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THE FEMALE ATHLETE TRIAD

Description

The female athlete Triad consists of three syndromes: disordered eating, amenorrhea, and osteoporosis. This article examines these syndromes, risk factors, prevention, treatment, and recommendations for getting help to athletes with the female athlete Triad.

List of Objectives:

1. The participant will be able to identify symptoms of each component of the female athlete Triad.
2. The participant will be able to identify athletes who may be at risk for the female athlete Triad.
3. The participant will be able to identify several methods of treatment for the female athlete Triad.

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Introduction

In 1992, the American College of Sports Medicine coined the term, "Female Athlete Triad." This Triad consists of three syndromes: disordered eating, amenorrhea, and osteoporosis. Each syndrome that makes up the female athlete Triad is an individual piece of the problem. However, the prevalence of this Triad is unknown because of the relative "newness" of its diagnosis (Bykowski, 1999). Due to the increased number of female participating in athletics, there is a greater risk of becoming afflicted with these conditions (West, 1998). There are numerous health benefits that can be gained through participating in physical activity and exercise, but unfortunately with the good also comes the bad. In this case, women in athletics are susceptible to this combination of disorders known now as the female athlete Triad. According to Burney and Brehm, 1998, athletics does not seem to be the primary cause of the Triad, but the demands from the intense training may cause an increase in the risks of suffering from the collective condition.

This paper will discuss the three components of the Female Athlete Triad, associated risk factors, who is at risk, epidemiological literature reviews, prevention and treatment, suggestions for athletic trainers in dealing with athletes, and suggestions on how to get help for this disorder.

Components of the Female Athlete Triad

The female athlete Triad can be explained in a triangle format. At the peak of the triangle sits the disordered eating and heavy exercise, and these habits can lead to amenorrhea, which in turn can increase the possibility of developing premature osteoporosis (Nieman, 1999). Individually, each component seems to be controllable, but when they are combined with one another, so are the effects and consequences (Burney & Brehm, 1998; Beals, et al., 1999). A 1994 study revealed that eating disorders cause 10-18% of deaths in those who suffer from the problem, and it was also reported that up to 62% of female athletes suffer from disordered eating habits (Burney & Brehm, 1998). From this information, it would be safe to assume that the relevance of this topic is important to the health care professional working with athletes.

Disordered Eating

Eating disorders and disordered eating are significant problems among athletes. Certain subgroups such as female athletes are especially at risk in sports that emphasize a thin body or appearance, including gymnastics, ballet, figure skating, swimming, and distance running (Picard, 1999). Female athletes who are concerned with controlling their body weight and body composition are at an increased risk for developing an eating disorder. These athletes may increase their training regimes and prolong dieting routines which adds to the risk of an eating disorder (Byrne & McLean, 2001). Several factors place an individual at risk for the development of an eating disorder. These factors include the need to maintain strong control over body shape, the level of performance, and the level of competition (Picard, 1999).

Some behavioral signs of disordered eating are a preoccupation with food or weight, increased criticism of one's body, frequent trips to the bathroom following meals and compulsive, excessive exercise (Smith, 1996; ETR Associates, 1996). For athletes, the eating disorder may be present in different forms. These include binge eating, purging through compulsive exercise, fasting, food restriction, diet pills, and a preoccupation with food and distorted body image (American Academy of Pediatrics, 2000).

The two main types of eating disorders are anorexia nervosa and bulimia nervosa. Anorexia nervosa represents the extreme of restrictive eating. It is when an individual feels terrified of gaining weight. Bulimia nervosa is characterized by bingeing and purging cycles, which occur two times per week for at least three months (Beals, 1999). However, anorexia nervosa or bulimia nervosa with excessive exercise and normal food intake with excessive exercise can also be classified as disordered eating (ETR Associates, 1996).

Amenorrhea

Amenorrhea is defined as the absence of menstruation. The two types of amenorrhea include primary and secondary amenorrhea. Primary amenorrhea is when a female does not have a menstrual cycle by the age of sixteen. Secondary amenorrhea is when a female has started menstruating, but has been without menstruation for six months. Amenorrhea can be caused by hormonal imbalances or exercise. The hormonal causes stem from low levels of follicle-stimulating hormone (FSH) and luteinizing hormone (LH), whereas the exercise-associated amenorrhea is due to a complex relationship between weight loss, decreased body fat and emotional or physical stresses (West, 1998).

