Athletes and Eating Disorders: The National Collegiate Athletic Association Study

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Abstract: **Objective:** *To present findings from a collaborative study with the National College Athletic Association regarding the prevalence of disordered eating among student athletes.* **Method:** *1,445 student athletes from 11 Division I schools were surveyed using a 133-item questionnaire.* **Results:** *Results indicated that 1.* I*% of the females met DSM-IV criteria for bulimia nervosa versus 0% for males. None of the student athletes met DSM-IV criteria for anorexia nervosa. 9.2% of the females were identified as having clinically significant problems with bulimia versus .* 0 1 *% of the males. 2.85% of the females were identified as having a clinically significant problem with anorexia nervosa versus 0% for males. 10.85% of the females reported binge eating on a weekly or greater basis versus 13.02% of the males. 5.52% of the females reported purging behavior (vomiting, laxatives, diuretics) on a weekly or greater basis versus 2.04% for the males.* **Discussion:** *Results from the current investigation are more conservative than previous studies of student athletes, but comparable to another large study of elite Norwegian athletes. Reasons for these differences are discussed. Clearly female athletes report more difficulty with disordered eating than male athletes. Some specific risk factors for female athletes are discussed. @ 1999 by John Wiley & Sons, Inc.* Int J Eat Disord 26: 1 79-1 88, 1999.

Key words: *student athletes; disordered eating, risk factors*

INTRODUCTION

The nature and extent of eating-related problems among highly competitive athletes have received increasing attention over the last decade (Thompson & Sherman, 1993; Brownell, Steen, & Wilmore, 1987; Powers & Johnson, 1996). The deaths and serious illnesses resulting from eating disorders among several elite athletes (Ryan, 1995) have raised concern that female athletes may be at particularly high risk for developing these syndromes.

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Several early studies attempted to estimate prevalence rates among athletes (Rosen & Hough, 1988; Rosen, McKeag, Hough, & Curley, 1986; Burckes-Miller & Black, 1988; Walberg & Johnston, 1991; Wilmore, 1991). Prevalence estimates varied widely from 1% for anorexia nervosa to 30% for bulimia nervosa. These early studies were plagued by a variety of methodological limitations including sampling procedure problems and small sample sizes.

In the most rigorous survey to date, Sundgot-Borgen (1994), using a combined selfreport and interview format, surveyed 522 elite female athletes in the Norwegian Confederation of Sports. Results indicated that 1.3% met criteria for anorexia nervosa as defined in the 4th ed. of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV;* American Psychiatric Association, 1994) and 8% met DSM-IV criteria for bulimia nervosa.

This study is a more methodologically rigorous attempt to continue to refine our understanding of the extent of pathological eating behavior and attitudes among our most competitive U.S. amateur athletes.

METHODS

A total of 1,445 (562 females, 883 males) varsity student athletes participated. Participation was voluntary, anonymous, and in accordance with university and federal guidelines for human subjects. The athletes were from 11 schools and 11 different sports. All were from Division I National Collegiate Athletic Association (NCAA) member institutions.

Selection of Participating Schools and Sports

The 11 Division I schools were selected to represent all regions of the United States and had highly competitive programs in the sports that were surveyed. The men's and women's sports were selected based on a brief survey the NCAA conducted among coaches to identify high risk sports for eating disorders.

Data Collection Procedures

Following the selection of the schools, an introductory letter from the president of the NCAA describing the study and requesting participation was sent to the athletic directors. Each athletic director was then contacted by the principal investigator to confirm the school's participation and arrange for data collection. Coaches of each team within the school also signed consent forms to participate in the study. Project faculty traveled to each school to administer the questionnaire. Testing sessions were coordinated by administrative assistants within each athletic department. Teams were brought to the sessions by their coaches, who were then asked to leave. Student athletes were informed of the purpose of the study and asked to answer questions honestly. Subjects were also reminded of the voluntary and anonymous nature of the study.

Student Athlete Questionnaire

The questionnaire was a 133-item survey designed to assess demographics; the nature and extent of athletic involvement; eating-related behaviors such as dieting, binge eating, and purging; drug and alcohol behavior; and attitudes concerning body image and weight-related issues. The questionnaire included three subscales from the Eating Disorder Inventory-2 (EDI-2; Body Dissatisfaction, Drive for Thinness, and Bulimia [Gamer, 1991]). The Rosenberg Self-Esteem Scale (Rosenberg, 1965) and the Body Cathexis Scale (Secord & Jourard, 1953) were also included as part of the questionnaire. The items in the questionnaire were selected in consultation with coaches, trainers, and other professionals familiar with issues unique to student athletes. The survey was piloted with student athletes prior to its use in the study.

