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## Female athlete triad syndrome and physical Education: Causes, components & treatment

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### Abstract

**Introduction:** The female athlete triad is a medical condition observed in physically active females involving three components: low energy availability with or without disordered eating; menstrual dysfunction; and low bone density.

**Methodology:** Survey of primary and secondary literature is the prime methodology used for preparing this research article.

**Research Findings:** The female athlete triad is a result of energy imbalance; thus, adjusting the energy expenditure and energy availability is the main intervention. Pharmacologic treatment may be considered when non-pharmacologic treatment has failed. A team approach involving the patient, obstetrician-gynecologist, sports nutritionist, coaches, parents, and mental health care provider, if indicated, is optimal.

**Conclusion:** Based on the prevalence of multiple female athlete triad risk factors, athlete education and monitoring of the risk factors by athletic staffs paramount to the long term health and wellbeing of the athletes. The athletes should be educated on healthy eating practices to achieve appropriate levels of caloric intake.

**Keywords:** Female athlete triad syndrome, physical education; menstrual dysfunction; eating disorder, over-training

### Introduction

Female athlete triad represents a group of three disorders often found together in female athletes, consisting of disordered eating, amenorrhea, and osteoporosis. Female Athlete Triad or FAT is a cluster of symptoms in active female population due to energy deficit leading to irregular or absent periods, poor bone health and increase injury risks. Girls who are growing, are at risk for low energy because their bodies require more energy to perform necessary functions for normal development. Sometimes girls are at a relative energy deficiency (RED) because they are burning more calories than they are taking in. Other times this is intentional due to disordered eating patterns and the pressure to “stay thin” compounded by the society. Either way, it is important that the amount of energy being used is always less than the amount of energy taken. For a growing teenage athlete, bone density can be compromised if there are deficiencies in protein, vitamins, and calcium [1]. The International Olympic Committee (IOC) has developed a broader syndrome called Relative Energy Deficiency in Sport (RED-S). It has been described by the IOC as an umbrella term for energy disorders in athletes. RED-S is still a relatively new attempt to create a general guideline to the identification and treatment of athletes across genders and pathologies. There is still only shallow research supporting this evolving term, but as of now the IOC considers Female Athlete Triad part of their overall RED-S diagnosis [2].

### History

Unhealthy weight loss practices are dangerous because much of the weight lost will be lean muscle rather than fat, which can affect athletic performance. Girls who develop eating disorders or body dysmorphic disorder are at risk of developing the so-called female athlete triad, which consists of disordered eating, cessation of menstrual periods (amenorrhea), and osteoporosis or brittle bones. A common symptom associated with the triad is an unusually high number of stress fractures during the girl's athletic career.

The triad, which was first described in 1993, may have long-term consequences for a woman's health. Female athletes in their freshman year of college are reported to be at increased risk of developing the triad, particularly if it is their first experience of living away from home or they are having academic difficulties.

### Symptoms, Components and Causes

The female athlete triad is a medical condition observed in physically active females involving three components:

- low energy availability with or without disordered eating
- menstrual dysfunction
- low bone density

An individual does not need to show clinical manifestations of all three components of the female athlete triad simultaneously to be affected by the condition. Consequences of these clinical conditions may not be completely reversible, so prevention, early diagnosis, and intervention are critical. All athletes are at risk of the female athlete triad, regardless of body build or sport. All active females should be assessed for components of the triad and further evaluation should be performed if one or more components are identified. The obstetrician gynecologist has the opportunity to screen athletes for components of the female athlete triad at comprehensive visits for preventive care. Using the menstrual cycle as a vital sign is a useful tool for identifying athletes at risk of female athlete triad and should be an integral part of the pre-participatory sports physical.

Female Athlete Triad may be caused by one or more of several factors in each individual patient. Low Energy Availability is thought to be the primary cause of Female Athlete Triad. Energy Availability is the dietary energy left in the body after exercise is completed, or total dietary energy in (calories in) minus total exercise energy expended (calories out). Low energy availability is not synonymous with disordered eating. Other causes include restricted diet, disordered eating, genetic absorption problem.

Over-training is also a common factor in Female Athlete Triad. Over-training is engaging in repetitive stressful activity (>7 Met) for more than 60 min 6 days/week. Over-training can be the trigger for the pathology as working your body past a reasonable training schedule prevents it from being able to heal from previous training sessions. This increases metabolic demands and releases stress-related hormones that affect blood flow and is severe cases absorption of nutrients. Over-training may prevent appropriate musculoskeletal recovery, perpetuate high levels of blood cortisol, and negatively affect energy absorption. These factors over time can cause cortical thinning of bones, pathological weakening of muscles and ligaments, and disrupt normal metabolic cycles. Over time the excess stress hormone and physical demand degrade the bone density of the athlete <sup>[3]</sup>.

### Myths and Realities about Female Athlete Triad Syndrome

In educational settings either with groups or individual patients and clients, it is very important that the physical therapist be ready and able to discuss and clarify the following "myths" associated with the Female Athlete Triad:

**Myth:** It is OK to not menstruate.

**Reality:** If a female athlete has not had a period for 3 months or more, she needs to be seen by a physician.

**Myth:** Thinner is better for performance; "the less I weigh the better I perform."

**Reality:** Being under your ideal body weight likely means that you have lost muscle mass and may not perform to your optimal abilities. A strong body is best prepared for optimal performance.