According to research, amenorrhea develops in female athletes due to effects of weight loss, lowered body fat, increased activity, and insufficient caloric intake (Vinci, 1999). Additionally, amenorrhea may retard bone growth and cause further bone loss which cannot be replaced (Weltman, Snead & Weltman, 1992).

At one time, amenorrhea was thought of as a normal process. Now, amenorrhea is associated with severe results for female athletes. Physical complications from amenorrhea usually develop from decreased serum estrogen levels. This in turn results in cardiac risks, premature osteoporosis, inadequate bone formation, and bone loss (Smith, 1996; Vinci, 1999, Beals, et al.).

Osteoporosis

In young female athletes, osteoporosis refers to premature bone loss or inadequate bone formation. This premature bone loss is mostly attributed to the decreased estrogen levels in the blood and the resulting calcium imbalances (Beals, et al, 1999). Women build bone until a maximum age of 34 and then starts to lose bone at 0.3-0.5% a year after age 35 (Weltman, Snead & Weltman, 1992). Premature bone loss may result in low bone mineral density, increased skeletal fragility, micro architectural deterioration, and an increased risk of stress fractures (Beals, et al, 1999). In addition, the decreased levels of estrogen associated with amenorrhea coupled with decreased calcium intake from disordered eating, leads to decreased mineralization of bone and increased stress fractures. Females in particular are at risk for more devastating fractures of the hip and vertebral column due to premature osteoporosis (Hobart & Smucker, 2000).

Additionally, bone mineral density lost secondary to amenorrhea can be irreversible even with calcium supplementation (Beals et al., 1999). This becomes a problem for young female athletes who should be forming bone at this point in their lives.

Prevalence

The exact prevalence of the female athlete Triad is unknown. This is due to the fact that most of the research is based on self reporting. It is often underreported due to the secretive nature of disordered eating. Data show the prevalence of disordered eating behavior to be between 15% and 62% of female college athletes. The prevalence rate of amenorrhea in female athletes has been reported in 3% up to 66% of the population (Hobart & Smucker, 2000). The prevalence of osteoporosis in female athletes is unknown. However, there is research to support a relationship between menstrual dysfunction and decreased bone mineral density.

Risk Factors

Specific risk factors are associated with each component of the female athlete Triad. First, the risk factors for disordered eating include malnutrition, fatigue, the decreased ability to fight infections, depression, and complications from an irregular heart beat or seizures (ETR Associates, 1996). Females with an eating disorder consume a significantly less amount of carbohydrates, fats, proteins, and vitamins. Long-term deprivation of energy and nutrition can lead to limited recovery from injuries, poor athletic performance, exercise-induced amenorrhea, and psychological stress (Manore, 2002 & Thompson, 1998). Risk factors associated with amenorrhea include lack of estrogen, hormonal imbalances, and premature osteoporosis. Finally, specific risk factors for osteoporosis include bone loss, lack of bone formation, and susceptibility to stress fractures (ETR Associates, 1996).

Who Is at Risk?

Specific characteristics have demonstrated an association between an individual and an eating disorder, which could potentially lead to the female athlete Triad. The first group of individuals is every female athlete or physically active women. Females participating in sports that emphasize low body weight, or a particular body shape are at an increased risk for an eating disorder. The individuals who participate in individual sports and who compete at an elite or highly competitive level are also susceptible to an eating disorder (Picard, 1999). A major problem with these athletes is that they possess a "win-at-all-costs" attitude and this attitude is ingrained in their minds (Hobart & Smucker, 2000). Also susceptible to an eating disorder are those individuals who are experiencing a traumatic life event and females who have a combination of over-training and a decreased caloric intake. Finally, those individuals who exhibit characteristics including high self-expectations, perfectionism, and an intense pressure to be slim and perform are also at an increased risk for an eating disorder (Picard, 1999).