RESULTS

Description of the Sample

The sample included 1,445 NCAA athletes from 11 schools in 11 different sports (football, basketball, track, swimming, gymnastics, wrestling, cross-country, crew, tennis, nordic skiing, and volleyball). The 1,445 athletes represented approximately 90% of the athletes on the rosters of the teams surveyed. There were no overt refusals to participate. Male football players comprised the largest group (384 subjects) and the largest female group comprised 135 swimmers. There were no females in football or wrestling and no males in basketball. The average age was 19.9 years; males were significantly older ($p < .0001$) at a mean of 20.1 years compared to the mean female age of 19.6 years.

Eating Disorder Behaviors

Binge eating is described in terms of both frequency of overeating and control issues (Table 1). More than one fourth of both male and female athletes had episodes of consuming large quantities of food at some time in their lives. Male athletes were statistically more likely to have had an episode of overeating on a daily basis in the preceding 3 months than females, but there was no statistical difference in percentage of males and females who had ever had overeating episodes. Female athletes were much more likely to feel out of control during an episode of overeating (81% compared to 45%, $p < .0001$) than male athletes. Thus, when the full criteria for a binge (episode of consuming a large quantity of food plus feeling out of control) is considered, more female athletes (22.68%) than male athletes (11.97%) binge eat (difference significant at $p < .0001$).

Table 1. Binge eating and control

Frequency	Females	Males	p Value
Episodes of consuming large quantities of food			
Lifetime	28.01%	26.60%	NS
Monthly (last 3 months)	16.19%	12.57%	.0530
Weekly (last 3 months)	8.36%	8.60%	NS
Daily (last 3 months)	2.49%	4.42%	.0576
Feeling out of control of eating	81%	45%	<.0001
Meet full criteria for binge eating (lifetime)	22.68%	11.97%	<.0001

Note: NS = not significant. Although male athletes are as likely to have had episodes of consuming large quantities of food as female athletes, almost twice as many females meet full criteria for binge eating at some time in their lifetime.

Table 2. Purge behavior

Frequency	Females	Males	p Value
Vomiting			
Lifetime	23.90%	5.93%	<.0001
Monthly (last 3 months)	6.4l%	2.04%	<.0001
Weekly (last 3 months)	3.20%	1.13%	.0054
Daily (last 3 months)	1.42%	0.34%	.0209
Laxatives			
Lifetime	11.72%	5.06%	<.0001
Monthly (last 3 months)	1.78%	1.02%	NS
Weekly (last 3 months)	0.36%	0.34%	NS
Daily (last 3 months)	0.18%	0.23%	NS
Diuretics			
Lifetime	3.89%	3.65%	NS
Monthly (last 3 months)	0.53%	0.23%	NS
Weekly (last 3 months)	0.36%	0.00%	.08
Daily (last 3 months)	0.00%	0.00%	NS

Note: NS = not significant.

The frequency of vomiting behavior is shown in Table 2. More female than male athletes had vomited to lose weight at some time in their life ($p < .0001$) and were more likely to have vomited monthly, weekly, or daily in the preceding 3 months. Similarly, female athletes were more likely to have used laxatives to lose weight at some time in their lives ($p < .0001$). However, there were no statistical differences between male and female athletes for monthly, weekly, or daily use in the preceding 3-month period. There was no statistically significant difference between males and females in terms of lifetime use of diuretics.

As shown in Table 3, female athletes were statistically more likely to have used diet pills at some time in the past ($p < .0001$) and during the last 3 months. There was no statistically significant difference between males and females in terms of use of steroids although very few athletes used this method to gain weight. Males were much more likely to use saunas or steam baths to lose weight. One fourth of the males had used this technique to lose weight at some time in their life compared to 7% of females ($p < .0001$) and males were more likely to have used this method in the preceding year ($p = .0006$).

Table 3. Use of diet pills, steroids, and sauna/steam

Frequency	Females	Males	p Value
Diet pills			
Lifetime	14.30%	2.16%	<.0001
Monthly (last 3 months)	1.42%	0.57%	.0925
Weekly (last 3 months)	1.25%	0.23%	.0164
Daily (last 3 montl-is)	1.25%	0.23%	.0164
Steroids			
In last year	3.26%	2.00%	
Sauna/steam			
Lifetime	6.59%	24.26%	<.0001
In last year	2.50%	14.63%	.0006
Age started	17.1 years (SD 1.9)	16.8 years *(SD* 1.9)	NS

Note: NS = not significant.

