

Treatment and Prevention of Eating Disorders in Athletes

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Learning Objectives

After you have read the article, you will be able to:

- Summarize the treatment of eating disorders among athletes, including the role of exercise in treatment and recovery.
- Discuss research on prevention of eating disorders among athletes, including the results of an 8-week prevention program for high school athletes.
- Describe bone health issues and management strategies for athletes with eating disorders.

Athletes may represent a group at increased risk of developing eating disorders (EDs), particularly among those participating in a leanness sport, where athletes may perceive a causal relationship between low body weight and achievement of optimal performance.¹ The health consequences of clinical EDs can be devastating, including hospitalization, suicidal attempts, and increased morbidity/mortality; for athletes there are additional concerns regarding decreases in performance and increases in injury risk.²⁻⁶ The female athlete triad (also called "the triad")

further characterizes health risks and potential consequences of an energy deficit resulting from EDs.⁷

Prevalence of EDs Among Athletes

The prevalence of EDs among athletes is highly dependent on the screening method used. The largest prevalence study to date, with 1620 female and male Norwegian elite athletes and 1696 controls, found a 13.5% prevalence of clinical and sub-clinical EDs among athletes.⁸ It is well-established that athletes in leanness sports (Table 1) have a higher prevalence of EDs compared with non-athletes and non-leanness sport athletes, with prevalence as high as 60%.⁹ There is particularly increased risk for EDs in aesthetic sports.¹⁰

In both leanness and non-leanness sports, female athletes are at increased risk of EDs compared with male athletes, with a prevalence of 20.1% in females and 7.7% in males.^{8,11} However, even among males, those participating in leanness sports (e.g., wrestling, endurance running, cycling) are at an increased risk of EDs compared with age-matched peers in other sports.¹²

Treatment

As is true with non-athletes, the management of athletes with EDs accrues benefits from a multidisciplinary approach. The ideal treatment team for an athlete includes a sports physician, a sports nutritionist/dietitian, and a mental health professional. If indicated, involving the coach/athletic trainer, teammates, family, friends, and potentially other medical specialists (e.g., endocrinologist, exercise physiologist) can be helpful in

adding extra support and expertise.^{3,13}

After managing acute complications, the primary goal is to normalize energy availability by making lifestyle and diet modifications and treating cognitive, behavioral, and emotional concerns.⁷ Modest exercise reduction (10%-20%) and an increase in energy availability to at least 30 kcal/kg to 45 kcal/kg of fat-free mass per day are accepted goals. If the patient is not compliant with treatment, removal from competition may be necessary.^{14,15} Increases in caloric intake should be made slowly to avoid "refeeding syndrome" and to minimize fear of "getting fat." A body mass index (BMI) goal of >18.5 kg/m² or $>90\%$ of ideal body weight is advised.⁷ The use of a "contract" outlining the expectations and return to sport conditions has been suggested by the American College of Sports Medicine, the International Olympics Committee, the National Collegiate Athletic Association, and other organizations as useful for reaching treatment goals.³ Once body weight is restored, menstrual cycles usually normalize (although there may be many months' delay) and increases in bone mineral density (BMD) usually follow.^{15,16} However, it is important to note that prolonged low energy availability often prevents improvement of BMD to a completely normal range.^{17,18}

Psychotherapy is often useful for the management of symptoms, understanding emotions, treating underlying depression, and restoration of weight. Cognitive-behavioral therapy, especially for individuals with bulimia nervosa (BN), has proven the most effective type of psychotherapy. Other types of therapies shown useful in

Table 1. Examples of Sports That Consider a Specific Body Weight and/or Leanness Important to Performance

Endurance Sports	Cross-country skiing, rowing, running, speed skating
Anti-Gravitational Sports	Cycling, swimming
Aesthetic Sports	Cheerleading, dance, figure skating, gymnastics, synchronized swimming
Weight-Class Sports	Boxing, kickboxing, judo, mixed martial arts, wrestling, lightweight rowing, weightlifting

EDs include commitment therapy and dialectical behavior therapy.^{3,19}

The role of exercise in ED treatment and recovery has been studied in recent years. A 2013 meta-analysis and a 2014 systematic review suggest that supervised exercise routines are considered safe for patients with EDs, with no associated weight loss compared with non-exercise therapy.^{20,21} Multiple studies suggest that such exercise-involved therapy improved strength, cardiovascular health, and biopsychological outcomes.^{20,21} As long as goals are being met, monitored exercise routines could be useful as part of the athlete's recovery process.