**Myth:** It is acceptable to follow a low carbohydrate diet or exclude foods as an athlete.

**Reality:** Low carbohydrate diets are not appropriate for an athlete and will likely result in low energy availability. Also, avoiding certain food groups such as dairy products and rich sources of iron (e.g. red meat) may affect your bone health and training abilities.

**Myth:** Multiple stress fractures are typical when training.

**Reality:** This is likely your bones ineffectively dealing with stress placed on them and may be an indication of dietary or training errors. Impairment of bone remodeling is considered to be the origin of low BMD in adolescent athletes, which may contribute to the prevalence of stress reactions and stress fractures.

### Precaution and Prevention

Early detection and prevention are necessary and hence it is important to educate and keep an update with school PE teachers, school nurses, mothers of highly athletic teenage girls, coaches, athletic trainers, dietitians, and Physical Therapists. One should also watch for indications of the female athlete triad, such as missing three or more menstrual periods; an unusual number of stress fractures; an excessive amount of time spent exercising or working out; a tendency to wear baggy or concealing clothes even in warm weather; and a restricted eating pattern. Adopting a vegetarian or vegan diet may indicate the onset of an eating disorder in a female athlete. It is tempting for parents to ignore female athlete triad and hope it goes away. But it requires help from a doctor and other health professionals. If your girl athlete child has signs and symptoms of female athlete triad, discuss your concerns with her and encourage her to seek treatment. If she refuses, you may need to mention your concern to a coach, teacher, or school nurse / doctor. Physical therapists frequently treat injured athletes and may have prolonged interactions with athletes depending on the length of the rehabilitation process. In addition to examination, assessment, and treatment of injuries, the role of the physical therapist includes prevention, and the promotion of health, wellness, and fitness.

There are things you can do to prevent the female athlete triad, especially if you are at risk:

- Eat a nutrient-rich, well-balanced diet.
- Exercise in moderate amounts.
- Get plenty of rest.
- Find ways to reduce stress.
- Talk to a doctor or counselor to get help.

### Treatment

The female athlete triad is a disorder that should be taken seriously. Most cases require treatment. A doctor will talk to you about healthy eating habits and lifestyle choices. You may need to change your diet. A nutritionist can help create an eating plan that provides enough vitamins and nutrients. You also may need to change your exercise routine. If your

periods do not return to normal, you may need more treatment. Your doctor may prescribe birth control pills to help regulate your cycle. Hormone medicines that include estrogen or progesterone may help as well. These can balance your energy and improve bone strength <sup>[4]</sup>.

The goal of treatment for those diagnosed with female athlete triad is restoration of regular menses as a clinical marker of reestablishment of energy balance and enhancement of bone mineral density. The female athlete triad is a result of energy imbalance; thus, adjusting the energy expenditure and energy availability is the main intervention. Pharmacologic treatment may be considered when non-pharmacologic treatment has failed. A team approach involving the patient, obstetrician-gynecologist, sports nutritionist, coaches, parents, and mental health care provider, if indicated, is optimal.

### Physical Therapy Management

Once a physical therapist notices the signs and symptoms of Female Athlete Triad, it is important that they get other health care professionals involved in the treatment of the patient. Physical Therapists are educated to be experts of movement and the physiological response to exercise, it is imperative that they are involved in patient education and exercise prescription once the patient's nutritional/energy needs are resolved. Physical Therapists may also help develop criteria for returning to sport <sup>[5]</sup>. In nutshell, an important potential role for the physical therapist is education about the triad to athletes, their parents, coaches, and the medical community at large.

### Recommendations and Conclusions

- All active females should be assessed for components of the triad and further evaluation should be performed if one or more components are identified.
- The female athlete triad is a result of energy imbalance; thus, adjusting energy expenditure and energy availability is the main intervention.
- Pharmacologic treatment may be considered when non-pharmacologic treatment has failed.
- Low energy availability is associated with hypothalamic dysfunction and, subsequently, will negatively affect menstrual function and bone health. Consequences of these clinical conditions may not be completely reversible, so prevention, early diagnosis, and intervention are critical.
- A team approach involving the patient, obstetrician-gynecologist, sports nutritionist, coaches, parents, and mental health care provider, if indicated, is optimal.

In conclusion, based on the prevalence of multiple female athlete triad risk factors, athlete education and monitoring of the risk factors by athletic staffs paramount to the long term health and wellbeing of the athletes. Both female athletes and female non-athletes to have health concerns related to their gender. Lean athletes were found to be at greater risk for disordered eating too. Risk of menstrual cycle dysfunction and osteoporosis was found to be greater in the athletes who did not participate in lean sports. Athlete education should focus on what a normal menstrual cycle is, the causes of dysfunction, and long term consequences of dysfunction. The athletes should be educated on healthy eating practices to achieve appropriate levels of caloric intake <sup>[6]</sup>.

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