Epidemiological Literature Review

Several studies concerning eating disorders and the female athlete Triad have been completed on differing populations. The following highlights several of these studies.

The article, "The level of competition as a factor for the development of eating disorders in female collegiate athletes," by Christy Picard, 1999, examined the role of the level of attitudes among a sample of NCAA Division I female collegiate athletes (N=38), demographic and health questionnaire, participants completed the Eating Attitudes Test (EAT-26) and the Eating Disorder Inventory-2 (EDI-2) (Picard, 1999). The results indicate that athletes at a higher level of competition are at an increased risk for the development of eating disorders and showed more signs of pathological eating. Secondly, athletes in sports emphasizing a lean physique and weight-restricting sports are more vulnerable to an eating disorder (Picard, 1999).

A second article, "Risk factors for stress fractures in track and field athletes: a twelve-month prospective study," by Kim Bennell, et al., investigated risk factors for stress fractures. This prospective study included a cohort of 53 female and male track and field athletes, ages 17-26, total bone mineral content, regional bone density, and soft tissue composition were measured. Also, menstrual characteristics, current dietary intake, and training were assessed using questionnaires. In the female athletes, significant risk factors include lower bone density, a history of menstrual disturbances, less lean mass in the lower limb, a discrepancy in leg length, and a lower fat diet. The results suggest that it may be possible to identify female athletes most at risk for this overuse bone injury (Bennell, et al., 1996).

A final article examined the prevalence of the female athlete Triad in Norwegian elite athletes and controls. This study was conducted in three phases: (part I) screening by means of a detailed questionnaire, (part II) measurement of bone mineral density (BMD), and (part III) clinical interview. In part I, all female elite athletes representing the national teams at junior or senior level, aged 13-39 yr (N=938) and an age group-matched randomly selected population-based control group (N=900) were invited to participate. Based on data from part I, a stratified random sample of athletes (N=300) and controls (N=300) was selected and invited to participate in parts II and III of the study. One hundred and eighty-six athletes (62%) and 145 controls (48%) participated in all parts of the study. The results of the study showed eight athletes (4.3%) and five controls (3.4%) met all criteria for the female athlete Triad (disordered eating/eating disorder, menstrual dysfunction, and low BMD). Six of the athletes who met all the criteria competed in leanness sports and two in nonleanness sports. When evaluating the presence of two of the components of the female athlete Triad, prevalence ranged from 5.4 to 26.9% in the athletes and from 12.4 to 15.2% in the controls. The results support the assumption that a significant proportion of female athletes suffer from the components of the female athlete Triad. In addition, it was also found that the female athlete Triad is also present in normal active females. Therefore, prevention of one or more of the components should be geared towards all physically active girls and young women (Torstveit & Sungot-Borgen, 2005).

Prevention and Screening

The key to preventing the female athlete Triad is education. One way of doing this is to prepare pamphlets or seminars for the clients, athletes, coaches, or parents. Another prevention key is starting a program at a local junior high or high school to help the age group that is most at risk for developing the components for the female athlete Triad (Burney & Brehm, 1998). Identification is also a key to prevention. The female athlete Triad and subsequent treatments for this disorder are a critical part of the health professional's knowledge. The certified athletic trainer must be observant to the changes in their athletes or clients. Proper screening at pre-participation physicals is critical and the medical professional needs to ask questions relating to each component of the female athlete Triad. All female athletes should undergo an initial evaluation. This evaluation should include questions related to height, weight, and menstrual irregularity (Rome, 2003). Other questions related to menstruation include: age at menarche, frequency and duration of menstrual cycles, longest period of time without menstruation, last menstrual period, and any history of hormonal therapy (Hobart & Smucker, 2000). Questions concerning attitudes about athlete's body weight and shape can also be asked. In addition, the team physician can ask questions related to the intensity and duration of exercise, stress perceived with missing workouts, social eating, any changes in dietary habits, family structure, and coping mechanisms the athletes use (Rome, 2003). The many signs and symptoms of the female athlete Triad should also be taken into consideration. See the table below for the thorough list of the signs and symptoms.

