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Disordered Eating and Exercise Patterns in Athletes



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Learning Objectives

1. Describe the concepts of normal eating, disordered eating, and eating disorders.
2. Explain why eating disorders are classified as psychiatric diseases.
3. State the diagnostic criteria for anorexia nervosa, bulimia nervosa, and eating disorders not otherwise specified.
4. Outline the characteristics of anorexia athletica and compare and contrast it with other eating disorders.
5. State the prevalence of disordered eating and eating disorders in the male and female athletic and general populations and discuss its impact on physical and mental health and performance.
6. Differentiate between athletes with eating disorders and those who are training intensely but do not have a disordered eating pattern.
7. Discuss the appropriate responses by teammates, coaches, athletic trainers, and others if disordered eating or an eating disorder is suspected.
8. Explain the Female Athlete Triad and how each component affects health and performance.
9. Describe exercise dependence and explain how it differs from overtraining.

Pre-Test

Assessing Current Knowledge of Disordered Eating and Exercise Dependence

Read the following statements and decide if each is true or false.

1. Disordered eating and eating disorders only affect female athletes.
2. Anorexia athletica means that an athlete has a classic case of anorexia nervosa.
3. Disordered eating and eating disorders are more likely to be seen among elite female athletes in sports such as distance running and gymnastics.
4. Coaches cause athletes to develop eating disorders.
5. A good diagnostic criterion for exercise dependence is the volume of exercise training (i.e., frequency and duration of exercise).

Karen had been running ever since she could remember, but it was not until her first year in high school when she joined the cross country team that she realized that she was in love with running. She loved everything about it—the digital training watch that she got for her 13th birthday, the wind in her long hair, the quiet time she had to herself away from her family's problems, and the feeling of accomplishment when she finished a race. She made a name for herself the first year and she realized that she could be the best runner at her school if she applied herself.

By her junior year she was featured in her hometown newspaper as someone to watch. She adopted a semi-vegetarian diet and altered her running stride to make it more efficient. She came in second in the regional meet and earned the right to go to the state championships. There she had a strong start but faltered down the stretch and she was disappointed for herself and her family. Her coach told her that if she trained just a little harder that she could be a contender in her senior year. Her parents were excited about the prospects of her earning a college athletic scholarship; without some financial help they had little hope of sending Karen away to college.

After the state meet Karen immediately began to train and to pay more attention to her diet. She noticed that the winners at the state meet had brought coolers with their own food and drinks. She became a vegetarian in earnest and began to eat differently than her friends and family, which meant that she often prepared her own food and ate alone. Eating alone turned out to be advantageous as she could avoid the family mealtime discussions that always left her feeling as if she was not good enough in her parent's eyes. Her best friend in middle school told her that she was no longer the happy-go-lucky girl she once was. Karen took that as a compliment—she was maturing and focusing on the future—college, running, and,

maybe, the Olympics. She had dreams and they involved taking her beyond the little town in which she grew up.

She was diligent about her training and diet and her senior year was all that she had hoped. She smashed school records, erased regional marks, blew by the competition, and

won the state meet by a record margin. Sought after by many colleges, Karen traveled out of state on recruiting visits. She received offers of athletic scholarships from several schools who were impressed with her perfect high school grades and high scores on her college entrance exams. Karen chose to attend a top-notch school on the other side of the country even though her parents had reservations about her being so far away and were concerned about how they would pay for the costs not covered by the scholarship.

Her freshman year of college was an eye-opener. Her college coach was much more demanding than her high school coach and everything about her seemed to be under scrutiny. She had made only a few friends, acquaintances really, and she missed her family, although her coach was like having family close. Much of the dorm food was not vegetarian and she found herself with few choices and even fewer foods that she enjoyed eating. One of her goals was to have the highest GPA on the team, but attaining perfect grades in college was much harder than in high school. When she was not training, she was studying. Karen was surprised to find out that the athletic scholarship she thought was guaranteed had to be renewed each year based upon her running and academic performances, something that really upset her parents. Although her coach never said it directly, he intimated that she would perform better if she were leaner. A couple of her teammates, whom she noticed were thin, wondered aloud if she had what it took to make it as a college runner at an NCAA Division I school. That was all the motivation that she needed to develop a stricter training program, and, for the first time in her life, a diet to lose weight and become thinner.

As she stepped up her training and restricted her diet, her performance began to improve. Karen rededicated herself to

running and was almost robotic in her approach. She had convinced her parents to let her move into a single room in the dorm and not buy the meal plan. They reasoned that her diet would be healthier and that she would be happier if she prepared her own food in the small kitchen at the end of the hall. Karen found that she loved creating meal plans and looking through vegetarian cookbooks.

She made tremendous improvements by the end of her sophomore year and her coach said that she was poised to have a breakout junior year. Unfortunately, she developed a painful stress fracture in her lower leg early in the preseason of her third year. Karen struggled for many months not only because she was unable to train but also because she needed the intense physical activity to keep her weight low. Her coach was not paying much attention to her now that she was sidelined with an injury and she was already worried that her full athletic scholarship might be reduced for her senior year. Karen gained 10 pounds in two months while recovering from her injury, which scared her, so she began to restrict her diet to a few healthy foods—salads, bagels, fruits, and water—and weigh herself daily. She even cut her long hair in an effort to feel lighter.

By the beginning of the season she had received clearance to restart her training, but her injury had substantially set her training back and she was concerned that she was entering racing season without the necessary preseason training. Karen now relished her training runs and began to run on designated rest days, although she knew if her coach was aware of this that he would never have allowed it. If she had been honest with herself, she would have realized that she did not so much love running anymore, as she *needed* running. Her coach had mentioned that he was worried about her apparent lack of eating and she took his comment as a good sign since he obviously was paying attention to her again. Karen assured him that she was eating more now that she was training. She made sure that she was not lying by increasing the size of her salads. Secretly, she was a bit worried because her menstrual periods, which had been light but regular since high school, were now almost nonexistent—just two periods in the last year. She had not dated anyone since coming to college so she was not worried about being pregnant. But she did have an immediate health concern—recurrent upper respiratory tract infections that had plagued her for months.

Her junior season started with an excellent showing at a big meet and her coach repeated his prediction that this would be her breakout year. Her next effort was hampered by a cold

and her coach seemed sympathetic to her frequent infections, although he did ask her specifically about her training and diet. Two more meets featured mediocre performances and she was not chosen to travel to an out-of-state invitation-only event. She resolved to work harder, training more than usual and eating a little less than she had been for the past few months. At the next meet she fainted at the start line and her coach said they needed to talk. She believed that she just had a bad day; he believed that she had anorexia athletica.

This case study will be used throughout this chapter to illustrate the development of and some of the problems associated with disordered eating and exercise patterns in athletes.

Overview of Eating and Exercise Patterns

“NORMAL” EATING

Eating is not solely physiological. While it is necessary to eat to obtain the nutrients needed for the body to properly function, eating also has a strong psychological component. There is no agreed-upon definition of normal eating, but the following definition is often used:

Normal eating is being able to eat when you are hungry and continue eating until you are satisfied. It is being able to choose food you like and eat it and truly get enough of it—not just stop eating because you think you should. Normal eating is being able to use some moderate constraint in your food selection to get the right food, but not so restrictive that you miss out on pleasurable foods... Normal eating takes up some of your time and attention, but it keeps its place as only one important area of your life. In short, normal eating is flexible. (Satter, 1987).

For individuals with access to an adequate amount of food, normal eating represents the middle area on the eating continuum shown in Figure 13.1. When considered over a period of time, such as a week, month, or year, food may be either under- or overconsumed and on any given day the energy (kcal) or nutrient content may be higher or lower than recommended guidelines. Normal eating consists of consuming foods that are nutrient rich as well as eating some foods that might have a low nutrient content. The diet is moderate, balanced, and varied and is flexible, especially in response to social situations. Normal eating involves moderate constraint, not reckless abandon or overly-strict **discipline**.

Discipline: Moderate self-control or restraint.

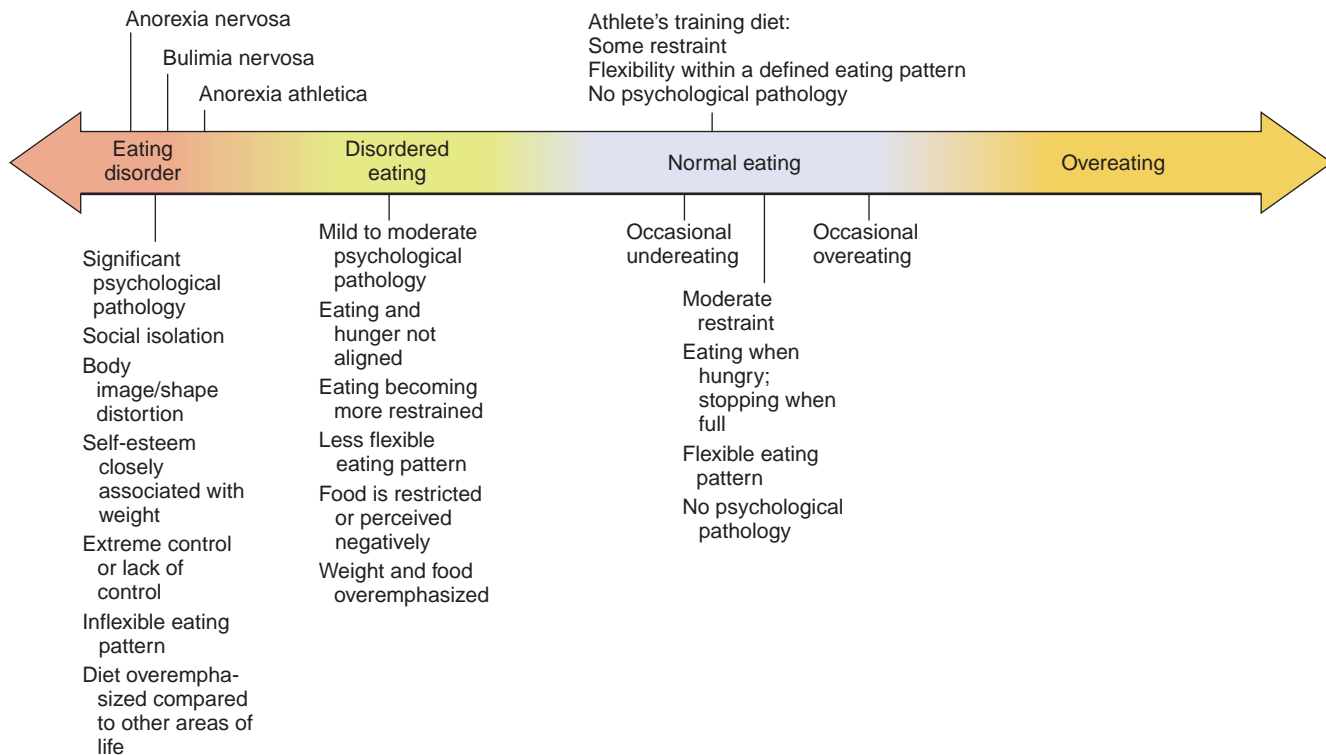


Figure 13.1 Eating Continuum

Eating disorders, disordered eating, normal eating, and overeating are areas along a continuum but these points are not well-defined.

