

Eating Disorders in Female Athletes: Use of Screening Tools

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Abstract

Screening female athletes for eating disorders is not performed commonly even though the American College of Sports Medicine, National Athletic Trainer Association, and International Olympic Committee have guidelines recommending screening. Eating disorders are more prevalent in the female athlete population than in the general population and carry short-term and long-term consequences that can affect sport performance. There are several screening tools available that have been studied in the general population and fewer tools that were validated specifically in female athletes. Female athletes with eating disorder pathology often have different factors and environmental pressures contributing to their pathology that can be identified best with an athlete-specific screening tool. We will discuss various screening tools available and the evidence for each one. Screening for eating disorders in all female athletes is an important part of the preparticipation examination and should be done using a tool specifically validated for the female athlete.

Female athletes are at higher risk for eating disorders and subclinical eating disorders than the general population (29). With regard to clinical eating disorders, high school female athletes have a prevalence of eating disorders ranging from 14% to 32% (16,23) compared with 0.5% to 5% in general high school females (4,23). Collegiate female athletes have a prevalence of eating disorders ranging from 6% to 45% (16) compared with 5% to 9% reported in the general adult population (15,16). Most studies indicated that the collegiate athlete had higher rates of eating disorders, and often the rate is dependent on sport. Subclinical eating disorders have a prevalence of up to 50% in high school female athletes

Introduction

Disordered eating pathology falls along a continuum. Clinical eating disorders refer to pathology that meets the diagnostic criteria for bulimia nervosa, anorexia nervosa, and eating disorders not otherwise specified, as outlined in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM). Subclinical eating disorders, or “disordered eating,” only meet some of the criteria for eating disorders but do not qualify for a full diagnosis according to the DSM. Smith (28) first described subclinical eating disorders in athletes in 1980. Beals and Manore (11) set forth criteria for subclinical eating disorders in female athletes in 2000. The DSM-V is the most recent edition; however much of the research was done previously and used DSM-IV criteria.

(23,32), as opposed to 25% in the general high school population (23). Collegiate female athletes have a subclinical eating disorder prevalence of 20% to 62% (15,32) compared with 9% in the general adult population (32).

In sport, there is often an ideal body image that suggests improved performance, and this may be one of the reasons why athletes are at increased risk of disordered eating. A shot putter may feel the need to have a large muscular physique, or a distance runner may feel the need to have a slight build because they believe that this will give them a competitive advantage. Performance thinness is a term used to describe the idea that performance is enhanced with lower body fat and lower body weight as in a gymnast or distance runner, whereas drive for muscularity is a term for preoccupation with being muscular and lean, as in a weight lifter (16). If an athlete begins to have an inappropriate relationship with eating to attain this ideal image, then they are at risk for disordered eating.

Eating disorders carry various health risks in the general population and additional risks in the female athlete population. Short-term consequences of eating disorders in athletes include potential for poor sport performance related to dehydration, lower $\dot{V}O_{2\max}$, and energy deficiency due to poor nutrition status (9,15). Long-term health consequences related to disordered eating have been recognized in several

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body systems including cardiovascular, endocrine, reproductive, skeletal, gastrointestinal, renal, and the central nervous system (15,27). First described in 1993, the female athlete triad is an interplay between disordered eating, amenorrhea, and osteoporosis (34) and has potential for long-term health consequences.

Screening for eating disorders in the female athlete population is different from screening for eating disorders in the general population. Female athletes who are training intensely to improve performance may have characteristics that overlap with disordered eating behaviors but are not necessarily pathologic in the athlete. For example, an athlete may exercise for long hours in preparation for her sport or she may count calories to ensure that she is fueling appropriately. Excessive exercise and constant calorie counting in a nonathlete, however, may be signs of disordered eating behaviors. The athlete drive for perfectionism in sport can be similar to the trait of perfectionism fueling eating disorders in the general population. Screening tools specifically for female athletes help separate those female athletes with behaviors specific to athletes in training from those that are at risk for disordered eating.