Signs and symptoms of the Female Athlete Triad

Fatigue

Anemia

Depression

Stress fracture

Decreased ability to concentrate

Cold intolerance

Hypothermia

Cold and discolored hand and feet

Enlargement of the parotid glands

Sore throat

Callused knuckles from pressure against the teeth during induced vomiting

Erosion of dental from frequent vomiting

Abdominal pain and bloating

Constipation

Dry skin

Face and extremity edema

Lightheadedness

Bradycardia

Changes in orthostatic blood pressure

Chest pain

Lanugo

(Kleposki, 2002)

Treatment

Treatment of the female athlete Triad requires a multidisciplinary approach. This “team approach” involves the primary care physician, a dietician, psychologist, and a member of the sports medicine staff. Treatment also includes decreasing exercise intensity or increasing body weight by 2-3 percent. Also, maintaining or increasing calcium intake to 1500 mg/day or taking dietary calcium supplements is critical. The athlete also needs to begin or continue a resistance training program designed to increase strength and muscle mass. If the athlete disregards the advice about exercise habits and nutritional guidelines, estrogen or hormone replacement therapy may be necessary (Beals, et al., 1998; Burney & Brehm, 1998; West, 1998).

If resources are available, a three pronged approach of psychological counseling, lifestyle changes, and pharmacotherapy should be implemented. Psychological counseling is the cornerstone of therapy (Putukian, 1998). Psychotherapy is crucial due to the fact that many of these females may be suffering from eating disorders for which treatment could last up to four years and beyond with the possibility of hospitalization (Sanborn et al., 2000).

Lifestyle changes for the female athlete would include dietary changes, exercise modification, and education on proper nutrition and exercise (Kleposki, 2002). A goal weight should be agreed upon by the team physician, the athlete, and the dietician. A dietary contract should be established in which the athlete gains .23 to .45 kilograms per week until the goal weight is reached (Hobart & Smucker, 2000). The team should also establish a well-rounded balanced diet for the athlete. However, it is imperative that the athlete is involved in all aspects of the dietary regimentation. This gives the athlete a sense of control over the situation (Smith, 1996). Exercise modification can also be established through a contract. “A contract places the decision to return to sports in the hands of the athlete and can be a motivating factor,” (Sanborn et al., 2000, p.211). The contract should be detailed and explicit about a cut-off weight for training and frequency and duration of training sessions. The cut off weight should be based on previous weight, body composition, and overall health (Sanborn et al., 2000). Weight should be followed very closely and the exercise should be reduced by at least 10%-20%. Compliance with the exercise contract can be measured by weight gain, resumption of menses, and attendance at the counseling sessions (Hobart & Smucker, 2000).

The female athletes should also be educated about nutrition and exercise. Many athletes have “myths” concerning the amount of body fat needed to perform at an elite level. Discussion should include information on the amount of fat needed for adequate athletic performance, the fact that fat is fuel for the body and the idea that there is a difference between feeling fat and being fat (Sanborn et al., 2000). Athletes should also be educated on proper normal menstrual cycles and what are signs, symptoms, and side effects of amenorrhea, including osteoporosis.

Pharmacotherapy is necessary at times for athletes with the female athlete Triad. The two most important interventions are estrogen replacement in amenorrhic patients and calcium supplementation to assist replacement in bone mass (Vince, 1999; Hobart & Smucker, 2000). Hormone replacement should be prescribed for every female athlete with the female athlete Triad because of estrogen deficiency. Treatment can be either by a oral contraceptive or a transdermal patch (Smith, 1996). Calcium supplements should also be encouraged as mentioned above. To absorb calcium into the bones, 400 to 800 IU of vitamin D should be supplemented daily (Kleposki, 2002).