Normal eating in athletes is particularly hard to define because some athletes must follow fairly strict eating guidelines to support their training and performance goals. A distance runner must be concerned about excessive caloric intake because weight gain as body fat could negatively affect training and performance. Rigorous training, especially during the latter part of the preseason, and the demands of competition require a well thought out diet plan. For example, the distance runner must be diligent about consuming the proper amount of carbohydrates daily or risk not restoring the muscle glycogen used during training and competition. The moderate restraint and dietary flexibility that is part of normal eating necessarily becomes a bit more restrained and less flexible during periods of intense training and competition, but it should not become overly restricted or inflexible. Normal eating among highly trained athletes is characterized by discipline, not by **obsession** (see Figure 13.1).

DISORDERED EATING

Disordered eating (DE) represents a deviation from normal eating, but the individual does not meet the diagnostic criteria for an **eating disorder (ED)**—anorexia nervosa, bulimia nervosa, or eating disorders not otherwise specified. Disordered eating is not well defined or easily recognized and encompasses a large area on the eating continuum (see Figure 13.1). The deviation from

normal may be occasional and minor or it may progress and become more frequent and **pathological**. The difficulty lies in identifying the overall context of normal eating and then determining the degree to which behaviors deviate from normal, tracking the progression, and identifying the level of severity. Individuals may be described as having a subclinical eating disorder if they demonstrate a number of disordered eating behaviors (see examples below) and exhibit associated psychological issues (Beals, 2006). Single disordered eating behaviors are not as severe as a subclinical eating disorder, which is not as severe as a clinical eating disorder, but any of the three conditions is cause for concern and intervention.

One sign of disordered eating may be the inability to “eat when hungry and stop when full.” In some cases, individuals will feel hungry but will refuse to eat at all or will wait until a predesignated time. When they do allow themselves to eat, the amount may be restricted. In other cases, the individual will be full but will continue to eat for nonphysiological reasons (e.g., anxiousness, loneliness, boredom). Body weight is not a good predictor of these behaviors; these examples include individuals who are underweight, normal weight, or overweight. Food intake may be strictly prescribed and this lack of eating flexibility is another characteristic of DE. One type of food (e.g., sweets) or nutrient (e.g., fat) may also be severely restricted and dietary intake can begin to conform to a rigid pattern. Food intake is often

viewed from the perspective of restriction (e.g., “don’t consume too many calories, don’t eat any fat”) rather than from the perspective of inclusion (e.g., “I need to eat an adequate amount of calories, including some fat”). Food and weight become overemphasized and take up a considerable amount of time and thought, to the exclusion of other important activities. Individuals with DE may exhibit any one or more of these behaviors, but, in short, disordered eating is inflexible.

Disordered eating in athletes is particularly hard to define because training and performance require attention and diligence to an eating plan, especially as athletes move to the more elite levels in their sports. The athlete’s “normal” pattern may be one of mild restraint. For example, a gymnast who eats “normally” may watch what she eats so that she consumes an adequate but not excessive amount of kilocalories to maintain her already lean physique and low body weight. She is thoughtful about what she consumes because she wants to make sure that her intake of carbohydrates and proteins is sufficient and this necessarily means a lower-fat diet than the general population. However, she sees food for what it is—the fuel to help her train and perform—and she is not exhibiting signs of disordered eating. Contrast this to the gymnast who tallies the amount of fats and kilocalories consumed daily and classifies food as “good” and “bad.” This gymnast monitors her diet so closely that she will not allow herself to consume dessert on *any* occasion. She eats when she feels hungry but if it is not a designated mealtime she will only consume carrots to satisfy her hunger. This gymnast is exhibiting some disordered eating behaviors and her disordered eating could become more severe. For example, in addition to the behaviors already described, she might become fearful of eating fats and refuse to eat more than 20 grams daily. If she exceeded this self-imposed limit, she might “punish” herself by doing 200 sit-ups and **fasting** for the rest of the day. She might begin to weigh herself daily and let the scale weight determine her eating pattern. These are examples of pathological behaviors associated with a subclinical eating disorder, but she would not meet the diagnostic criteria for an eating disorder.

EATING DISORDERS

Eating disorders represent a substantial deviation from normal eating (see Figure 13.1) and are **psychiatric** conditions that involve body image issues. The three clinical eating disorders recognized by the American Psychiatric Association (APA) are anorexia nervosa, bulimia nervosa, and eating disorders not otherwise specified (EDNOS) and each has established criteria (DSM-IV, 1994). Although anorexia nervosa and bulimia nervosa are both characterized as eating disorders, they are more dissimilar than similar. Those with EDNOS do not meet

the specific criteria established for either anorexia or bulimia but a variety of significant problems are present, as will be illustrated later in this chapter. Although this chapter focuses on eating and exercise behaviors, one should not forget that eating disorders are psychiatric diseases and their development is a result of psychological disturbances often related to issues of control.

Anorexia Nervosa. **Anorexia nervosa** is characterized by a refusal to maintain a minimum body weight. There is an intense fear of gaining weight and an intense desire to be thin. Also present is an extremely distorted body image—those with anorexia nervosa see themselves as fat in their mind’s eye even when they are **emaciated**. Two subtypes exist. The first is referred to as *Restricting type* and these individuals self-impose starvation and engage in excessive exercise. A second subtype is termed *Binge-Eating/Purging type*. These individuals employ starvation and excessive exercising techniques but may also overeat at times and then use self-induced vomiting, **diuretics**, or **laxatives** to compensate for the increased energy intake associated with the bingeing behavior.

The **prevalence** of anorexia nervosa in late adolescence and early adult females is estimated to be 0.5 to 1.0 percent of that population. It is most prevalent in females (more than 90 percent of all cases). Males do manifest anorexia nervosa, although the prevalence is unknown. The typical age range for females exhibiting anorexia nervosa is early adolescence (~ age 13) through early adulthood (mid-twenties) and critical ages appear to be age 14 (often the start of high school) and age 18 (start of College, living away from family). The **incidence** appears to be on the increase, but this trend is hard to document (DSM-IV, 1994).

Obsession: Idea or feeling that completely occupies the mind, sometimes associated with psychiatric disorders.

Disordered eating (DE): A deviation from normal eating.

Eating disorder (ED): Substantial deviation from normal eating, which meets established diagnostic criteria.

Pathological, pathology: A condition that deviates from that which is considered normal.

Fasting: Abstaining from food or drink.

Psychiatric: Relating to the medical specialty concerned with the diagnosis and treatment of mental or behavioral disorders.

Anorexia nervosa: A life-threatening eating disorder characterized by a refusal to maintain a minimum body weight.

Emaciated: Extremely thin; may be a result of self-starvation.

Diuretic: Causing an increased output of urine.

Laxative: A substance that promotes bowel movements.

Prevalence: The number of cases of a condition that exists in the population at a given point in time.

Incidence: The number of new cases of an illness or condition.



Anorexia nervosa is characterized by a refusal to maintain a minimum body weight.

Those with anorexia nervosa meet the following criteria, shown here as listed in the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (DSM-IV, 1994):

- A. Refusal to maintain body weight at or above a minimally normal weight for age and height (e.g., weight loss leading to maintenance of body weight less than 85% of that expected; or failure to make expected weight gain during period of growth, leading to body weight less than 85% of that expected).
- B. Intense fear of gaining weight or becoming fat, even though underweight.
- C. Disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or denial of the seriousness of the current low body weight.
- D. In postmenarcheal females, **amenorrhea**, i.e., the absence of at least three consecutive menstrual cycles (A woman is considered to have amenorrhea if her periods occur only following hormone, e.g., estrogen, administration.)

Specify type

Restricting type: during the current episode of Anorexia Nervosa, the person has not regularly engaged in binge-eating or purging behavior (i.e., self-induced vomiting or the misuse of laxatives, diuretics, or **enemas**).

Binge-eating/Purging type: during the current episode of Anorexia Nervosa, the person has regularly engaged in binge-eating or purging behavior (i.e., self-induced vomiting or the misuse of laxatives, diuretics, or **enemas**).

While the four criteria are easily listed, diagnosing anorexia nervosa takes skill and clinical judgment. For example, there is not a single "normal weight" for any given age and height, so it must be determined for each Individual. Individuals of the same height have different

normal weights because of differing bone structure and body composition. In addition, weight history (e.g., weight stability, lowest and highest weight attained) should be considered. Once a normal weight is established (e.g., 115 pounds [\sim 52 kg]), then 85 percent of that weight can be calculated (e.g., 98 pounds [\sim 44.5 kg]).

The fear the individual has about weight gain may actually increase as weight loss continues. It may seem counterintuitive that a female whose normal weight is 115 pounds (\sim 52 kg) is fearful of weight gain when she is at 95 pounds (43 kg) and even more fearful when she weighs 90 pounds (41 kg). Recall that anorexia nervosa is a psychiatric disorder and that body image is distorted. It is common for someone with anorexia nervosa to look in the mirror and believe that she is fat or believe that one part of the body is fat (e.g., thighs or buttocks). In those with anorexia nervosa, self-esteem is dependent on body weight and body shape. Weight loss or maintenance of a body weight below one's minimum weight is seen by the individual as extreme self-discipline and is thought of as a desirable characteristic. Weight gain is seen as a lack of self-discipline and a lack of self-control and both are considered undesirable characteristics.

In most cases, weight loss is achieved primarily by voluntary starvation; excessive exercise may be a secondary method used. The self-starvation often begins with the elimination of foods high in kilocalories and becomes more restricted until the diet may contain only a few low-calorie-containing foods (e.g., vegetables). The term *anorexia* means loss of appetite and in this respect the disease is misnamed. Those with anorexia nervosa rarely lose their appetite; rather, they do not allow themselves to respond to it. They also rarely complain about their weight loss. Ironically, they are so self-controlled that they lose control. Control and self-esteem are psychological issues that will need to be addressed as part of therapy (DSM-IV, 1994).

Bulimia Nervosa. **Bulimia nervosa** is characterized by recurring binge eating coupled with inappropriate ways of preventing weight gain following the eating binge. Two subtypes exist. The first, known as the purging type, includes self-induced vomiting or the use of laxatives, diuretics, or enemas. The second, nonpurging type, involves fasting or excessive exercise. Those who purge attempt to keep the food from being absorbed (self-induced vomiting, use of laxatives) or prevent scale weight from increasing (use of diuretics or enemas). The nonpurgers compensate for the increased caloric intake by subsequent fasting or excessive exercise. Those with bulimia may use a number of methods, but purging by self-induced vomiting is the most common.