Pharmacological treatments, including selective serotonin reuptake inhibitors (SSRIs), atomoxetine, antiepileptic drugs, and olanzapine have demonstrated benefits in patients with EDs.^{3,19} SSRIs have been proven particularly helpful in some patients with BN, significantly reducing the frequency of binge eating and purging.^{7,19,22,23} In anorexia nervosa (AN), SSRIs have not been shown as effective, with medication such as olanzapine often preferred.²⁴

Assessing bone health in athletes with EDs is often suggested and includes obtaining BMD measurements via dual-energy x-ray absorptiometry (DXA) as well as determining the athlete's calcium and vitamin D levels (goal: vitamin D ≥ 30 -32 ng/mL).¹⁸ Calcium and vitamin D optimization is important for bone health. Adolescents should have 1300 mg/day of elemental calcium in divided doses (1000 mg in men and women ≥ 9

years old) and 400 IU to 800 IU of vitamin D.^{25,26} Potassium supplementation (60 mg-90 mg) is also sometimes recommended for athletes, especially those with restrictive eating behaviors.^{25,26} Other supplements may include folic acid, which contributes to the intracellular regeneration of nitric oxide; a dose of 10 mg folic acid has been shown to decrease endothelial dysfunction.³

Oral contraceptive pills (OCPs) containing estrogen and progestin are widely used in amenorrheic athletes and in patients with AN, but their effects on bone density are inconclusive.^{7,27,28} Unlike estrogen taken orally, transdermal estrogen delivered in patches has minimal negative effects on insulin-like growth factor 1 (IGF-1), a bone trophic hormone. Therefore transdermal estrogen may contribute to a greater increase in BMD in amenorrheic athletes with EDs.²⁵ Misra and colleagues showed improved spine and hip BMD with transdermal physiological replacement of estrogen along with oral progesterone in AN patients.²⁹ This therapy is currently being tested in amenorrheic athletes. Biphosphonates are usually not recommended in females of reproductive age, because they have potential teratogenic effects and can remain in the body for up to 10 years. Biphosphonates should be used in young athletes only under extreme circumstances, with guidance from a metabolic bone specialist.⁷

Despite extensive literature on treatment and prevention of EDs, more studies specific to management in athletes are needed. The Female Athlete Triad Coalition has created a con-

sensus statement on management and return to sport for female athletes, although evaluation of the effectiveness of these guidelines is needed.⁷

Prevention

EDs can be devastating for an athletic career. Prevention and early detection are the most effective strategies to avoid long-term consequences. Coaches spend a significant amount of time with their athletes and may be the first to identify an athlete with inappropriate eating behaviors. Coaches play an important role in the support of ED prevention and management, and those who have access to a multidisciplinary treatment team do better in assessing and managing EDs.³⁰ In addition, education about EDs and the triad is necessary among sports groups. In a study evaluating knowledge on the triad among female exercisers, only 10% could name the components of the triad and 45% did not think amenorrhea could affect bone health.³¹

In an 8-week program for high school athletes called ATHENA (Athletes Targeting Healthy Exercise & Nutrition Alternatives), teaching sessions were run by coaches and peers, with topics including depression, self-esteem, healthy norms, and societal pressures to be thin. Those who participated in the sessions reported less use of diet pills and improvements in diet habits compared with those who received only written information. However, when subjects were followed for up to 3 years, there was no decrease in eating pathology.³² Becker and colleagues compared an athlete-modi-

fied, cognitive dissonance-based prevention intervention versus an athlete-modified healthy weight prevention intervention in a study of 157 female collegiate athletes. After 1 year of follow-up, there were reductions in bulimic pathology, shape concern, and negative affect as well as an increase in the number of athletes seeking medical attention for the triad. In this study, athletes preferred a program that focused more on nutrition than body image.³³ Martinsen and colleagues evaluated a 1-year intervention focusing on strengthening self-esteem, self-confidence, motivation, sports nutrition, and EDs in relation to health and performance in female and male high school athletes. They found that such an intervention can prevent new cases of EDs and symptoms associated with EDs in female athletes. The investigators also found a trend toward increased incidence of EDs from freshman to junior year of high school when no intervention was offered.³⁴

Conclusions

Eating disorders are prevalent among athletes, especially among female athletes in leanness sports. Prompt diagnosis and treatment of EDs are important to decrease long-term consequences and recovery time. The triad is of particular concern, because many female athletes with EDs may experience menstrual dysfunction and subsequent bone loss that is rarely fully restored in prolonged cases. Treatment of EDs is best done by a multidisciplinary team, utilizing medical, psychological, and sports professionals. Further studies are needed to determine whether hormonal and/or psychological medications add significant benefits beyond intensive behavioral modification, nutritional education, and psychological counseling. Prevention of EDs in high-risk athletes should be pursued from an early age. This may be achieved with further education of coaches, athletes, parents, and other health providers.