Suggestions for Athletic Trainers

When dealing with eating disorders relating to athletes, there are several specific steps to follow. First, arrange a private meeting with the athlete. The health professional needs to be supportive, express concern, and explain observations that led to the suspicions. Next, proper nutrition, proper training techniques, and healthy mind and body should be encouraged. Finally, the athlete should be referred to a qualified health professional trained in dealing with eating disorders and the female athlete Triad (Burney & Brehm, 1998). If there are any questions or concerns about the athlete, contacting a family physician, sport psychologist or dietician in a step in the right direction. Also the American College of Sports Medicine (ACSM) and the National Collegiate Athletic Association (NCAA) provides educational materials for help with prevention training

Conclusion

The female athlete Triad is an important concern for athletes and the medical staff. Current research is being conducted all the time, but a need still exists for more. There are still missing links in the female athlete Triad research. For example, the exact prevalence is unknown. Education and prevention are the keys in combating this problem. Exercise is an important factor for a healthy life. Therefore, it is necessary to help keep the “active” safe from the dangers associated with over-training.

Take the Quiz Below.

CEU Quiz for NATA Certified Athletic Trainers
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THE FEMALE ATHLETE TRIAD

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-

Record answers below. Clearly circle ONE answer per line.

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D
6. A B C D
7. A B C D
8. A B C D
9. A B C D E
10. A B C D
11. A B C D
12. A B C D
13. A B C D
14. A B C D
15. A B C D
16. A B C D E
17. A B C D
18. A B C D
19. A B C D
20. A B C D

Mark Answers Above.

THE FEMALE ATHLETE TRIAD

Quiz

1. The Female Athlete Triad includes all of the following disorders EXCEPT:
 - a. disordered eating
 - b. amenorrhea
 - c. adrenal insufficiency
 - d. osteoporosis

2. Amenorrhea is defined as absence or cessation of consecutive menstrual cycles for:
 - a. 2 or more cycles per year
 - b. 3 or more cycles per year
 - c. 5 or more cycles per year
 - d. 7 or more cycles per year

3. Most of the physical complications of amenorrhea develop from:
 - a. decreased serum estrogen levels
 - b. increased serum estrogen levels
 - c. decreased serum progesterone levels
 - d. increased serum progesterone levels

4. Which of the following statements about female athletes are FALSE?
 - a. Osteoporosis is due to premature bone loss.
 - b. Bone density is secondary to amenorrhea.
 - c. Osteoporosis can be reversed by calcium supplementation.
 - d. The female athletes are at risk for vertebra fractures.

5. Sport specific triggers that are risk factors for young female athletes include all of the following EXCEPT:
 - a. soccer
 - b. ballet
 - c. gymnastics
 - d. diving

6. The optimal time to screen athletes for problems associated with the female athlete Triad is:
 - a. during a visit for acute fracture
 - b. after an injury occurs
 - c. during a pre-participation physical
 - d. during the annual female exam

7. While examining a female athlete you noted callused knuckles. This finding may be an indicator of:
 - a. anorexia
 - b. purging
 - c. binge eating
 - d. nervous tick

8. The cornerstone of treatment for disordered eating is:
 - a. nutritional counseling

- b. involvement of the personal trainer
 - c. parental counseling
 - d. psychological counseling
- 9.** The recommendation of weight gain per week for the female athlete Triad is:
- a. 0.10 to 0.18 kg
 - b. 0.18 to .0.25 kg
 - c. 0.23 to 0.45 kg
 - d. 0.45 to 0.63 kg
- 10.** As part of the patient-provider contract, exercise should be reduced by:
- a. 5-10%
 - b. 10-20%
 - c. 20-30%
 - d. 35-40%
- 11.** Athletics are the primary cause of the female athlete Triad.
- a. True
 - b. False
- 12.** Which of the following is not a risk factor for an eating disorder?
- a. average body composition
 - b. level of competition
 - c. level of performance
 - d. control over body shape
- 13.** Secondary amenorrhea is when a female does not have a menstrual cycle by age 16.
- a. True
 - b. False
- 14.** The prevalence of amenorrhea in female athletes has been reported as high as:
- a. 40%
 - b. 25%
 - c. 66%
 - d. 50%
- 15.** Which is not a risk factor associated with amenorrhea?
- a. Hormonal imbalances
 - b. Premature osteoporosis
 - c. Excess levels of estrogen
- 16.** Questions that should be included on the pre-participation physical form related to the female athlete Triad include:
- a. What is your height?
 - b. What menstrual irregularities have you had?
 - c. What is you weight?
 - d. Have you had any weight problems or fluctuations?
 - e. All of the above.
- 17.** When discussing pharmacotherapy as treatment, the two most important interventions are”
- a. estrogen replacement and calcium supplementation
 - b. progesterone replacement and calcium supplementation
 - c. estrogen replacement and Vitamin D supplementation
 - d. progesterone replacement and Vitamin D supplementation

