

The female athlete triad: disordered eating, amenorrhea, osteoporosis

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In June 1992, the American College of Sports Medicine convened a panel of experts to address an area of growing concern in sports medicine: a triad of disorders observed in adolescent and young adult female athletes. This two-day workshop explored the medical and practical issues surrounding a triad of disorders that has just recently been described in the literature, but one that has been silently observed by coaches, parents, team physicians, and athletes for some time. This triad of disorders includes disordered eating, amenorrhea, and osteoporosis. In the setting of a comprehensive conference format, experts addressed prevention, screening, risk profiles, diagnostic parameters, training dynamics, treatment, educational gaps, and research needs.

The young female athlete, driven to excel in her chosen sport, may be at risk of developing this potentially lethal triad of medical disorders. Our understanding of this complex triad is unfortunately limited at this time. Jack Wilmore, Ph.D., FACSM, coeditor of *Eating, Body Weight and Performance in Athletes*, pointed out the fallacy of assuming that continued weight loss ensured continued improvement in athletic performance (1). Muscle mass as well as fat is lost during extreme dieting and performance may actually deteriorate. Other side effects of poor nutrition such as fatigue, anemia, electrolyte abnormalities, and depression can also contribute to a poor performance. Although many coaches now realize that body composition measurements provide better information than body weight alone, most do not realize that these measures are far from precise and that holding all athletes to a single standard for body fat can have serious repercussions. The constant focus on either achieving or maintaining a prescribed weight goal may put the female athlete at risk for developing a disordered pattern of eating. This in turn may put the athlete at an increased risk of developing two associated disorders, amenorrhea and osteoporosis. Alone each disorder is worrisome and can yield considerable disability, but in combination the

triad disorders are potentially fatal. In short, the three disorders can be described as follows:

Disordered eating. At the extreme this includes anorexia nervosa and bulimia nervosa. However, not all affected athletes with disordered eating will meet the strict DSM-III-R criteria for these two conditions, yet they are still at an increased risk of developing serious endocrine, skeletal, and psychiatric disorders due to disordered eating patterns (1). The term disordered eating refers to the entire spectrum of disordered eating patterns; the medical communities are now beginning to view the entire spectrum as potentially risky. The prevalence of disordered eating in female athletes, based on a series of small studies, has been reported to be as high as 62% (17).

Amenorrhea. Delayed menarche (>16 yr), as well as secondary amenorrhea is defined by the absence of three to six consecutive menstrual cycles. In the general population it has been reported that 2–5% of women have amenorrhea. The observed prevalence is higher in athletes, ranging from 3.4% to 66% (2,7,8,11,12,16).

Osteoporosis. Premature bone loss and/or inadequate bone formation resulting in low bone mass microarchitectural deterioration increased skeletal fragility resulting in an increased risk of fracture. The prevalence of this condition among female athletes is unclear. What is clear, however, is that the bone loss in an amenorrheic athlete is rapid and may not be completely reversible (3–6,19).

Potentially all adolescent and some adult female athletes are at risk, particularly at the elite level. Male athletes may also be affected but very little has been reported in this area. Certainly these disorders affect nonathletes as well, yet there is evidence that the female athlete, especially those participating in certain sports, may be at an increased risk. The characteristics or circumstances that apparently increase an athlete's risk of developing one or more of the triad conditions were discussed. A *pressure to excel* was common among affected athletes as well as constant attention given to *achieving or maintaining an "ideal" body weight and/or "optimal" body fat*. This triad appears to be common among athletes competing in *appearance or endurance sports*. During the conference questions were raised

about *potentially harmful training techniques* as well as the role of *inadequate nutrition*. Additionally, a question regarding the potential of a time-sensitive period, a *window of vulnerability*, was also discussed. The role of *social isolation* was raised as well as the potential for a *specific psychological profile*, which might put the athlete at risk. Also the possibility of a *sport-athlete mismatch* was considered.

The pressure to perform in modern athletics has never been greater. Athletes appear to be willing and eager to attempt any measure to achieve an advantage. This aggressive "at any cost" approach has been supported and encouraged by a number of different "players" on the athlete's team. Thus, the parties responsible for the development of the triad **include, but are not limited to the athlete**. The role of the parent, the coach, the athletic trainer, the team physician, as well as the school or athletic association administrators must be considered.

The conference included a series of small work group sessions. Each work group attempted to describe and develop an action plan to address one aspect of the problem. Specific strategies were outlined for the following six areas:

- Prevention
- Research needs
- Health consequences
- Medical care
- Education
- Agency/administration responsibilities.

During this two-day conference more questions were raised than answers agreed upon, but the conference participants did agree on the following general statements:

1) There is a continuum of disordered patterns of eating within the athlete population ranging from poor nutrition to clinical pathology, and all points along this continuum can have serious consequences for the athlete's health. For those athletes who progress to anorexia or bulimia, those consequences include serious medical complications and even death (1).

2) A frequent symptom of eating disorders in women is amenorrhea. It was noted that menstrual irregularities can occur in the absence of an eating disorder (8,9,18). While the precise etiology of amenorrhea and oligomenorrhea in these athletes has yet to be determined, it is possible that even seemingly minor deficits between caloric expenditure and caloric intake may play a role (1,9,18). Amenorrhea is an overt sign of a decrease in estrogen production, and the long-term consequences of a chronic hypoestrogenic state in young women are

largely unknown (3). Once menstrual dysfunction develops, bone loss may occur (3-6,19). Estrogen levels in most amenorrheic women drop to postmenopausal levels, and there is a rapid loss of bone in the spine (15). Recent studies indicate that some of the loss may be irreversible (3,19). The spinal density of some young female athletes is similar to that of women in their 70s and 80s and may never return to normal (5,15,19). These athletes are at increased risk for stress fractures and more serious fractures of the pelvis, hip, and spine (16). What the future holds for these women is uncertain, but there is great concern about the potential for premature osteoporotic fractures as these women age.

Those attending the conference were in full agreement that girls and women should realize the full physiological, social, and psychological benefits of sports and exercise and should be encouraged to strive for excellence. However, pressure to excel that ignores the consequences for the athlete cannot be tolerated. Among priorities established by the conference participants were (i) to prepare educational materials for athletes, parents, coaches, trainers, and administrators; (ii) to identify physicians and scientists who are able to address lay and professional audiences on the issues; (iii) to prepare guidelines for team and primary care physicians to follow for preparticipation examinations of female athletes; (iv) to prepare guidelines for the team and primary care physician to follow regarding prevention, identification, and treatment of these disorders; (v) to prepare a position paper endorsed by the American College of Sports Medicine establishing a standard of conduct for those responsible for coaching and/or training of female athletes; and (vi) to work with the appropriate medical specialty groups to address preventive measures and appropriate treatment of these disorders.

A research agenda addressing these issues was an important outcome of this conference. Research needs were identified in the following areas:

- Surveillance
- Body composition
- Weight management
- Disordered eating
- Menstrual dysfunction
- Osteoporosis

Specifics regarding this research agenda will follow in subsequent ACSM communications. Also, strategies on prevention, health consequences, medical care, education as well as agency responsibilities and liability will follow as the dialogue continues.

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