts of sedentary behavior, such as sitting, is a risk factor for female bone health independent of whether they engage in physical activity or not. However, this same relationship has not been shown for men (Chastin et al., 2014).



Diagnosis & Treatment

Many physicians are not familiar with the Triad and are dismissive of its signs and symptoms (though considerable progress has been made in this area). Amenorrheic athletes are still frequently prescribed hormonal contraceptives to prevent or slow bone loss, but this does not address the underlying problem—it only addresses the symptoms. Contraceptives may normalize menstrual periods and provide exogenous estrogen, but the literature is undecided as to whether benefits to bone mineral density (BMD) result (Liu & Lebrun, 2006). In fact, long-acting progesterone-only contraceptives like Depo-Provera have been shown to cause bone loss, and the packaging now includes a warning to this effect. Nevertheless, this particular drug remains popular among athletes who feel normal menstruation impairs their performance. Moreover, newer preparations of oral contraceptive pills that contain ultralow doses of ethinyl estradiol may pose additional risks to skeletal health in young women. Athletes on birth control pills often believe they have addressed their Triad-related problems, and thus are probably not being counseled to improve dietary habits. As a result, they may continue to fall further down the energy availability spectrum, which can negatively affect athletic performance, skeletal health, and overall health physiological function.

The Need for Education

Because of the need for early diagnosis and treatment, it is critical that those individuals working with female athletes have awareness of the Triad, symptoms as they are manifest in female athletes, especially vulnerable female athlete populations, and the health implications for female athletes who may exhibit one, two, or all three disorders associated with the Triad.

- As critical as detection is, awareness among coaches and health care providers is low. According to a study conducted by Logan et al. (2013), among 931 physicians working at three academic medical centers, 63% reported that they had not heard about the female athlete triad. The group with the most awareness was orthopaedic surgeons (80.3%) followed by those working in obstetrics and gynecology (55.2%). Just over half of physicians in physical medicine and rehabilitation/rheumatology indicate that they had heard of the syndrome.
- According to Torres-McGehee et al. (2012), 77.8% of athletic trainers and 81.6% of strength and conditioning coaches, 35.9% of coaches and only 9% of athletes demonstrated adequate sports nutrition knowledge.



In an effort to address the need for education among coaches, Ostler (2014) created an online female athlete triad educational website. Resources about the Female Athlete Triad include the following:

- The Female Athlete Triad Coalition — femaleathletetriad.org
- American College of Sports Medicine — <https://www.acsm.org/docs/brochures/the-female-athlete-triad.pdf>
- Ostler's (2014) Female Triad Trial — <http://thetriad.ajostler.synology.me/About.html>

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The full report can be accessed online at:
www.WomensSportsFoundation.org/HerLifeDependsOnIt3

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