Body Mass Index

The mean body mass index (BMI) for the female and male subjects were, respectively, 21.1 kg /**M2** *(SD* = 2.4) and 25.7 kg /M2 *(SD* = 4.5). Table 4 shows the frequency distribution for BMI for males and females. Two subjects had BMIs below 15; 173 females and 44 males had BMIs between 15 and 20. At the other extreme, 3 males had BMIs between 40 and 45 and 2 females and 26 males had BMIs between 35 and 40.

BMI was assessed by sport and by gender using analysis of variance (ANOVA) with post-hoc testing with the Sheff6 F. For females, crew athletes had higher BMIs than either cross-country, track, or gymnastic athletes ($p < .0001$, $p = .0288$, and $p = .0089$, respectively). Female cross-country athletes had lower BMIs than basketball players ($p < .0001$), track athletes ($p < .0001$), swimmers ($p < .0001$), and gyn-Lnasts ($p = .0009$). For males, football players had higher BMIs than athletes in track, swimming, gymnastics, wrestling, cross-country, crew, or nordic skiing (all at the $p < .0001$ except nordic skiing which had a $p = .0007$). In addition, male cross-country athletes had statistically lower BMIs than track athletes ($p = .001$).

Fat Content and Amenorrhea

Desired fat content was reported by 341 females and 554 males. The mean total fat content desired by females was 13% *(SD* = 3.7) and the mean fat content desired by males was of 8.6% *(SD* = 7.3). Of those who reported their estimated fat content (276 females and 422 males), females had a mean fat content of 15.4% *(SD* = 4.5) and males had a mean fat content of 10.5% *(SD* = 10.3). Ideal fat content for the age range of the subjects is 19-23% for females (Frisch, 1988) and 10-15% for men (Hannon & Lohman, 1978). Thus, both males and females want to be at a fat content below ideal; however, males are at a low normal fat content and females are at an abnormally low fat content. Mean estimated fat content for females is below that required for normal menses (Frisch, 1988).

The data were analyzed to determine if there were differences between fat content in women who reported normal menses (regular monthly menses or occasional skip of a month) or amenorrhea (infrequent; e.g., once in 6 months or none for at least 6 months). Of the sample, 245 women reported normal menses and 33 had amenorrhea; mean fat content for these groups was 20.9% *(SD* = 4.6%) and 16.2% *(SD* = 4.0) respectively. The difference between groups was statistically significant at $p = .0003$ (Table 5). BMI for female athletes with normal menses was 21.3 and for female athletes with amenorrhea it was 20.0. This difference was not statistically significant. Thus, the difference in fat content provided more meaningful information regarding possible amenorrhea than did the BMI.

Table 4. Body mass index (BMI) and gender

BMI	Female n	Male *n*
12-15	1	1
15-20	173	44
20-25	359	416
25-30	21	249
30-35	0	139
35-40	2	26
40-45	0	3
Total	556	878

Table 5. Amenorrhea and fat content

Menstrual Status	BMI *(SD)*	Mean Fat Content (SD)	*n*
Normal menses	21.3 kg/m'	20.9%(4-6)	245
Amenorrhea	20.0 kg/M2	16.2%(4.0)	33

Note: Difference in fat content between groups (normal menses and amenorrhea) statistically significant at p = .0003. Difference in body mass index (BMI) between groups (normal menses and amenorrhea) statistically significant at p = .0001. Normal menses were defined as regular monthly menses or occasional skip of a month and amenorrhea was defined as infrequent menses, for example, once in 6 months or none for at least 6 months.

Prevalence of Eating Disorders and Subclinical Syndromes

Table 6 represents an attempt to diagnostically classify the athletes. Four categories were created which include DSM-IV, clinically significant, self-identified, and at risk. To meet DSM-IV criteria for anorexia nervosa, BMI was required to be less than or equal to 15 kg /M2 , amenorrhea had to be present (in females), and there had to be elevation of both the Drive for Thinness and Body Dissatisfaction subscales of the EDI-2. None of the athletes met these stringent criteria for anorexia nervosa. To meet formal criteria for DSM-IV bulimia nervosa, athletes had to binge eat and use a purge method (vomiting, laxative, or diuretics) twice weekly for 3 months and have elevated scores on both the Drive for Thinness and Body Dissatisfaction subscales of the EDI-2. 1.1% of females and no males met these criteria for bulimia nervosa.

Using less stringent criteria of BMI 20 kg/m 2 or less, 2.85% of females and no males were considered to have clinical significant symptoms of anorexia nervosa. Using less stringent criteria of binge eating or purging monthly, 9.2% of females and .005% of males had clinically significant symptoms of bulimia nervosa.