The prevalence of bulimia nervosa in the general population is difficult to estimate, in part because many people do not seek treatment so it goes undetected. It is

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most prevalent in females (~ 90 percent of those diagnosed with bulimia) but is not absent in males. The prevalence of bulimia in late adolescence and early adult females is estimated to be 1 to 3 percent of that population, which is greater than the prevalence of anorexia nervosa. The age range (adolescence to middle adulthood) is also larger than anorexia nervosa and some people struggle with bulimia for many years. Those with bulimia nervosa meet the following criteria:

- A. Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following:
 1. eating, in a discrete period of time (e.g., within any 2-hour period), an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances
 2. a sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating)
- B. Recurrent inappropriate compensatory behavior in order to prevent weight gain, such as self-induced vomiting; misuse of laxatives, diuretics, enemas, or other medications; fasting; or excessive exercise.
- C. The binge eating and inappropriate compensatory behaviors both occur, on average, at least twice a week for 3 months.
- D. Self-evaluation is unduly influenced by body shape and weight.
- E. The disturbance does not occur exclusively during episodes of Anorexia Nervosa.

Specify type

Purging type: during the current episode of Bulimia Nervosa, the person has regularly engaged in self-induced vomiting or the misuse of laxatives, diuretics, or enemas.

Nonpurging type: during the current episode of Bulimia Nervosa, the person has used other inappropriate

compensatory behaviors, such as fasting or excessive exercise, but has not regularly engaged in self-induced vomiting or the misuse of laxatives, diuretics, or enemas (DSM-IV, 1994).

Diagnosing bulimia also takes considerable skill and clinical judgment because the physical signs may not be obvious, and most bulimics eat in secret because they are ashamed of their eating and compensatory behaviors. Additionally, individuals with bulimia are often within the normal weight range. Restricting caloric intake (i.e., “dieting”) is frequently a binge-eating trigger. In other words, food intake will be severely restricted for a period of time in an effort to lose weight and during or after this self-imposed restriction binge eating will begin. A circular pattern can develop that involves food restriction for several days or weeks followed by a binge followed by food restriction. This pattern can continue for months or years.

A binge is described as eating a large amount of food in a short period of time, but there is no quantitative definition so the amount is relative to the individual’s usual pattern of eating. During a binge, the food is usually consumed rapidly, thus an often-used guideline is that the food is consumed in 2 hours or less.

Those with the purging subtype typically self-induce vomiting. Initially a finger is used to invoke vomiting, but most bulimics can become adept at willing themselves to vomit. Laxatives are used by approximately one-third of purgers. Other methods that are sometimes mentioned—use of ipecac (a medicine used to induce vomiting, often in cases of accidental poisoning) and enemas—are actually rarely used. Use of the finger to induce vomiting causes calluses to form on the back of the finger(s) over time due to the finger(s) rubbing

Amenorrhea: Menstruation is absent or suppressed.

Enema: Insertion of a liquid via the rectum to induce a bowel movement.

Bulimia nervosa: An eating disorder characterized by bingeing and purging cycles.

against the teeth. Frequent exposure to vomitus, which is acidic, removes enamel from the teeth and leaves them more prone to cavities and dental decay. These are some of the more obvious physical signs to those who are trained to recognize them.

Binge eating is a source of distress for the individual. Vomiting may relieve the physical discomfort associated with extreme overeating but not the emotional discomfort. Those with bulimia lose control over the eating situation (they literally cannot stop the binge) and this is followed by depression related to loss of control. Self-esteem is closely tied to both body shape and weight, and those with bulimia nervosa are overly critical of their bodies. Self-esteem and control are psychological issues that will need to be addressed as part of therapy.

Eating Disorders Not Otherwise Specified. A third diagnostic category is **eating disorders not otherwise specified**. This diagnosis is the most common in outpatient settings where approximately 60 percent of all eating disorders diagnosed are EDNOS. Surprising, this prevalent form of an eating disorder does not have defined criteria and is not well studied. The EDNOS diagnosis is often a result of a “default” categorization—pathological behaviors are clearly present but the specific diagnostic criteria for either anorexia nervosa or bulimia nervosa are not met. EDNOS is sometimes described as a “mixed eating disorder” (Fairburn and Bohn, 2005). Examples of EDNOS listed in the DSM-IV (1994) include:

1. For females, all of the criteria for Anorexia Nervosa are met except that the individual has regular menses.
2. All of the criteria for Anorexia Nervosa except that, despite significant weight loss, the individual’s current weight is in the normal range.
3. All of the criteria for Bulimia Nervosa are met except that the binge eating and inappropriate compensatory mechanisms occur at a frequency of less than twice a week or for a duration of less than 3 months.
4. The regular use of inappropriate compensatory behaviors by an individual of normal body weight after eating small amounts of food (e.g., self-induced vomiting after the consumption of two cookies).
5. Repeatedly chewing and spitting out, but not swallowing, large amounts of food.
6. Binge eating disorder: recurrent episodes of binge eating in the absence of the regular use of inappropriate compensatory behaviors characteristic of Bulimia Nervosa (see Spotlight on Enrichment: Binge Eating Disorder).

Pictures of emaciated females suffering from anorexia nervosa and newspaper articles that highlight individuals who eat a gallon of ice cream in a single

sitting before self-inducing vomiting may lead to stereotyping of these eating disorders. As is evident by the EDNOS examples and prevalence, characterizing eating disorders is not simple and the early diagnosis of any eating disorder is difficult. Consider two females who are 5'8" and weigh 125 pounds (56.8 kg). This weight falls at the lower end of the normal weight for height range, and each woman would be described as thin. For the first woman, this is her biologically comfortable weight and she can maintain that weight with a normal pattern of eating and physical activity. She also has a realistic body image and is not overly concerned if her weight varies between 125 and 130 pounds (56.8 and 59 kg). This woman does not exhibit any characteristics associated with an eating disorder. In contrast, the second woman can only maintain her 125-pound (56.8-kg) weight with daily food restriction and excessive exercise. In fact, weight maintenance is not the goal because she is always thinking about losing five pounds. She is dissatisfied with her weight and considers herself not thin enough. She is fearful that her current weight will “balloon” to 130 pounds (59 kg), so if she exceeds 125 pounds (56.8 kg) when she steps on the scale, she fasts for the rest of the day and goes to the gym for an additional aerobic session. Her favorite food is a chocolate candy bar, but she panics if she eats more than her self-imposed limit of one-half of a candy bar and compensates by self-inducing vomiting. This woman does not meet the criteria for anorexia nervosa and does not appear emaciated, but she does have an eating disorder (not otherwise specified) that needs treatment.

ANOREXIA ATHLETICA

Anorexia athletica is a condition found in athletes that overly restrict caloric intake, engage in excessive exercise, or do both for the purpose of attaining or maintaining a low body weight as a way to improve performance. This eating disorder subcategory is not included in the *Diagnostic and Statistical Manual of Mental Disorders* (1994) but is used by some sport dietitians because it better describes the characteristics exhibited by athletes with eating disorders. Just as “normal” eating in athletes is a bit different from that of the general population, anorexia athletica is a bit different from anorexia nervosa or an EDNOS seen in the general population. The characteristics of anorexia athletica are as follows:

- Reduced body mass (weight) and loss of fat mass is performance related and not related to appearance or body shape. (It should be noted that concerns about body shape could arise as the individual compares body weight, shape, or composition to the sport’s most successful athletes.)

- The loss of body mass results in a lean physique.
- **Weight cycling** (repeated weight gain and loss) is usually present although maintenance of a low body weight may be seen all year (preseason, competitive season, “off-season”).
- Restriction of food intake and/or excessive exercise is voluntary or at the suggestion of a coach or trainer.
- The abnormal eating occurs while the athlete is competing but stops at the end of the athlete’s career (Sudi et al., 2004).

Few studies have been conducted using the criteria for anorexia athletica, therefore, the prevalence is difficult to determine. A 1993 study of 522 Norwegian elite female athletes found that 43 (8.2 percent) met the criteria for anorexia athletica while seven (1.3 percent) had anorexia nervosa and 42 (8 percent) had bulimia nervosa (Sundgot-Borgen, 1993; Sudi et al., 2004). Beals and Manore (2002) found that the prevalence of clinical

eating disorders in female collegiate athletes was low (2.3 percent and 3.3 percent of the sample were diagnosed with bulimia and anorexia, respectively), but that as many as one-third was at risk for an eating disorder. While prevalence figures help shed light on each eating disorder, the critical points are that all these eating patterns are deviations from normal, are harmful to the athletes who manifest them, and can be prevented or detected early (Beals and Manore, 2000).

Eating disorders not otherwise specified (EDNOS): A “mixed eating disorder” in which pathological behaviors are present but the diagnostic criteria are not met for either anorexia nervosa or bulimia nervosa.

Anorexia athletica: Overly restrictive caloric intake and/or excessive exercise in an athlete to attain or maintain a low body weight as a way to improve performance.

Weight cycling: Repeated weight loss and weight gain.

SPOTLIGHT ON ENRICHMENT

Binge Eating Disorder

Binge eating, one characteristic of bulimia nervosa, is described as eating a large amount of food in a short period of time. The binge is associated with a loss of control, which is distressing to the individual. In those with bulimia nervosa, compensatory behaviors (e.g., vomiting, laxatives, fasting, excessive exercise) are employed to offset the binge and limit its effect on body weight. In binge eating disorder (BED), no compensatory behaviors are used and the individual typically becomes or remains obese.

Binge eating disorder is considered an eating disorder not otherwise specified. However, there are specific diagnostic criteria included in the appendix of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) for research purposes. These criteria need to be better studied and fine-tuned, but many researchers believe that there is a subset of obese individuals who suffer from BED and need psychological, nutritional, and medical treatment on the same scale as those suffering from anorexia nervosa or bulimia nervosa (Tanofsky-Kraff and Yanovski, 2004). The following criteria have been established to date:

- A.** Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following:
 - 1.** Eating, in a discrete period of time (e.g., within any 2-hour period), an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances
 - 2.** A sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating)
- B.** The binge-eating episodes are associated with three (or more) of the following:
 - 1.** Eating much more rapidly than normal
 - 2.** Eating until feeling uncomfortably full
 - 3.** Eating large amounts of food when not feeling physically hungry
 - 4.** Eating alone because of being embarrassed by how much one is eating
 - 5.** Feeling disgusted with oneself, depressed, or very guilty after overeating
- C.** Marked distress regarding binge eating is present.
- D.** The binge eating occurs, on average, at least twice a week for 6 months.
- E.** The binge eating is not associated with regular use of inappropriate compensatory behaviors (e.g., purging, fasting, excessive exercise) and does not occur exclusively during the course of anorexia nervosa or bulimia nervosa.

Binge eating disorder is not bulimia nervosa minus the compensatory behaviors. A comparison of the criteria indicates that individuals with BED eat rapidly until they are uncomfortably full, often when they are not hungry, and then feel disgusted, depressed, or guilty. The time period used for diagnosis also varies, with binge eating disorder occurring over a six-month period. More research is needed to identify those with BED and determine the most successful interventions.

What's the point? “Normal” eating is flexible. Disordered eating and eating disorders are deviations from normal and are often characterized by obsession or inflexibility.

Voluntary Excessive Exercise and Exercise Dependence. As with eating, exercise exists on a continuum, from a complete lack of activity to an amount of exercise that would be considered excessive. Also similar to eating, there are differences in amount that may be subtle and make it difficult to determine if the exercise is contributing positively to the athlete’s performance or has become a detracting influence. The *intent* of the exercise is an important factor.