Self-report eating disorder questionnaires have been studied extensively in the general population and less extensively in the female athlete population. Current popular questionnaires will be reviewed briefly, followed by a closer examination of those identified by the National Athletic Trainer Association (NATA) position stand as being specific to female athletes (15).

General Population Eating Disorder Screening Tools

The Eating Attitudes Test (EAT) initially was developed and validated in 1979 to rate a range of attitudes and behaviors found in those with anorexia nervosa (17). In 1982, the EAT was updated and the revised EAT-26 was developed using factor analysis and displayed good criterion validity and high internal consistency (19). The three-factor solution included dieting, bulimia and food preoccupation, and oral control (described as self-control of eating and perceived pressure from others to gain weight). The survey also has been found to be reliable and valid in other languages as well as being validated in the adolescent population (21).

The Eating Disorder Examination Questionnaire (EDE-Q) was developed from the Eating Disorder Examination (EDE). The EDE originally was developed in 1987 and is considered to be the gold standard in eating disorder diagnosis. Currently in its 16th edition, the EDE consists of a semistructured clinical interview that takes 30 to 60 min to complete. The EDE-Q is a 36-item questionnaire derived from the EDE interview, 11th edition, and has been shown to have acceptable internal consistency and test-retest reliability (25). The test has been validated in the adult population (1) but has not been validated in the adolescent or female athlete population (13).

The Eating Disorder Inventory (EDI) consists of 64 questions developed to characterize bulimia and anorexia psychological characteristics. Subscales derived from the investigation were drive for thinness, bulimia, body dissatisfaction, ineffectiveness, perfectionism, interpersonal distrust, interoceptive awareness, and maturity fears. The EDI

was shown to have construct, criterion, and discriminative validity (18). The EDI was revised in 1991 to the EDI-2 (5).

Female Athlete Eating Disorder Screening Tools

The Female Athlete Screening Tool (FAST) is a 33-item questionnaire that was developed specifically for female athletes (24). It takes approximately 15 min to complete the questionnaire. The FAST was validated in a collegiate population with subjects from both Division I and Division III National Collegiate Athletic Association schools. A total of 14 athletes without an eating disorder, 12 athletes with an eating disorder, and 15 nonathletes with an eating disorder were compared using the EDE-Q, Bulimia Test-Revised (BULIT-R), EDI-2, and FAST. Reliability analysis demonstrated high internal consistency (Cronbach $\alpha = 0.87$). Discriminative validity was established and demonstrated that the FAST could differentiate between athletes with eating disorders and athletes participating in behaviors aimed to enhance performance. Athletes with eating disorders additionally scored higher on the FAST than did nonathletes with eating disorders, indicating a measurable difference affected by athlete status. Correlation analysis demonstrated high concurrent validity between the FAST and the EDI-2 and EDE-Q. The FAST differentiates the unique characteristics of the female athlete with disordered eating pathology and effectively identifies those at risk.

The Athletic Milieu Direct Questionnaire (AMDQ) is a self-report questionnaire developed to screen for eating disorders and disordered eating in female athletes (26). The AMDQ is composed of 119 questions, and it was not reported how long it took to complete. The authors report that the test was piloted for content validity, test-retest reliability, and criterion validity prior to the study but did not include that analysis in their publication. For this study, 149 adult female athletes from a Division I university completed the AMDQ, EDI-2, and BULIT-R consecutively. In a second session, the subjects were interviewed with the EDE 12.0D and measured for height, weight, and body fat percentage in order to diagnose and classify the subjects. The authors used item analysis and logistic regression to produce three subsets of questions from the AMDQ. These subsets were compared with three previously published subsets of the BULIT-R, three subscales of the EDI-2, and another amalgam of questions taken from all three screening tools. The AMDQ subsets had high sensitivity (approximately 80%), a low false-negative rate (approximately 20%), a high negative predictive value, and good accuracy and validity. However no statistically significant differences between the different screening tools were evaluated or reported. One strength of the study is the structured EDE interview for comparison. Limitations to this study are the lack of test-taking order randomization, lack of statistical significance analysis, and comparison with tests that were not designed to evaluate disordered eating. The AMDQ has not been cited or used in further studies.