The athletes were asked if they believed they had an eating disorder. The results of that inquiry are shown in Table 6. Eleven female athletes and one male athlete said they had anorexia nervosa. Twenty-one females said they had bulimia nervosa and two males said they had bulimia nervosa.

Table 6. Eating disorders diagnoses

	Anorexia Nervosa		Bulimia Nervosa	
Diagnostic Category	Female	Male	Female	Male
DSM-IV	0	0	1.1%	0%
Subclinical	2.85%	0	9.2%	.005%
Self-identified	1.96%	1	5.5%	.005%
At risk	34.75%	9.5%	38%	38%

Note: Anorexia nervosa criteria: DSM-IV, body mass index (BMI) -15 kg/m' and amenorrhea and Eating Disorder Inventory-2 (EDI-2) scales Drive for Thinness (DT) - 1 0 and Body Dissatisfaction (BD) - 1 2; subclinical, BMI 20 kg /M2 or less *and* amenorrhea and DT scale *-10* or EDI-2 BD -12; self-identified, athletes indicated they have anorexia; at risk, BMI -20 kg/m' or amenorrhea or EDI-2 DT scale -10 *or* EDI-2 BD -12. Bulimia nervosa criteria: DSM-IV, binge eating and self-induced vomiting or laxatives or diuretics twice weekly or more over last 3 months and mean score -10 on DT and -12 BD; subclinical, binge eating or purging monthly or greater over last 3 months and scores on EDI-2 scales DT 10 and BD -12; self-identified, athletes indicated they have bulimia nervosa; at risk, greater than six episodes or following behavior over last 3 months: binge eating or vomiting or laxatives or diuretics or diet pills *or* score on EDT-2 Scales DT -10 *or* BD -12.

To determine the athletes who might be at risk for an eating disorder, the following criteria were used. Athletes who had a BMI less than or equal to 20 kg/m 2 or amenorrhea or elevation on either of the two key EDI-2 subscales (Drive for Thinness or Body Dissatisfaction) were considered at risk for anorexia nervosa. Using these criteria, 25% of female athletes and 9.5% of male athletes were considered at risk for anorexia nervosa. Athletes who had

six episodes of binge eating or vomiting or laxative or diuretic abuse or use of diet pills or elevated scores on either of the key EDI-2 scales were considered at risk for bulimia nervosa. Fifty-eight of female athletes and 38% of male athletes were considered at risk using these criteria.

Body Cathexis Scale

Females were generally less satisfied with their appearance as measured by the Body Cathexis Scale. **An** unpaired means t test was used to compare results between males and females. For Overall Appearance, chest, breasts, stomach, buttocks, hips, and thighs, female athletes were statistically less satisfied than male athletes at the $p < .0001$ level. For ankles, males were less satisfied than females at the $p = .0024$ level. There were no statistically significant differences for arms, shoulders, or calves.

EDI-2

Three subscales of the EDI-2 (Drive for Thinness, Bulimia, and Body Dissatisfaction) were scored using the method described by Garner (1991). There were statistically significant differences between male and female athletes for all three subscales at the $p < .0001$ level. In each case, females scored significantly higher than the males, but mean scores were not as high as the scores of eating disorder patients used to standardize the EDT-2.

When the scores on the subscales were compared for the different sports and by sex using ANOVA and a post-hoc analysis using the Sheff6 F, statistically significant differences were found for the Drive for Thinness subscale for both sexes and for males for the Body Dissatisfaction subscale, but no differences by sport for the Bulimia subscale. There were statistically significant differences between female swimmers and female gymnasts ($p =.0179$) and between female basketball players and female gymnasts ($p =.0002$); in both cases, the female gymnasts scored significantly higher than the comparison female athletes. For the Body Dissatisfaction subscale, the only significant differences were between male sport groups: football players scored significantly higher than male track athletes ($p = .0005$), male gymnasts ($p = .0215$), and male cross-country athletes ($p < .0001$). Thus, female gymnasts scored higher than certain female athletes on the Drive for Thinness subscale and male football players were more dissatisfied with their bodies than three other groups of male athletes. Although these were the only significant differences, it is interesting to note that the mean scores for all female sport groups were higher than the male scores on all three subscales of the EDI-2.

Rosenberg Self-Esteem Scale

There are 10 items in the Rosenberg Self-Esteem Scale; five are positive statements about the self and five are negative statements about the self. The test was scored so that high scores on the positive statements (1-5) indicate higher self-esteem and low scores on the negative statements (6-10) indicate higher self-esteem. When each question was assessed for differences between men and women, each comparison was statistically different and in each case it was in the direction of females having lower self-esteem scores than men. Each of the 10 comparisons between male and female athletes was statistically significant at the .0001 level except for one item ("I feel I do not have much to be proud of") and for this item $p = .0811$.