Individuals with disordered eating, eating disorders, or anorexia athletica may use exercise to increase their energy expenditure to lose weight or offset increased caloric consumption from bingeing. While physical activity and exercise are generally considered to be beneficial to health and well-being, an overdependence on exercise has the potential to become a harmful obsession (Bamber et al., 2000). Because of the commitment many athletes have to their training to improve performance, it is very difficult to distinguish the amount of

exercise that is appropriate from that which may reflect a psychological disturbance.

In the past, researchers attempted to define “overexercise” or “excessive exercise,” using absolute measures of the amount of exercise training, such as frequency and duration (Anshel, 1992). The major problem with this approach is the inability to set a definitive amount of exercise that accurately distinguishes what is appropriate or excessive for all athletes. For example, 75–80 miles (~ 125–135 km) of running a week by a college-aged female to control her weight would seem to be excessive, but this training volume might be appropriate for a collegiate cross country runner preparing for the competitive season.

There can also be a fine line between the frequency, intensity, and duration of exercise that improves performance and that which results in a decline in performance. The latter is known as overtraining and demonstrates the difficulty of identifying the appropriate amount of exercise and recovery to achieve optimal fitness and reach a peak level of performance. As discussed earlier in this chapter in relation to eating behaviors, there are subtle differences in the intent of the exercising behavior and the athlete’s psychological state. These differences help to distinguish committed exercise training from overtraining from **exercise dependence**.

SPOTLIGHT ON ENRICHMENT

Do Wrestlers Have Eating Disorders?

Wrestlers meet the criteria for anorexia athletica. However, wrestlers generally do not meet the criteria for anorexia nervosa or bulimia nervosa. The few studies that have been conducted with wrestlers indicate that the majority do not possess the psychological pathology that accompanies eating disorders and contributes to their severity. Wrestlers do not base their self-esteem on their body weight. Most wrestlers only engage in abnormal eating behaviors during wrestling season. Their in-season eating pattern is described as **non-normative** (a deviation from normal), but they generally fall within the normal range when administered tests that measure thoughts, feelings, or attitudes that are associated with anorexia nervosa. Thus, restricting food and fluid are potentially dangerous to a wrestler’s physical health, but this eating pattern is transient and does not likely have long-term effects on mental health (Dale and Landers, 1999; Enns, Drownowski, and Grinker, 1987). Some wrestlers do score above the cutoff on tests used to identify at-risk eating behaviors, and there is concern that the binge eating that is part of many wrestlers’ weight cycling patterns may lead to an eating disorder after their careers end and weight loss is not so easily achieved after overeating. Weight cycling, and the effect that it may have on performance and health, is discussed in Chapter 11.



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Wrestlers may eat abnormally during the wrestling season, but generally do not meet the criteria for anorexia nervosa or bulimia nervosa.

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Some researchers have proposed the concept of primary and secondary exercise dependence (Veale, 1987). The proposed idea of primary exercise dependence involves a preoccupation with exercise—an “addiction” to exercise alone—that is independent of other potential mental disorders and is not used for other reasons such as controlling weight. A lack of supporting scientific research and more recent studies has called into question the prevalence of primary exercise dependence (Bamber et al., 2000, 2003).

In a study of female exercisers, Bamber et al. (2000) found that exercise dependence was not present in women who did not also demonstrate an eating disorder or disordered eating. Exercise dependence was defined as an unhealthy preoccupation with exercising, which had the potential to become a damaging obsession. Behaviors associated with exercise dependence include exercising when medically **contraindicated**, psychological distress when withdrawing from exercise, and a consuming obsession with exercise that transcends considerations of work and social life.

In a subsequent study, Bamber et al. (2003) identified four dimensions of exercise dependence: impaired functioning, withdrawal, presence of an eating disorder, and other associated features. The proposed criteria for

exercise dependence are shown in Table 13.1. The distinguishing features that appear to separate exercise dependence from committed training or overtraining are impaired functioning (e.g., psychological, social and occupational, physical, and/or behavioral), withdrawal symptoms, and presence of an eating disorder.

Disordered Eating and Eating Disorders in Athletes

PREVALENCE

The prevalence of disordered eating and eating disorders in athletes is very difficult to determine. Beals (2006) notes that only four studies have used a large enough sample size and valid survey instruments to be

Exercise dependence: An unhealthy preoccupation with exercising.

Non-normative: A pattern of behavior that deviates from what is considered to be normal.

Contraindicated: Inadvisable because of a likely adverse reaction.



Ian Walker/Getty Images

Sports that require or reward low body weight, low percent body fat, or thin appearance have a higher prevalence of disordered eating and eating disorders.

considered scientifically sound. In these studies the prevalence ranged from a low of 1.3 percent (anorexia nervosa in female athletes) to as high as 20 percent (any clinical eating disorder in female athletes). In addition to prevalence figures, some other conclusions can be drawn from these four studies. First, similar to the general population, female athletes are more likely than male athletes to exhibit both disordered eating and eating disorders. Second, the prevalence of disordered eating (i.e., subclinical eating disorders) is higher than the prevalence of clinical eating disorders. Third, the sports that have a higher prevalence are those that require or reward a low body weight, a low percentage of body fat, or a thin appearance.

Sundgot-Borgen et al. (1999) reported the results of their study that included the entire population of Norwegian elite male and female athletes. Scientists can usually study only a sample of the population, so this study offered additional insight because of its unique design. Using the DSM-IV criteria, the authors found that 20 percent of elite female athletes and 8 percent of elite male athletes met the diagnostic criteria for anorexia nervosa, bulimia nervosa, or eating disorders not otherwise specified. Clearly, elite female athletes are at greater risk than elite males, but eating disorders in elite male athletes should not be overlooked. Of the elite female athletes who developed ED, 60 percent indicated that dieting was an important factor in its development while 28 percent indicated injury was a factor. Of the elite males with ED, only 13 percent indicated that dieting was an important factor while injury (25 percent) and overtraining (21 percent) were mentioned more frequently.

Athletes in many sports are considered at risk for disordered eating and eating disorders (see Figure 13.2). Aesthetic sports, where appearance is part of the scoring, can lead to an overemphasis on a thin appearance.

- Ballet dancing (women)
- Bodybuilding
- Boxing
- Cheerleading (women)
- Diving (women)
- Figure skating (women)
- Gymnastics (women)
- Horseracing (jockeys)
- Lightweight rowing
- Martial arts (e.g., Judo, Karate, Kickboxing, Tae kwon do)
- Rhythmic gymnastics
- Running (middle or long distance)
- Swimming
- Ski jumping
- Synchronized swimming
- Wrestling

Figure 13.2 Sports Considered Higher Risk for the Development of Disordered Eating.



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Ballerinas may be at increased risk for disordered eating because the body's appearance is an integral part of the art of ballet.

Examples of such sports include women's gymnastics, figure skating, diving, ballet, and cheerleading. Their male counterparts are expected to be lean and muscular but not necessarily thin, so there are a higher percentage of at-risk females than males in these sports. Due to the acrobatic nature of some sports such as gymnastics, a high power-to-weight ratio is important and may influence some athletes to attempt to achieve a minimal level of body fatness while maintaining muscle mass.

A low body weight can also be seen to be advantageous in sports in which weight must be moved, such



Bradley Kanaris/Getty Images

Athletes in sports with weight restrictions are at risk for developing eating disorders.

as distance running. Both females and males in this sport may struggle with disordered eating as they try to attain and maintain a low body weight. Very low body weights are also advantageous for jockeys and ski jumpers, and some of these athletes develop disordered eating. Athletes in sports with weight categories (e.g., wrestling, boxing, martial arts, lightweight rowing) are at risk for eating disorders, especially if competition weight is well below a normal, biologically comfortable weight. Sports with revealing clothing (e.g., swimming, diving) or in which body appearance is the sport (e.g., bodybuilding) put athletes of both genders at risk. While these are some obvious examples of sports that create conditions that may pressure athletes to engage in pathological eating behaviors,



AP Photo/Mark Humphrey

Athletes that compete in sports with revealing clothing may feel internal or external pressures to meet body image expectations.

any athlete may be at risk because low body weight is not the only driving factor. Recall that those diagnosed with bulimia nervosa often are normal weight individuals.

Little is known about disordered eating and eating disorders in male athletes. It has been suggested that males more often develop pathological eating behaviors (i.e., disordered eating) rather than eating disorders and that males with disordered eating have more depression and substance use than males with “normal” eating patterns. Body image disorders appear to be more prevalent in males in Western countries than in non-Western countries. There is more media emphasis on male body image than in the past but it is unknown what, if any, effect increased media attention may have (Baum, 2006). An emerging area of interest,

SPOTLIGHT ON ENRICHMENT

The Adonis Complex

The Adonis Complex: The Secret Crisis of Male Body Obsession (Pope, Phillips, and Olivardia, 2000) is a consumer-oriented book written by three university professors (two M.D.s and one Ph.D.) outlining the psychological problems associated with striving for excess muscularity. These problems include obsessive-compulsive behavior, chronic depression, eating disorders, and/or substance abuse (e.g., anabolic steroids).

The parallel medical term is muscle dysmorphia, a pathological preoccupation with gaining muscle mass. The few studies that have been conducted, primarily in males who lift weights, suggest that muscle dysmorphia is an obsessive-compulsive disorder, but there are elements of inaccurate body image, body dissatisfaction, and eating attitudes that are similar

to those found in diagnosable eating disorders. Those with muscle dysmorphia have highly developed skeletal musculature but they believe their muscles are too small. They are dissatisfied with their appearance, weight, and amount of muscle mass and are at risk for using anabolic steroids to change body composition (Choi, Pope, and Olivardia, 2002; Olivardia, Pope, and Hudson, 2000).

Body dissatisfaction in men is increasing, but the incidence and prevalence of muscle dysmorphia is not known (Choi, Pope, and Olivardia, 2002). Muscle dysmorphia is an example of body dysmorphic disorder (preoccupation with defective appearance), the latter of which is listed in the diagnostic manual for the American Psychiatric Association.