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References

1. Werner A., Thiel A, Schneider S, Mayer J, Giel KE, Zipfel S. Weight-control behaviour and weight-concerns in young elite athletes - a systematic review. *J Eat Disord.* 2013; 1: 18.
2. Knapp J, Aerni G, Anderson J. Eating disorders in female athletes: use of screening tools. *Curr Sports Med Rep.* 2014;13; 214-218.
3. Zach KN, Smith Machin AL, Hoch AZ. Advances in management of the female athlete triad and eating disorders. *Clin Sports Med.* 2011;30: 551-573.
4. Kramer JP. Eating disorders and the athlete. *Del Med J.* 1987;59:608-609.
5. Coelho GM, Soares Ede A, Ribeiro BG. Are female athletes at increased risk for disordered eating and its complications? *Appetite.* 2010;55:379-387.
6. El Ghoch M, Soave F, Calugi S, Dalle Grave R. Eating disorders, physical fitness and sport performance: a systematic review. *Nutrients.* 2013;5:5140-5160.
7. De Souza MJ, Nattiv A, Joy E, et al. 2014 Female Athlete Triad Coalition Consensus Statement on Treatment and Return to Play of the Female Athlete Triad: 1st International Conference held in San Francisco, California, May 2012 and 2nd International Conference held in Indianapolis, Indiana, May 2013. *Br J Sports Med.* 2014;48:289.
8. Sundgot-Borgen J, Torstveit MK. Prevalence of eating disorders in elite athletes is higher than in the general population. *Clin J Sport Med.* 2004;14:25-32.
9. Reardon CL, Factor RM. Sport psychiatry: a systematic review of diagnosis and medical treatment of mental illness in athletes. *Sports Med.* 2010;40:961-980.
10. Van Durme KL, Goossens KL, Braet C. Adolescent aesthetic athletes: a group at risk for eating pathology? *Eat Behav.* 2012;13:119-122.
11. Martinsen M, Bratland-Sanda S, Eriksson AK, Sundgot-Borgen J. Dieting to win or to be thin? A study of dieting and disordered eating among adolescent elite athletes and non-athlete controls. *Br J Sports Med.* 2010;44:70-76.
12. Thompson RA, Sherman RT. *Eating Disorders in Sport.* New York, NY: Routledge; 2010.
13. Bar KJ, Markser VZ. Sport specificity of mental disorders: the issue of sport psychiatry. *Eur Arch Psychiatry Clin Neurosci.* 2013;263(suppl2):S205-S210.
14. Deimel JF, Dunlap BJ. The female athlete triad. *Clin Sports Med.* 2012;31:247-254.
15. Nattiv A, Loucks AB, Manore MM, et al. American College of Sports Medicine position stand. The female athlete triad. *Med Sci Sports Exerc.* 2007;39:1867-1882.
16. Arends JC, Cheung MY, Barrack MT, Nattiv A. Restoration of menses with nonpharmacologic therapy in college athletes with menstrual disturbances: a 5-year retrospective study. *Int J Sport Nutr Exerc Metab.* 2012;22:98-108.
17. Olmos JM, Valero C, De Barrio AG, et al. Time course of bone loss in patients with anorexia nervosa. *Int J Eat Disord.* 2010;43:537-542.
18. Javed A, Tebben PJ, Fischer PR, Lteif AN. Female athlete triad and its components: toward improved screening and management. *Mayo Clin Proc.* 2013;88:996-1009.
19. American Psychiatric Association. Treatment of patients with eating disorders, third edition. American Psychiatric Association. *Am J Psychiatry.* 2006;163(suppl7):4-54.
20. Ng LW, Ng DP, Wong WP. Is supervised exercise training safe in patients with anorexia nervosa? A meta-analysis. *Physiotherapy.* 2013;99:1-11.
21. Vancampfort D, Vanderlinden J,

Deltert M, et al. A systematic review of physical therapy interventions for patients with anorexia and bulimia nervosa. *Disabil Rehabil.* 2014;36:628-634.

22. Thiel A. Are psychotropic drugs necessary for the treatment of anorexia and bulimia nervosa? *Psychother Psychosom Med Psychol.* 1997;47:332-345.

23. Zhu AJ, Walsh BT. Walsh, Pharmacologic treatment of eating disorders. *Can J Psychiatry.* 2002;47:227-234.

24. Hay PJ, Claudino AM. Clinical psychopharmacology of eating disorders: a research update. *Int J Neuropsychopharmacol.* 2012;15:209-222.