DISCUSSION

The prevalence of symptomatic eating behaviors and attitudes is significantly lower in the current study than reported in some earlier studies. There are several potential explanations for these differences. The most parsimonious explanation would be that the more rigorous sampling procedure, larger sample size, and stringent criteria have resulted in a more accurate estimate. There are, however, some important and interesting other possibilities. The study was conducted in collaboration with the NCAA. This was, undoubtedly, both a blessing and a curse. It would be almost impossible to gain access to the size and quality of athletic departments surveyed without the influence of the NCAA. The NCAA is, however, a regulatory organization that can have a significant influence on athletic departments. Although coaches or school representatives were not present during the actual survey, and the students were guaranteed complete anonymity, athletes may have had a tendency to minimize some of their difficulties in an effort to protect their athletic department.

An interesting alternative explanation for the lower rates may have to do with the caliber of athletes surveyed. We selected the most prominent and competitive schools in the country for the sports we were surveying. Several of the earlier studies relied on Division 11 or less competitive programs. It is possible that the risk factors for disturbed eating behavior may be higher among lower tier athletes.

How valid are these data? Sundgot-Borgen, in an elegant two-tiered method of surveying elite Norwegian athletes, discovered that self-report surveys resulted in a significant underestimate of the extent of pathogenic weight control behaviors. She found in the interview phase that as many as 10% of the female athletes practiced vomiting, yet the screening study indicated that only 3% did. Interestingly, 11.03% of our female athletes reported vomiting on a monthly or greater basis over the last 3 months. Sundgot-Borgen reported that, overall, 18% of her sample were suffering from "true eating disorders." Our final estimate, using only self-report, was that 13.165% (DSM-IV and clinically significant combined) had clinically significant problems. Overall, our opinion from postsurvey discussions with coaches, athletes, and NCAA staff is that the current results represent a conservative estimate of the extent of pathogenic eating behavior and attitudes among athletes at this level. Sundgot-Borgen makes the convincing argument that follow-up interviews are necessary because of the tendency for more elite athletes to underreport disturbed eating behaviors and attitudes.

Despite the potential underreporting within the current study, the results still demonstrate that, at a minimum, the prevalence of eating disorders among our most elite college athletes is quite high. Furthermore, this appears to be a problem that affects predominantly female athletes. Female athletes consistently reported significantly higher rates of disordered eating attitudes and behaviors. Sadly, they also reported significantly lower self-esteem than the male athletes. A subtle, but particularly disturbing, finding among the female athletes was that, overall; their goal was to achieve a body fat content that would result in amenorrhea.

The drive for thinness that affects primarily the female athletes appears to emanate from two sources that we have referred to as performance thinness and appearance thinness (Powers & Johnson, 1996). Performance thinness refers to the commonly held belief that achieving a lower weight and lower percentage body fat will enhance performance for all athletes, particularly in the endurance sports. While male athletes may be able to reduce their percentage of body fat to 1% without apparent immediate significant medical consequences, this is rarely true for female athletes. On average, most women have to maintain approximately 17% body fat in order to menstruate. When body fat falls below a menstrual threshold and amenorrhea develops, osteoporosis may occur within 1 year (Bachrach, Guido, Katzman, Litt, & Marcus, 1990). Furthermore, the submenstrual threshold body weight undoubtedly increases food preoccupation and triggers adaptive physiological mechanisms that will heighten the likelihood that overeating will occur in an effort to defend body weight above the menstrual threshold.

Appearance thinness refers to the trend over the last several decades to reward thinner athletes in the adjudicated sports such as gymnastics and figure skating. In 1972, the winning female gymnastics team had an average height of 5 ft 3 in. and an average weight of 106 lb. In 1992, the average height was 4 ft 9 in. and the average weight was 83 lb (Ryan, 1995). It is our belief that this trend toward rewarding leanness has contributed to the female athlete's drive for thinness.

The results of the current study suggest that: (1) female student athletes in Division I programs are at significant risk for developing eating-disordered thoughts and behaviors; (2) coaches, athletic department directors, trainers, student athletes, regulatory board members, and parents of athletes need to be aware that emphasizing pursuit of a low percentage body fat can have serious physiological and psychological side effects; and (3) two-staged surveys using both self-report and interview formats need to be developed to gain a more precise estimate of the nature and extent of disturbed eating behaviors and attitudes among student athletes.

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