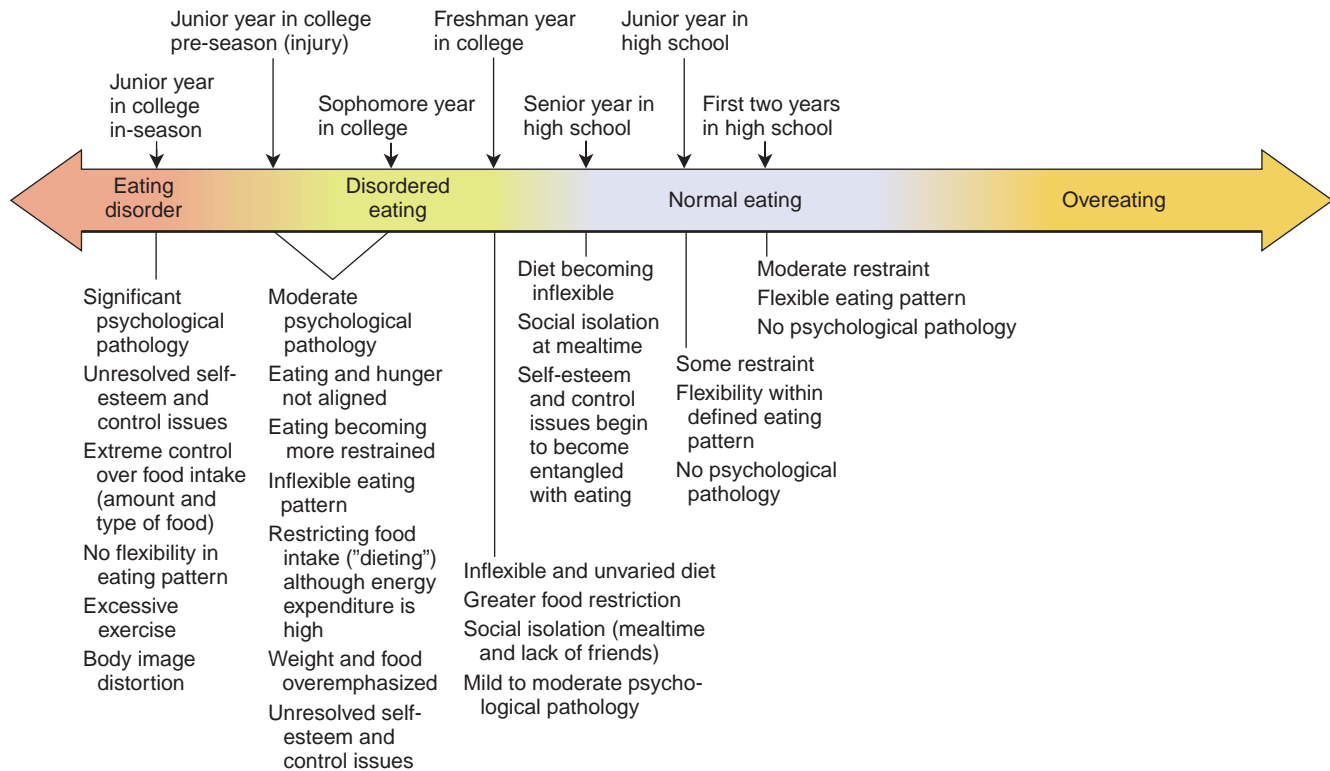


Figure 13.3 An Eating Continuum Example: Karen, the Cross Country Runner

Karen's behaviors placed on the eating continuum.

muscle dysmorphia, is explained in Spotlight on Enrichment: The **Adonis** Complex.

THE DEVELOPMENT OF DISORDERED EATING AND EATING DISORDERS IN ATHLETES

This chapter began with a vignette about Karen, a collegiate cross country runner. As is hinted at in the scenario, there were some unresolved family, control, and self-esteem issues. Karen also exhibited some personality traits, such as perfectionism, excessively high achievement goals, and obsessiveness, which are associated with eating disorders. Participating in a sport, wanting to excel, fierce competitiveness, or being injured do not cause an eating disorder. These may be factors that influence its development, but an eating disorder is, at the core, a psychiatric disease.

Karen was a naturally talented runner who had a “normal” eating pattern when she entered high school. As she became more dedicated to improving her running, she adopted a semi-vegetarian diet in her junior

year of high school to support her training and performance goals. If she consumed sufficient kilocalories and nutrients and maintained some dietary flexibility, then her diet would be considered “normal” for a well-trained athlete. She enjoyed the recognition she got from her parents for being in the newspaper. In her senior year she followed a more strict vegetarian diet, preparing her own food and eating alone. She started to become socially isolated at mealtime, and her diet was becoming more inflexible. During therapy, Karen identified her senior year as the point in time when she began to move away from “normal” on the eating continuum (see Figure 13.3) because she had found a way to “control” her parent’s comments and her feelings of low self-esteem that accompanied dinner-time conversation. At the same time her successful cross country season was showering her with attention, something she realized later that she desperately needed.

At 18 she left home to attend college and compete at the NCAA Division I level. Although she was a talented high school runner, this is always a vulnerable time for an athlete who goes from being “a big fish in a little pond” to “a little fish in a big pond.” For Karen, it became a time of distress because she felt that she had little control over her life. Some of her teammates (who were also her competitors) made disparaging comments, and these comments affected her self-esteem. Eating in the dorm contributed to her diet becoming less flexible and

Muscle dysmorphia: Pathological preoccupation with gaining muscle mass.

Adonis: Greek mythological character described as an extremely handsome young man.

more monotonous. That she no longer enjoyed eating was also a factor because pleasurable eating is a part of “normal” eating. The stated reasons for moving into a single room and fixing her own food was the potential for more nutritious eating, but the unstated reason was that she felt more in “control” when she ate alone, something she had first discovered in high school. Changes in her eating situation led her away from a normal eating pattern by creating more isolation at mealtime that supported greater food restriction.

Karen had made few friends and missed her family, so her coach became her surrogate family. She sought his attention in the same way that she sought her parent’s attention in high school—by being a successful runner. When Karen perceived that the coach thought that she needed to be leaner, she had a new goal to accomplish. Her body weight became closely tied to her self-esteem.

An important issue for Karen was her decision to start a weight-loss diet. Recall that dieting can be a factor that triggers the development of an eating disorder, especially in elite female athletes. She restricted her caloric intake (at the same time that she increased her energy expenditure), but she did not establish a weight-loss goal, so she had no way of knowing if, and when, she met that goal. She was also using her weight as a way of vying for her coach’s attention.

Karen’s injury further contributed to her disordered eating for both physical and psychological reasons. Her goal was to keep her weight “low,” but the injury prevented energy expenditure through exercise. A goal of losing weight or maintaining an already low body weight when injured is often not realistic. Trying to attain an unrealistic goal moved Karen further along the disordered eating continuum. The injury also changed the amount of attention that she received from her coach, the person in her life whose opinion she cared about the most.

When her injury was resolved, she continued to consume a restricted diet and voluntarily engaged in excessive exercise. Increasing the serving size of a low calorie food such as salad was not an appropriate dietary response to a substantial increase in training volume. When she did not get an invitation to an important meet, her response was to train more and eat less. At this point, Karen exhibited all the signs of anorexia athletica and had unresolved psychological issues related to control, self-esteem, and personal relationships.

DISTINGUISHING BETWEEN “NORMAL” AND DYSFUNCTIONAL BEHAVIORS IN ATHLETES

Excellent athletic performance, especially at the elite level, requires rigorous training. A nutritious diet supports training and can improve performance, and some athletes must follow fairly strict eating protocols to

support their training, body composition, and performance goals. Both training and eating can become regimented, a factor that may contribute to disordered eating. A fine line separates rigorous training and eating regimes that enhance performance and support health from disordered eating and exercise dependence that hurt performance and undermine health. Crossing this imaginary line may be accidental or intentional. Since early intervention is critical for treatment and recovery and the athlete may be unaware or in denial that problems exist, it is important for coaches, athletic and personal trainers, and others who work closely with athletes to be able to distinguish that which is “normal.”

Table 13.2 compares the features that may help to distinguish “normal” and disordered eating and exercise patterns in athletes. Athletes in both groups share many features: a high level of physical training, an eating plan to support the demands of training, and a desire to change body composition. But there are marked differences between the two groups in actions and perspective. Returning to the example of Karen, she exhibited almost all the features of disordered eating and exercise patterns shown in Table 13.2.

In addition to behavioral signs, there may be physical signs of disordered eating and eating disorders. Some of these signs may not be noticeable until the disordered eating is prolonged or severe. Frequent gastrointestinal (GI) problems may be present early (some athletes may use GI distress to control weight), but by themselves are too general to predict disordered eating. As food intake is restricted and nutritional status declines, the athlete may exhibit weight loss, chronic fatigue, iron-deficiency anemia, irregular or absent menstruation, and slow recovery from illness or injury. Those with anorexia nervosa may be exceptionally intolerant to cold temperatures (due to low percent body fat) or grow fine hair on the body (known as lanugo) in an effort to regulate body temperature. Bulimics may have callused fingers, teeth with little enamel, or esophageal erosion from self-inducing vomiting (Beals, 2006).

DISORDERED EATING AND EATING DISORDERS IN ATHLETES: WHEN AND HOW TO INTERVENE

Early intervention is critical in the treatment of disordered eating and eating disorders. If left alone, athletes typically do not resolve these issues themselves. In some cases, the athletes do not realize that they have fallen into a disordered eating pattern; in other cases, the athletes staunchly deny that an eating problem exists. If a coach, athletic trainer, or teammate suspects that any degree of disordered eating exists, the question is not when, but how, to intervene.

Beals (2006) notes that if disordered eating is suspected, the appropriate course of action is to approach the athlete and refer to a trained professional for further

Table 13.2 Distinguishing “Normal” and Abnormal Eating and Exercise Patterns

	Features of athletes with “normal” eating and exercise patterns	Features of athletes who may have disordered eating and exercise patterns
Performance	Performance is improved or a high level of performance is maintained	Performance declines
Training	Purposeful training; no overtraining	Excessive exercise or activity; self-imposed overtraining or exercise dependence; anxious if not able to train; continues to train with injury against medical advice
Energy intake	Caloric intake is monitored; athlete is disciplined but not obsessive about the amount of food consumed	Caloric intake is controlled; athlete is disciplined and obsessive; amount of calories consumed is recorded or mentally counted; consumption of caloric intake over self-imposed limit causes anxiety
Perspective on food intake	Food is needed to fuel training; eating is enjoyed and viewed positively	Food needs to be restricted; eating is not enjoyable and viewed negatively
Dietary intake	Consumption of “healthy foods” and adequate kilocalories; no concern about occasionally eating low nutrient dense foods	Consumption of “healthy foods” but inadequate kilocalories; Concern about or refusal to occasionally eat low nutrient dense foods
Dietary flexibility	Routinely follows a well-planned diet but is flexible as needed	Ritualistic and inflexible pattern of eating
Body image	Accurate and positive body image	Inaccurate and negative body image
Body composition	Realistic weight and body composition goals that improve or maintain performance; goals are attainable without compromising health	Unrealistic weight and body composition goals that do not improve or maintain performance; goals are not attainable without compromising health
Muscle mass	Increased or maintenance of muscle mass with resistance training	Decreased or inability to increase muscle mass with resistance training

evaluation. If confirmed, the placement of the athlete into a treatment program is crucial. Approaching anyone with an eating disorder is an extremely sensitive issue and must be done in a professional and confidential manner. In some universities a referral protocol has been established, and, if so, it should be followed exactly. If no protocol exists, a good starting point is to refer the athlete to the team physician.

The primary goal of treatment is to help the athlete resolve both the psychological and physical issues present. Early intervention is critical to meeting that goal, because those with less severe or less prolonged problems have a better chance of successful treatment. If appropriate, a second goal is for the athlete to return to the sport. Athletes who refuse treatment or do not satisfactorily complete treatment should not be allowed to train or compete because their mental and physical health will be compromised (International Olympic Committee [IOC], 2005).