The Physiologic Screening Test (PST) is an 18-item tool composed of 14 self-report items and 4 physiologic measurements meant to be given in a medical examination-type format to hide its true purpose. The test takes approximately 20 min to complete. The self-report items ask about bowel

habits, menstrual history, weight history, and history of exercise outside of practice. The four physiologic measurements obtained were body fat percentage, waist-to-hip ratio, standing diastolic blood pressure, and presence of enlarged parotid glands. Item analysis was well described, and the final items displayed good discriminant validity and test-retest reliability. Epidemiologic analysis was obtained by surveying 148 collegiate female athletes in Division I sports, club sports, and dance team (14). All participants took the BULIT-R, EDI-2, and PST, with results compared against diagnosis by EDE 12.0D. Results indicated that there was good sensitivity of 86.5%, specificity of 77.7%, and a low false-positive rate of 22.3%. Limitations of this study include comparison to tests that were not designed to detect disordered eating. Additionally enlarged parotid glands are a subjective measure and are difficult to measure accurately. The authors do not demonstrate that the addition of physiologic measurements adds to their screening tool and may be a barrier for implementation. This test has not been used in any further studies.

The Survey of Eating Disorders among Athletes (SEDA) is a 33-item self-report questionnaire mentioned in the NATA recommendations; however it is almost 30 years old, is based on outdated diagnostic criteria, and lacks recent validation. The SEDA gives brief definitions of eating disorders and asks athletes whether they believe that they ever have had an eating disorder. The majority of the follow-up questions are interested in the factors the athlete feels may have contributed to their eating disorder and the interventions they feel may prevent or reduce eating disorders in their sport (20). Athletes reported that the weight loss for performance excellence factor was the most important environmental factor. Athletes felt that “education and counseling, emphasis on fitness rather than body weight and body fat ideals, sensitivity of athletic personnel to weight control issues, and stress management” would be most helpful for preventing eating disorders in athletes (20). The SEDA is a novel tool investigating the factors contributing to eating disorders but not a screening tool for identifying those at risk.

The Health, Weight, Dieting, and Menstrual History Questionnaire is a self-report questionnaire consisting of 54 items. How long it took to complete the questionnaire was not reported. Test items are composed of four categories including musculoskeletal health, menstrual history, dieting behaviors, and weight history (8,15). The questionnaire was built from questions in the EDI and EDE-Q, and its content was validated by an expert panel (8). This questionnaire has been used in several studies to help assess female athletes (7,8,10,12), but its content has not been analyzed any further than expert opinion.

The College Health-Related Information Survey (CHRIS-73) is a self-report 32-item screening test for male and female collegiate athletes based on the Juvenile Wellness and Health Survey (JWHS-76) (30,31). How long it took to complete the survey was not reported. The JWHS-76 was developed based on expert opinion for high school students. The CHRIS-73 was designed to evaluate current mental and physical health and functioning of college student athletes. Participants were recruited from Division I male and female athletes ($N = 408$) and compared with collegiate students not participating in athletics ($N = 110$). The questionnaire was piloted to refine

the survey in general health classes and reviewed in discussion groups with student athletes prior to this study. Item and factor analysis demonstrated 32 questions, yielding a 4-factor solution, 1 of which was eating problems. Results indicated good internal consistency and discriminant validity between athletes and nonathletes and male and female participants. Unfortunately neither the CHRIS-73 nor the eating problem question subset has been validated as an effective screening tool to evaluate disordered eating in athletes. This survey has not been used in any further studies.