25. Nazem TG, Ackerman KE. The female athlete triad. *Sports Health.* 2012;4:302-311.

26. National Institute of Medicine. Dietary reference intakes tables and application, Nov 30, 2010. Accessed on March 27, 2014, from <http://www.iom.edu/Activities/Nutri->

tion/SummaryDRIs/DRI-Tables.aspx. 27. Miller BE, DeSouza MJ, Slade K, Luciano AA. Sublingual administration of micronized estradiol and progesterone, with and without micronized testosterone: effect on biochemical markers of bone metabolism and bone mineral density. *Menopause.* 2000;7:318-326.

28. Vescovi JD, Jamal SA, DeSouza MJ. Strategies to reverse bone loss in women with functional hypothalamic amenorrhea: a systematic review of the literature. *Osteoporos Int.* 2008;19:465-478.

29. Misra M, Katzman D, Miller KK, et al. Physiologic estrogen replacement increases bone density in adolescent girls with anorexia nervosa. *J Bone Miner Res.* 2011;26:2430-2438.

30. Plateau CR, Arcelus J, McDermott HJ, Meyer C. Responses of track and field coaches to athletes with eating problems. *Scand J Med Sci Sports.* 2014;Jul 2.

31. Miller SM, Kukuljan S. Turner AI,

Vander Pligt P, Ducher G. Energy deficiency, menstrual disturbances, and low bone mass: what do exercising Australian women know about the female athlete triad? *Int J Sport Nutr Exerc Metab.* 2012;22:131-138.

32. Elliot DL, Goldberg L, Moe EL, et al. Long-term Outcomes of the ATHENA (Athletes Targeting Healthy Exercise & Nutrition Alternatives) Program for female high school athletes. *J Alcohol Drug Educ.* 2008;52:73-92.

33. Becker CB, McDaniel L, Bull S, Powell M, McIntyre K. Can we reduce eating disorder risk factors in female college athletes? A randomized exploratory investigation of two peer-led interventions. *Body Image.* 2012;9:31-42.

34. Martinsen M, Bahr R, Borresen R, Holme I, Pensgaard AM, Sundgot-Borgen J. Preventing eating disorders among young elite athletes: a randomized controlled trial. *Med Sci Sports Exerc.* 2014;46:435-447.

Getting to the Heart of Diabetes: The Journey from Guidelines to Clinical Practice

by Sharon Smalling, MPH, RD, Shirley Chambers, MEd, RD, CDE, and Christine Camarillo, RD

Heart disease remains the number one cause of death in the United States for both men and women, accounting for 25% of all deaths—but for those with diabetes, the risk of death related to some form of heart disease approaches 68%.¹ The 2013 *Guideline on Lifestyle Management to Reduce Cardiovascular Risk*, a report of the American Heart Association (AHA) and American College of Cardiology (ACC) Task Force on Practice Guidelines, was released in November 2013.² The report states that its target audience is primary care providers.² Because individuals with diabetes have a 2- to 4-fold increased risk of heart disease and stroke,¹ it is imperative that medical professionals caring for patients with diabetes have a working knowledge of these new lifestyle guidelines for cardiovascular risk reduction. In this article, we review the lifestyle management rec-

ommendations (Table 1) developed from the review of evidence on diet and physical activity and their relationship to cardiovascular risk factors and outcomes.

Background

In 2008, the National Heart, Lung and Blood Institute (NHLBI) convened a panel of experts to develop specific critical questions (CQs) to aid in developing guidelines for lifestyle modifications to reduce CV risk (Table 2). The panel was charged with interpreting the evidence relating to these CQs through systematic reviews and then writing recommendations for the 2013 *Guideline on Lifestyle Management to Reduce Cardiovascular Risk*. In 2013, the NHLBI began collaborating with the AHA and ACC to partner with other professional organizations and stakehold-

ers to finalize the guidelines. Of note, the National Institute of Diabetes and Digestive and Kidney Diseases was represented in the Expert Work Group.²

The three CQs pertain specifically to the effects of dietary pattern, sodium and potassium intake, and types and levels of physical activity, which by virtue of their potential effects on the modifiable risk factors of lipids and blood pressure (BP) may prevent the development of cardiovascular disease (CVD). Specific evidence statements, aligned with the CQs and graded by strength of evidence from the systematic reviews, were used to derive the 10 lifestyle recommendations by the Work Group. The recommendations apply to adults over age 18 and under age 80, with and without CVD.²