Treatment involves three components—psychological, nutritional, and medical. Each needs to be treated by an expert, so treatment involves a team approach including a psychologist, registered dietitian,

and physician. Psychological counseling is necessary because psychological disturbances are at the core of the eating disorders. A description of the intensive psychological therapy needed is beyond the scope of this chapter, but it is fundamental to treating any eating disorder. Nutritional counseling is necessary, even though many who have eating disorders know a great deal about the caloric and nutrient content of food. Nutrition counseling helps them to view food in a normal context, one in which eating is both flexible and enjoyable. Medical guidance is needed to resolve physical problems resulting from the eating disorders and to coordinate medical care over the course of treatment, which may be months or years in length, depending on the severity of the eating disorder.

What’s the point? Disordered eating and eating disorders are a threat to an athlete’s physical and mental health and any signs or symptoms should not be ignored. Early identification, intervention, and treatment are critical.

Female Athlete Triad

The Female Athlete Triad (see Figure 13.4) is a term used to describe three interrelated conditions: disordered eating (resulting in low energy availability), amenorrhea (a sign of hormonal disruption), and **osteoporosis** (evidence of low bone mineral density). The three may be present together and have developed in sequence—low energy availability due to low energy intake and high energy expenditure leads to amenorrhea that leads to osteoporosis—although each of these conditions can occur independently of the others. Each of the three factors develops along a continuum. Both the International Olympic Committee Medical Commission (2005) and the American College of Sports Medicine (1997, currently under review) have issued position papers on the Female Athlete Triad. Preventing and treating the Female Athlete Triad is a high priority because of the substantial short- and long-term medical problems that can occur.

LOW ENERGY AVAILABILITY

Low energy availability results when the female athlete is in negative energy balance. Negative energy balance is the result of energy expenditure exceeding energy intake. Athletes in sports in which low body weights are required (e.g., lightweight rowing, lower weight categories in the martial arts) or desired (e.g., gymnastics, ballet dancing, distance running) may intentionally undereat in an effort to attain or maintain that low body weight. Coupled with the high energy expenditure required for training in these sports, an ongoing **energy deficit** is likely. This deficit may last months or years. In adolescent athletes, physical growth also requires energy, and growth may contribute further to the energy deficit.

Low energy availability may or may not be associated with disordered eating. For example, a female distance runner with a low body weight may try to slightly underconsume energy (kcal) intake daily when compared to energy expenditure to prevent a gain in body fat. She could have a well-planned, nutritious, and disciplined training diet that is not an obsession and not disordered eating. Since she is intentionally in an energy deficit, she is at risk for developing amenorrhea and osteoporosis, but she does not have the same psychological risk as a similar athlete with disordered eating or an eating disorder. Those female athletes who exhibit disordered eating patterns are at greater risk both physiologically and psychologically. It bears repeating that food restriction or “dieting” in a low body weight elite female athlete is often a trigger that can lead to disordered eating, which can progress to an eating disorder.

Persistent and severe energy deficits force the body to adapt and begin to suppress physiological functions that are associated with normal growth and

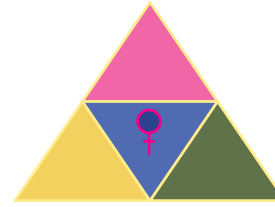
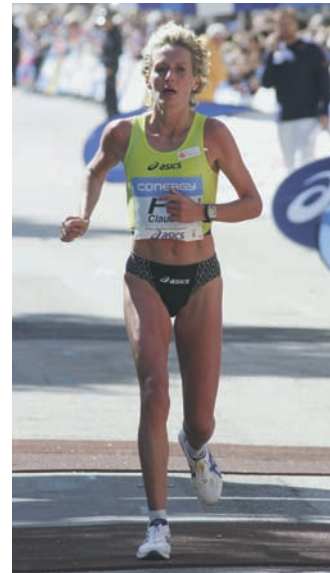


Figure 13.4 The IOC symbol for the Female Athlete Triad



Alexander Hasenstein/Bongarts/Getty Images

In sports in which low body weight may be associated with better performance, athletes may undereat, resulting in a chronic energy deficit.

development. The Female Athlete Triad singles out one altered physiological function that is a result of low energy availability—amenorrhea (IOC, 2005).

AMENORRHEA

Amenorrhea is defined as the absence or suppression of menstruation. In the United States, primary amenorrhea describes a female who has gone through puberty but by age 15 has not yet menstruated. In secondary amenorrhea, the female began menstruating but menstruation has been absent for three or more months. There are a variety of medical conditions that may have an effect on normal menstruation patterns. In the context of the Female Athlete Triad, the amenorrhea is a result of low energy availability and is not due to some other medical condition or contraceptive technique that may result in absent menstruation.

Osteoporosis: Disease of the skeletal system characterized by low bone mineral density and deterioration of the bone's microarchitecture.

Energy deficit: Result of consuming less energy (kcal) than expended.

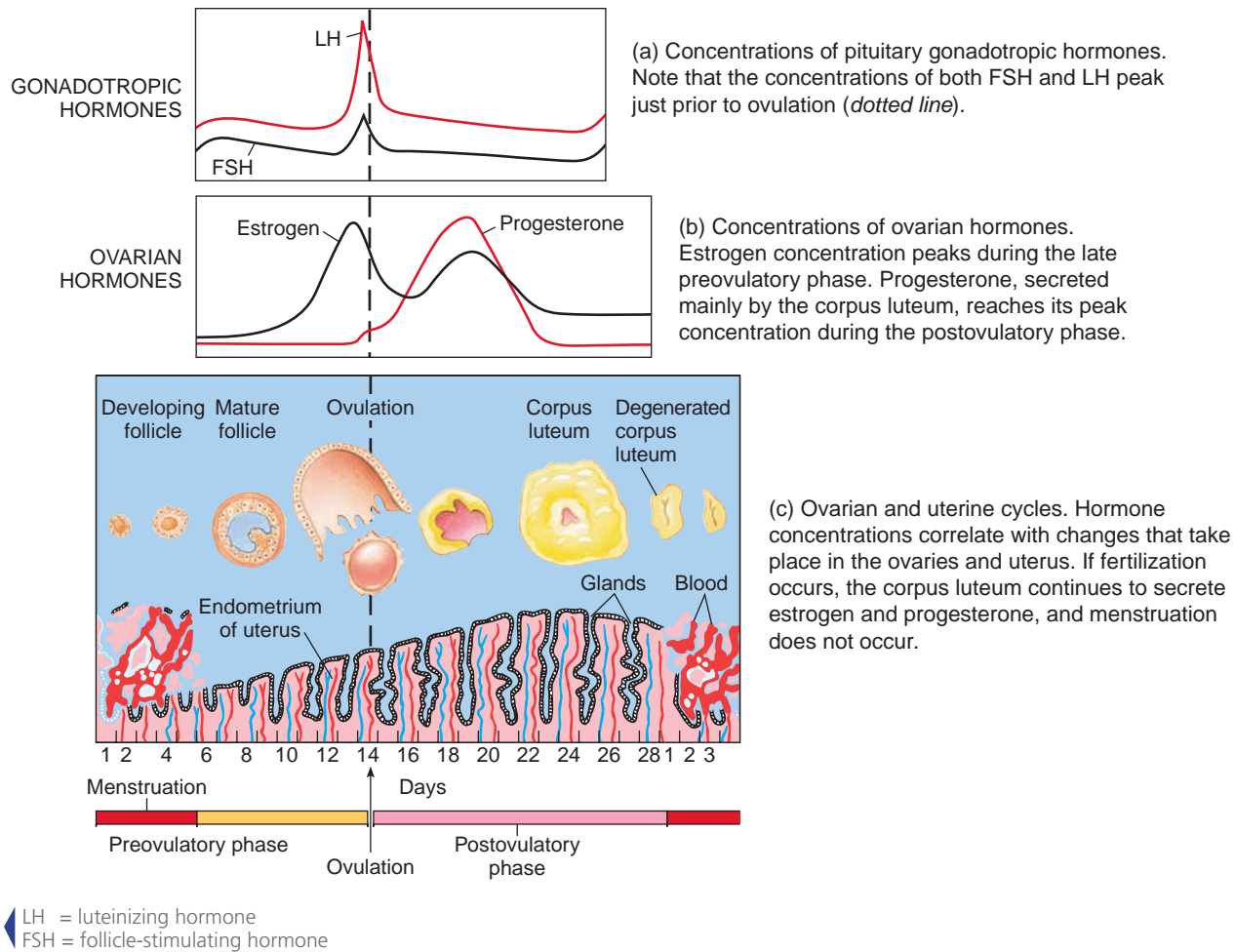


Figure 13.5 Hormonal Fluctuations during the Menstrual Cycle

A current theory of amenorrhea in athletes is that chronic low energy availability disrupts the normal secretion of luteinizing hormone, resulting in a disruption of menses.

In the past, amenorrhea in athletes was attributed to low body fat stores and the stress of exercise. These factors are no longer believed to play causative roles. Rather, the amenorrhea seems to be due to an energy deficit that alters the secretion of **luteinizing hormone (LH)**. Menstruation is regulated by a number of hormones, including follicle-stimulating hormone (FSH), luteinizing hormone (LH), and estrogen. Figure 13.5 illustrates the expected hormonal fluctuations associated with menstruation, although many variations are seen. During the first few days of the menstrual cycle the growth of one egg is accelerated. One to two days prior to ovulation, there is a surge in LH secretion so that ovulation can occur. The unfertilized egg grows and secretes estrogen and progesterone, hormones that inhibit the secretion of LH and FSH (Guyton and Hall, 2005). The current prevailing theory is that low energy availability disrupts the normal secretion of luteinizing hormone, resulting in amenorrhea (IOC, 2005).

Athletes that begin intense training at an early age, such as gymnasts or distance runners, may exhibit primary amenorrhea, that is, they have never menstruated. This intense training may lead to the chronic energy deficit before the onset of puberty. Other athletes may begin menstruating normally but develop secondary amenorrhea later when the training demands of their sport escalate. Ironically, many athletes view the lack of menstrual periods as being advantageous. It may be perceived as evidence that they are lean or it may simply be a relief from the inconvenience of the monthly period. Athletes may also have the mistaken idea that amenorrhea may act as birth control, and that pregnancy is not possible during the time when menstruation is not present. Instead of being advantageous, amenorrhea should be recognized as undesirable and potentially harmful to health.

Amenorrhic athletes typically have low energy (kcal) intake as well as low nutrient intake. Of particular

concern are the vitamins and minerals that are necessary for bone formation, such as calcium and vitamin D. Other nutrients that are commonly lacking are the B vitamins, iron, and zinc. Increasing total energy intake may reverse the amenorrhea and will likely provide more vitamins and minerals as well (Manore, 2002).

OSTEOPOROSIS

Amenorrhea is associated with low estrogen secretion. One of the actions of estrogen is protection against calcium loss from bone, and a low estrogen concentration results in loss of bone calcium and alterations in bone microarchitecture (Figure 13.6). As the mineral density of the bone declines, its structure deteriorates and there is a greater risk for fracture. Of great concern to athletes are stress fractures, small cracks or incomplete breaks in weight-bearing bones, typically the tibia and fibula. Amenorrheic athletes are at greater risk for stress fractures than athletes with normal menstruation.