A newer screening tool not included in the NATA position stand due to the timing of its publication is the Brief Eating Disorders in Athletes Questionnaire (BEDA-Q) (22). The questionnaire was developed in elite high school female athletes (ages not reported) in three phases. In phase 1, 221 adolescent female athletes were screened with a questionnaire regarding training history, menstrual history, past dieting and eating disorder (ED) history, as well as the EDI-2. Female athletes who scored at risk for eating disorder ($N = 96$) and a comparison group who did not score at risk ($N = 88$) then underwent a full EDE interview to determine ED diagnosis. There was no mention of whether those performing the EDE interview were blinded to the results of the questionnaires. Through logistic regression, expert opinion, and group discussions, the researchers chose items that they felt best predicted possible ED. Two versions of the questionnaire were developed: one with seven questions (sensitivity, 85.7%; specificity, 78.8%) and a second with nine questions (sensitivity, 82.1%; specificity, 84.6%). Both questionnaires showed good ability to distinguish between female athletes with and without ED (receiver operating characteristics [ROC], 0.83, with 95% confidence interval (CI), 0.74–0.92; and ROC, 0.86, with 95% CI, 0.78–0.93, respectively). In phase 2, the BEDA-Q version 1 was tested against an external data set of 54 age-matched elite female athletes randomly selected from previous studies (ROC curve of 0.77 with 95% CI of 0.63–0.91). Phase 3 was designed to look at the predictive value of the two questionnaire versions. Of 53 female athletes without previous diagnosis, 13% had developed eating disorders at 2-year follow-up. BEDA-Q version 2 was found to have better diagnostic predictive accuracy (ROC, 0.73, with 95% CI, 0.52–0.93). The BEDA-Q benefits from a large sample size for validation within an adolescent population. However it is not clear whether EDE interviewers were blinded and it does not appear that logistic regression was done for each question of the health history and EDI-2. Accurate results from an abbreviated screening tool would be useful for clinical implementation. This tool has not been used in further studies.

Discussion

The American College of Sports Medicine (ACSM), NATA, and International Olympic Committee all advocate screening for eating disorders (15,27,33). In 2007, ACSM published guidelines recommending screening female athletes for the female athlete triad (27). NATA guidelines acknowledge the limitations of the EDE-Q, EDI-2, and the EAT and recommend use of an athlete-specific screening tool. Despite these clear recommendations, eating disorder screening still is limited

in actual practice. A study on Division I schools showed that only 60% of schools reported screening for eating disorders, and only 6% were using a validated screening tool for eating disorders in the general population (6).

Considering the high prevalence of eating disorder pathology in female athletes, combined with the different internal and external pressures contributing to pathology in athletes versus nonathletes, it is important that athlete-specific screening tools be developed and utilized. Of the screening tools specific to female athletes, the Health, Weight, Dieting, and Menstrual History Questionnaire and the CHRIS-73 have not been validated. The PST showed good sensitivity and specificity but added physical examination measures that may be unreliable (parotid gland evaluation) and that were not shown to improve the self-report questionnaire. Additional time, equipment, and personnel needed for physical examination measurements may make this screening tool more cumbersome. The SEDA is not a screening tool but is useful only for detecting eating disorders that already have been diagnosed.

The AMDQ, BEDA-Q, and FAST tools have been validated for female athletes, and all are promising for use as a screen for clinical eating disorders. The FAST is the only tool that additionally can identify subclinical eating disorders. The BEDA-Q is the shortest of the screening tools. Each questionnaire is practical to include in the preparticipation form. None of the questionnaires have been revised or studied for the most recent DSM-V criteria. The FAST currently is undergoing an update to align with DSM-V diagnostic criteria and also is being used in other female athlete research (2,3) including a study for validation in the adolescent population. Finally it would be interesting to have each questionnaire compared head to head.

Potential for future research would include validation of athlete-specific screening tools in an earlier age group, such as high school female athletes. The SEDA data do suggest that early screening would be appropriate, as female athletes' self-reported clinical eating disorders developed as early as middle school (20). Long-term data could then investigate whether screening for eating disorders at an early age will help reduce rates of eating disorders by identifying those at risk. With more accurate screening tools, and more diligent screening programs, research then can be done on affecting outcomes, with educational, prevention, and treatment programs.

Conclusions

Eating disorder screening guidelines exist and need to be applied more effectively with regular use of athlete-specific screening tools that better capture the unique characteristics of the athlete population.

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