18. Which of the following is not a sign of symptom of the female athlete Triad?
- depression
 - increased body temperature
 - abdominal pain
 - fatigue
19. Treatment for hormone replacement can be either by oral contraceptives or a hormonal patch.
- True
 - False
20. Many athletes have “myths” concerning the amount of body fat needed to perform at an elite level.
- True
 - False
21. Which of the following is not included in lifestyle changes for the female athlete?
- exercise modification
 - dietary changes
 - education on nutrition/exercise
 - education on relationships

References

- American Academy of Pediatrics (2000). Medical concerns in the female athlete. *Pediatrics*, 106, 610-613.
- Beals, K., Brey, R., & Gonyou, J. (1999). Understanding the female athlete Triad: Eating disorders, amenorrhea and osteoporosis. *Journal of School Health*, 69(8), 337.
- Bennell, K. Malcolm, S., Thomas, S., et al. (1996). Risk factors for stress fracture in track and field athletes: a twelve-month prospective study. *The American Journal of Sports Medicine*, 24(6), 810.
- Burney, M & Brehm, B. (1998). The female athlete Triad. *The Journal of Physical Education, Recreation, and Dance*, 69(9), 43.
- Bykowski, M. (1999). Female athlete Triad often undiagnosed, under treated. *Family Practice News*, 29(18), 31.
- Byrne, S & McLean. (2001). Eating disorders in athletes: a review of the literature. *Journal of Science in Medicine and Sport*, 4, 145-159.
- ETR Associates (1996). Help on the way: Female athlete Triad. *ETR Brochure*, H234.
- Hobert, J & Smucker, D. (2000). The female athlete Triad (on-line). Available: <http://www.aafp.org/aft/20000601/3357.html>.
- Kleposki, R. (2002). The female athlete Triad: A terrible trio implications for primary care. *Journal of the American Academy of Nurse Practitioners*, 14(1), 26-34.

Manore, M. (2002). Dietary recommendation and athlete menstrual dysfunction. *Sports medicine*, 32, 887-901.

Nieman, D. (1999). Exercise Risks, in Exercise Testing and Prescription: A health related approach, (4th ed.) Mayfield Publishing, Mountain View, CA.

Picard, C. (1999). The level of competition as a factor for the development of eating disorders in female collegiate athletes. *Journal of Youth and Adolescence*, 28 (5), 583.

Putukian, M. (1998). The female athlete Triad. *Clinics in Sports Medicine*, 17(4), 675-696.

Rome, E. (2003). Eating disorders. *Obstetrics and Gynecology Clinics of North America*, 30, 353-377.

Sanborn, C., Horea, M., Siemers, B., & Dieringer, K. (2000). Disordered eating and the female athlete Triad. *Clinics in Sports Medicine*, 19(2), 199-213.

Smith, A. (1996). The female athlete Triad: Causes, diagnosis, and treatment. *The Physician and Sports medicine*, 24(7), 67.

Thompson, J. (1998). Energy balance in young athletes. *International Journal of Sports Nutrition*, 8, 160-184.

Torstveit, M. & Sungot-Borgen, J. (2005). The female athlete Triad exists in both elites and controls. *Medicine & Science in Sports & Exercise*, 37(9), 1449-1459.

Weltman, A., Snead, D., & Weltman, J. (1992). Effects of calcium supplementation on bone mineral density in premenopausal women runner. *Medicine & Science in sports & Exercise*, 4, S12.

Vinci, D. (1999). The female athlete Triad: amenorrhea, and osteoporosis. *Athletic Therapy Today*, 4(5), 34-35.

West, R. (1998). The female athlete Triad: The Triad of disordered eating, amenorrhea and osteoporosis. *Sport Medicine*, 26(2), 63.