The loss of calcium from bone is progressive. Dual energy X-ray absorptiometry (DEXA) can determine bone mineral density (BMD). The results of this test place females in one of three categories: 1) normal, 2) **osteopenia** (low BMD), or 3) osteoporosis. In general, athletes who are menstruating have normal or above-normal BMD because weight-bearing exercise has a positive effect on the deposition of calcium in bone. However, numerous studies have documented that trained athletes with amenorrhea may exhibit low bone mineral density or osteoporosis. Beginning in the 1980s, Drinkwater and colleagues demonstrated that bone loss occurred in regularly exercising athletes that were amenorrheic (1984, 1986, 1990). Athletes who are not menstruating are at risk first for osteopenia and then for osteoporosis. Khan et al. (2002) note that at least one study showed that 22 to 50 percent of the subjects, amenorrheic runners and ballet dancers, had varying degrees of osteopenia. In two studies of amenorrheic female distance runners between the ages of 20 and 30, 10 to 13 percent were diagnosed with osteoporosis.

Cobb and colleagues (2003) studied 91 well-trained female distance runners ages 18 to 26 years. Thirty-three athletes had zero to nine menstrual periods in a year while the remaining subjects (58 athletes) had normal menstruation. Bone mineral density was determined by DEXA for the entire body as well as the hip and spine. When BMD was compared to those with **eumenorrhea** (i.e., normal menstruation), the amenorrheic athletes had 3 percent less in the entire body, 6 percent less in the hip, and 5 percent less in the spine. Based on spine measurements, two of the amenorrheic runners were classified as osteoporotic and nearly half were osteopenic. In comparison, none of the eumenorrheic athletes were osteoporotic and only 26 percent were osteopenic.



Figure 13.6 Healthy (left) and Osteoporotic (right) Bone Compared

An osteoporotic bone has a decreased amount of bone mineral and a change in the bone architecture.

The IOC report (2005) states that amenorrhea that lasts longer than six months will likely have a negative effect on the athlete's bone mineral density. This loss of bone calcium is especially disturbing because it is occurring during a period of life when bone mineral density should be increasing. Keen and Drinkwater (1997) were able to study some of the athletes from their original studies in a follow-up investigation eight years later. Of particular interest were comparisons between those who exhibited regular menstruation or intermittent menstruation/amenorrhea both originally and at follow-up. There was a significance difference in bone density between the two groups, with those in the group in which intermittent menstruation/amenorrhea persisted having ~ 85 percent of the bone density of those with regular menstruation. Early intervention for amenorrheic athletes is important to prevent irreversible loss of bone mineral density. The Spotlight on Enrichment: Normal Bone Density in a Former Amenorrheic, Osteoporotic Distance Runner reviews a case study of an athlete who successfully reversed low bone mineral density with increased food intake and decreased exercise that led to weight gain (Fredericson and Kent, 2005).

A number of cross-sectional studies of young women have shown that physically active and athletic women typically demonstrate higher bone mineral

Luteinizing hormone: One of the menstrual cycle hormones associated with ovulation.

Osteopenia: Low bone mineral density; a risk factor for osteoporosis.

Eumenorrhea: Normal menstruation.

density (ACSM, 1995). This is particularly true for women who participate in weight-bearing sports or activities. However, exercise does not guarantee increased bone density, as bone loss has been demonstrated in regularly exercising athletes that were amenorrheic (Drinkwater et al., 1984, 1986, 1990). The risk of osteoporosis is a long-term health concern, but the bone loss associated with amenorrhea may have more immediate consequences for these athletes. Menstrual irregularity, and the associated bone mineral loss, is associated with a greater incidence of stress fractures in runners, particularly in the lower leg. A study of female collegiate runners (Barrow and Saha, 1988) revealed a much higher percentage of stress fractures in runners reporting an irregular menstrual history (zero to five menses a year) compared to runners reporting regular menstruation (10 to 13 menses per year) (see Figure 13.7).

PREVALENCE OF THE FEMALE ATHLETE TRIAD

Any physically active female is at risk for developing the Female Athlete Triad (see Table 13.3). Torstveit and Sundgot-Borgen (2005b) studied 186 elite athletes and 145 age-matched controls. The elite athletes trained an average of approximately 14 hours per week while the controls were physically active for a little more than 5 hours per week. Additionally, the activity of the control group was of lesser intensity than the elite athletes. Eight elite athletes (4.3 percent) met all the criteria for the Female Athlete Triad—disordered eating or eating disorder leading to low energy availability, menstrual dysfunction, and low bone mineral density (BMD). Five members of the control group (3.4 percent) also met

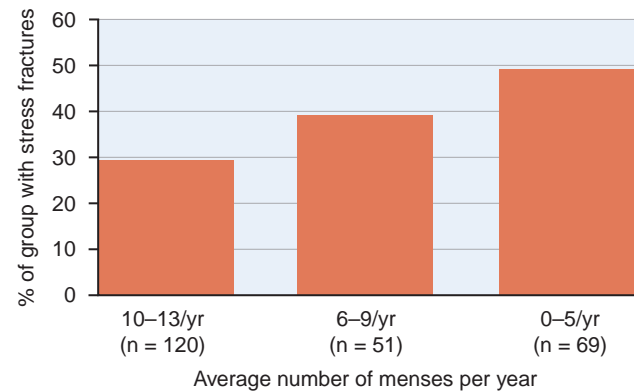


Figure 13.7 Prevalence of Stress Fractures According to Menstrual History

Barrow, G.W. & Saha, S. (1988). Menstrual irregularity and stress fractures in collegiate female distance runners. *American Journal of Sports Medicine*, 16(3), 209–216.

these criteria. This study suggests that elite and recreational athletes as well as women who are not physically active may be at risk. An earlier study by the same authors found that female athletes competing in sports that emphasize leanness or low body weight were more likely to be at risk for the Triad than female athletes in other sports (Torstveit and Sundgot-Borgen, 2005a).

Table 13.3 also illustrates the prevalence of two of the three Triad components in elite athletes and controls. In the same way that disordered eating can progress along a continuum to an eating disorder, there appears to be a progression in the development of amenorrhea and osteoporosis. While only 4.3 percent of the elite athletes met the full criteria, 26.9 percent (50 elite athletes) exhibited disordered eating or eating disorders and menstrual dysfunction (but not low bone

SPOTLIGHT ON ENRICHMENT

Normal Bone Density in a Former Amenorrheic, Osteoporotic Distance Runner

Fredericson and Kent (2005) report the results of a case study of a distance runner who successfully reversed low bone mineral density (BMD) with improved energy intake that led to weight gain. The case study covers an eight-year period from approximately age 23 to age 31. The subject ran competitively from age 12 through age 25. She had a personal best marathon time of 2:41 (2 hours, 41 minutes). While running competitively, she typically ran 80 to 90 miles/wk (~ 134 to 150 km/wk).

This runner began to restrict energy and fat intake at age 13. She had a low weight for height through age 25. Weight at age 23 was approximately 107 lb (48.6 kg) and Body Mass Index (BMI) was 15.8 (healthy weight BMI = 18.5 to 24.9). She had primary amenorrhea until age 23 and BMD measured at this time was found to be the equivalent of a 13-year-old.

At age 25 the runner became concerned about her long-term health and made numerous lifestyle changes. She reduced her mileage to 20 to 50 miles/wk (~ 33 to 83.5 km/wk). She began to increase both her energy and fat intakes for the purpose of weight gain. In the first four months weight increased from (~ 111 lb (50.4 kg) to ~ 122.5 lb (55.7 kg) and then gradually increased to ~ 144 lb (65.5 kg) by age 31, during which time normal menstruation resumed. Concurrent with weight gain, she dramatically improved her BMD, which eventually was in the normal range for her chronological age.

This case study cannot be extrapolated to other amenorrheic runners, but it does document that resumption of menses and dramatic gains in BMD did occur in this individual with lifestyle intervention that resulted in the attainment of a sustainable weight.

Table 13.3 Prevalence of the Female Athlete Triad Components

	Female Athlete Triad (all three components)	Disordered eating + menstrual dysfunction	Disordered eating + low bone mineral density	Menstrual dysfunction + low bone mineral density
Elite athletes (N = 186)	4.3% (N = 8)	26.9% (N = 50)	10.2% (N = 19)	5.4% (N = 10)
Control group (N = 145)	3.4% (N = 5)	13.8% (N = 20)	15.2% (N = 22)	12.4% (N = 18)

Adapted from: Torstveit, M.K. & Sundgot-Borgen, J. (2005). The female athlete triad exists in both elite athletes and controls. *Medicine and Science in Sports and Exercise*. 37(9): 1449–1459.

Note: 87 of 186 elite athletes and 65 of 145 subjects in the control group demonstrated two of the three or all three components of the Female Athlete Triad.

mineral density). Twenty-two controls (15.2 percent) had disordered eating and low BMD but not menstrual dysfunction. The Triad may progress in stages and there is some evidence that the elite athletes have a more severe condition than the controls. Although prevalence data are still emerging, screening is very important for early detection of any component of the Triad.

PREVENTION, INTERVENTION, AND TREATMENT

The prevention of the Female Athlete Triad begins with preventing persistent energy deficits. Athletes in sports known to be at risk for the Triad should work with a physician, a sports dietitian, and an exercise physiologist to identify a biologically comfortable body composition and (low) body weight. A low body weight must be consistent with good performance and not compromise the athlete's physical or mental health, so establishing appropriate goals are essential (see Chapter 11). Once weight and body composition goals are determined, the athlete's training plan can be developed, a diet plan can be devised, and a follow-up schedule can be established. Athletes can achieve a low but biologically comfortable weight with short-term, monitored, and safe diet and exercise programs that promote slow weight loss. Close contact and communication with trusted health and sports professionals can help athletes prevent "slipping over the line" from disciplined eating and training to disordered eating and excessive exercise. These professionals can also help athletes define and distinguish appropriate weight and body composition from inappropriate and potentially harmful weight and body composition.

In a perfect world, the Female Athlete Triad would always be prevented through the use of excellent screening tools to identify athletes who may be at risk for disordered eating and immediate intervention with those who exhibit disordered eating. The world is not perfect, so there are athletes whose eating becomes progressively more pathological and who need treatment. The course of treatment may be long, especially if deep-seated psychological issues need to be resolved. Changes in diet and exercise to prevent low energy intake and high

energy expenditure are needed to resolve the athlete's amenorrhea. While amenorrhea is present, oral contraceptives (a source of estrogen) may be prescribed to prevent or slow calcium loss from bone (IOC, 2005). Because there is emerging evidence that menstrual dysfunction and low bone mineral density may be present in the absence of disordered eating or eating disorders, screening for these two components is recommended as part of a routine physical exam.

In the case of Karen, the cross country runner, the low energy availability was a result of increasingly severe disordered eating and exercise dependence, which resulted in amenorrhea. Karen was aware that she was menstruating only periodically but she kept this information a secret. Amenorrheic athletes are at a greater risk for stress fractures than athletes with normal menstruation, so it is not a surprise that Karen was diagnosed with a stress fracture. A DEXA scan would be needed to determine if bone mineral density was already low.

Karen's story could end in several ways. The best-case scenario is for her to receive and complete treatment for her eating disorder, including the underlying psychological issues related to control and self-esteem. If appropriate, she could eventually be cleared to train and compete, although she would need to meet certain criteria such as maintenance of a minimum body weight and normal menstruation. Sadly, Karen's story could also be one of declining health that leads to an early death. She could refuse treatment and continue her same patterns of behavior. Refusing treatment would result in her being removed from the team, but she could continue to engage in excessive exercise and disordered eating until she died, typically of a medical condition (e.g., cardiac arrest, electrolyte imbalance, severe dehydration) or suicide. Early intervention is the best way to ensure the best-case scenario.

What's the point? Any female athlete can be at risk for the Female Athlete Triad. Low energy availability, hormonal disruption, and low bone mineral density are serious physiological issues that need to be prevented or reversed.

Establishing a Culture That Supports “Normal” Eating: Role of Coaches Disordered eating and eating disorders do not develop in a vacuum. The IOC Medical Commission (2005) notes that several factors may influence their development. Western cultures emphasize thinness, and females frequently restrict food intake to lose weight. Females who equate thinness with success are more susceptible to developing eating disorders. From the female athlete’s perspective, “success” may include being thinner than a teammate or receiving more attention from her coach because of her thin body. Female athletes in sports in which thinness is desirable can face extraordinary pressures, especially as they try to reach the elite levels of their sports. Decreasing body weight or reducing body fat can, and often does, lead to improved performance initially and a desirable appearance in revealing clothing. However, a belief that an ever-lower body weight or body fat percentage is beneficial is not only incorrect (it leads to poorer performance), but this belief is a powerful risk factor for the development of an eating disorder.

There is evidence that certain personality traits such as perfectionism, obsessive-compulsive behavior, overcompliance, and extreme competitiveness and goal setting are associated with disordered eating. Ironically, these are traits that are valued by coaches and extolled in the media because many highly successful athletes exhibit these behaviors. Thus, athletes may be positively reinforced for the same behaviors that put them at risk for disordered eating (IOC, 2005).

No one person can change the way society views and values the appearance of the human body. Nor can one person shape the athlete’s personality or beliefs about body weight and body image. However, the one person who may have the most influence over the athlete’s behavior may be the coach. For this reason, the IOC Medical Commission recommends that coaches not be involved in determining the athlete’s weight or body composition, nor should they suggest to the athlete

that body weight should be reduced. This keeps coaches from establishing and judging the athlete’s weight or body composition and helps coaches prevent inadvertent reinforcement of disordered eating or excessive exercise.

However, many coaches are involved in weight-related issues. A 2003 survey of U.S. collegiate coaches of female gymnastics, swimming, basketball, softball, track, and volleyball teams found that 44 percent of those surveyed weighed athletes, assessed body composition (44 percent), and suggested losing weight by restricting food (33 percent) or increasing workouts (29 percent). Weight, body composition assessment, and a plan for weight (fat) loss are best carried out by trained professionals other than coaches because athletes are directly affected by coaches’ decisions and coaches can be a powerful influence on the athlete’s behavior and health (Heffner et al., 2003).

Many coaches work hard to prevent eating disorders. After a diagnosis of anorexia athletica or Female Athlete Triad has been made, coaches often wonder what role they may have played in its development. Coaches do not *cause* eating disorders or other related conditions, but they must be careful not to unwittingly create conditions that encourage them. Coaches must be careful about how they reinforce behavior because the attention, or lack of attention, can reinforce inappropriate eating and exercise behaviors. In sports whose athletes are known to be at risk for anorexia athletica and the Female Athlete Triad, it is very important that each athlete have ongoing medical, nutritional, and training advice and that optimal and minimum body weights be determined and monitored by someone other than the coach (see Chapter 11).

Returning to Karen’s story one last time, she had high goals even as an adolescent. She was a perfectionist, as evidenced by her perfect high school grades and her desire to repeat that achievement in college. Her obsession about food and exercise was probably a natural fit

THE EXPERTS IN . . .

Eating Disorders in Athletes

Two internationally known researchers in the field of disordered eating in athletes are Monica Torstveit, M.S., and Jorunn Sundgot-Borgen, Ph.D. These researchers are able to study the entire population of elite Norwegian athletes, particularly female athletes, and have been instrumental in describing and understanding elite athletes’ eating behaviors. In the United States, two prominent researchers are Katherine Beals, Ph.D., R.D., and Melinda Manore, Ph.D., R.D. Both are sports dietitians

and university faculty members and their research has broadened knowledge in the areas of disordered eating, eating disorders, and energy availability, particularly in female collegiate athletes. Barbara Drinkwater, Ph.D., has conducted landmark studies on bone mineral content of athletes based on their menstruation status. Members of the IOC and ACSM committees issuing position papers on the Female Athlete Triad are all experts in their respective fields.

The Internet Café

Where Do I Find Reliable Information about Disordered Eating in Athletes?

Both the International Olympic Committee Consensus Statement on the Female Athlete Triad and the American College of Sports Medicine position stand are available on the Internet. These reports are excellent resources for anyone who wishes to know more about these conditions. Access the IOC report at http://www.olympic.org/uk/organisation/commissions/medical/index_uk.asp and the ACSM report at <http://www.acsm.org/index.asp>. In each case enter Female Athlete Triad in the website search box.

The National Eating Disorders Association is the largest nonprofit group in the United States in the area of disordered eating and eating disorders. They publish and distribute materials, including some targeted to athletes, and operate a referral helpline. <http://www.nationaleatingdisorders.org>.

The National Institute on Drug Abuse funded the development of curricula targeted to high school athletes. ATHENA (Athletes Targeting Healthy Exercise & Nutrition Alternatives) is designed to promote healthy nutrition and exercise behaviors and reduce disordered eating and body image distortion. ATLAS (Athletes Training and Learning to Avoid Steroids) emphasizes the impact that anabolic steroids and other substances (e.g., alcohol) have on performance and the positive performance effects of nutrition and training. Both programs can be purchased. More information is available at <http://www.ohsu.edu/hpsm/athena.html>.

with her overachieving, competitive personality. She had unresolved family problems when she left for college and then found herself faced with new situations that were stressful and that she could not fully control. She had an athletic scholarship, but it was not guaranteed. Other athletes were not only better performers, but Karen perceived that they were thinner. By her junior year in college she was lonely, isolated, starving, injured, and sick.

Karen began to view her coach as a substitute for both her family and friends. She perceived that her

coach thought that she needed to lose weight and she may not have realized the difference between being “lean” (i.e., having a relatively high percentage of lean body mass and a relatively low percentage of body fat) and being “thin.” It is impossible to know what comments were made, but coaches should be aware that even an innocent comment about weight or body composition could be misconstrued.

Summary

Normal eating is flexible. It is neither overly restricted nor without restraint. Athletes need a well-planned, nutritious diet that supports their training. For a highly trained athlete, dietary intake should be **disciplined**, but without **obsession**. When viewed on a continuum, normal eating may progress to **disordered eating**, which may progress to an **eating disorder**. Criteria have been established for three eating disorders—**anorexia nervosa**, **bulimia nervosa**, and **eating disorders not otherwise specified**. All are psychiatric disorders and can damage the athlete’s mental and physical health.

Anorexia athletica is characterized by a low body weight and low body fat mass, weight cycling, restriction of food intake, and excessive exercise in athletes. At greatest risk for anorexia athletica or other disordered eating patterns are those in sports in which low body weight or a thin appearance is advantageous. However, any athlete, male or female, may exhibit disordered eating. Restricting energy intake (“dieting”), especially in low body weight females, can be a factor in triggering disordered eating. A fine line can exist between the normal eating pattern of an elite athlete with a rigorous training program and a disordered eating pattern that progresses to an eating disorder, but there are ways to distinguish based on the athlete’s behaviors, attitudes, and performance.

KEEPING IT IN PERSPECTIVE

Eating, Exercising, Weight, and Performance

Perhaps no area of sports nutrition requires more perspective than the eating and exercise behaviors that support an appropriate weight and excellent performance. It is not rigorous training or disciplined eating per se that creates problems for the athlete’s physical and mental health. For those struggling with psychological issues such as control and self-esteem, it is the obsession with exercise and eating that results in a loss of perspective that creates, and then drives, increasingly abnormal eating and exercise behaviors. A low

body weight or low body fat mass, appropriately defined, can be a factor in improving performance. If a low body weight is never defined, inappropriately chosen, or becomes the sole or primary goal (replacing the original goal of improved performance), then the proper perspective has been lost. Food and exercise then become the means to an (unachievable) end and performance and health, both physical and mental, suffer. Eating is for fuel and fun, and when that perspective is lost, the athlete is on a slippery slope.

Prevention is key; failing that, early intervention is critical because treatment is more successful if the disordered eating is less severe. If disordered eating or an eating disorder is suspected, the athlete should be referred for further evaluation and, if confirmed, treatment. Psychological counseling is a required part of therapy because these are **psychiatric** diseases. Coaches do not cause eating disorders, but they must be careful that they do not create conditions that inadvertently contribute to them. An International Olympic Committee report suggests that coaches not be involved in determining an athlete's weight or body composition goals.

The Female Athlete Triad describes three inter-related conditions—disordered eating (resulting in low energy availability), **amenorrhea** (a sign of hormonal disruption), and **osteoporosis** (evidence of low bone mineral density). Low energy availability results when energy intake is not equal to energy expenditure and may be a result of disordered eating. An energy deficit over time can lead to amenorrhea and osteoporosis. Any of the three components of the Triad can damage the athlete's mental or physical health.

Eating a nutritious diet supports training, which can improve performance. Obsessions about food intake or **exercise dependence** are detrimental to training, performance, and the athlete's physical and mental health. Trying to attain and maintain a biologically uncomfortable low body weight puts the athlete at risk for developing a disordered eating pattern.

Post-Test

Reassessing Knowledge of Disordered Eating and Exercise Dependence

Now that you have more knowledge about disordered eating and exercise dependence, read the following statements and decide if each is true or false. The answers can be found in Appendix O.

1. Disordered eating and eating disorders only affect female athletes.
2. Anorexia athletica means that an athlete has a classic case of anorexia nervosa.
3. Disordered eating and eating disorders are more likely to be seen among elite female athletes in sports such as distance running and gymnastics.
4. Coaches cause athletes to develop eating disorders.
5. A good diagnostic criterion for exercise dependence is the volume of exercise training (i.e., frequency and duration of exercise).

Review Questions

1. What is normal eating? How might normal eating in highly trained athletes differ from nonathletes?
2. What distinguishes normal eating from disordered eating or an eating disorder?
3. How does anorexia athletica differ from anorexia nervosa?
4. Do the following factors have an effect on the prevalence of any of the eating disorders—age, gender, dieting to lose weight, injury, and personality characteristics? Describe the individual who is at the greatest risk for developing anorexia athletica.
5. Why are the eating disorders referred to as mental or psychiatric diseases?
6. What characteristics do well-trained athletes without disordered eating share with those athletes who demonstrate disordered eating and exercise behaviors? How could a coach distinguish these two groups of athletes?
7. Describe the appropriate intervention if disordered eating is suspected.
8. Name the three components of the Female Athlete Triad and explain how each is independent of and related to the other components.
9. Discuss the dimensions of exercise dependence.
10. Explain the difference between exercise dependence and overtraining.

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