

Body Image, Anthropometric Measures, and Eating-Disorder Prevalence in Auxiliary Unit Members

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Context: Medical professionals have recognized eating disorders and related problems in competitive athletes. Auxiliary members (color guard, dance, majorettes) experience the same appearance-related pressures observed in sports commonly associated with eating disorders.

Objective: To estimate eating-disorder prevalence based on associated eating-disorder characteristics and behaviors in female auxiliary members and to compare perceived and ideal body images and anthropometric measurements between at-risk and not-at-risk participants for eating-disorder characteristics and behaviors.

Design: Cross-sectional design.

Setting: Three universities in the southeastern United States.

Patients or Other Participants: Participants ($n = 101$, mean age = 19.2 ± 1.2 years) represented 3 auxiliary units, including color guard ($n = 35$), dance line ($n = 47$), and majorettes ($n = 19$).

Main Outcome Measure(s): Participants self-reported menstrual history, height, and weight. Anthropometric measurements included height, weight, body fat percentage, and waist

and hip circumferences. We screened for eating-disorder risk behavior with the Eating Attitudes Test (EAT)-26 and for body dissatisfaction with the Figural Stimuli Survey.

Results: Based on the EAT-26, we estimated eating-disorder prevalence among members to measure 29.7% (95% confidence interval = 20.8%, 38.6%). The EAT-26 results revealed that 21% of participants used purgatives and 14% vomited to control weight or shape. The at-risk group had higher scores on the EAT-26 total ($P \leq .01$) and on the dieting ($P \leq .01$), oral control ($P = .02$), and bulimia ($P = .01$) subscales. Hip circumference ($P = .01$), self-reported weight ($P = .03$), measured weight ($P = .04$), difference between measured and preferred weights ($P = .02$), and calculated target weight ($P = .02$) were different between the at-risk and not-at-risk groups.

Conclusions: Collegiate auxiliary unit members may have an unacceptable prevalence of eating disorders. Our results validate concerns that auxiliary members may exhibit an unacceptable eating-disorder risk, highlighting the need to examine and address unhealthy weight-management behaviors independent of eating-disorder status.

Key Words: EAT-26, body image, athletes, dancers

Key Points

- Female collegiate auxiliary unit members' characteristics indicate an increased risk for developing eating-disordered thoughts and behaviors.
- Uniform type may affect body image and body dissatisfaction.
- In assessing risk, anthropometric measurements and not self-reported measurements alone should be used.
- Unhealthy weight management behaviors in these groups, independent of eating-disorder status, deserve attention.

Involvement in organized sports or dance can offer many benefits, such as improved self-esteem and encouragement for individuals to remain active throughout their lives. Athletic competition or dance, however, may cause severe psychological and physical stress. When pressures are added to an existing cultural emphasis on thinness, the risks may increase for athletes and dancers to develop eating disorders. In the largest US study¹ to date of collegiate athletes (883 men, 562 women) at 11 National Collegiate Athletic Association (NCAA) Division I schools, only a small percentage of female athletes (1.1%) met the diagnostic criteria for clinical eating disorders, but a large percentage (9.2%–58%) demonstrated disordered-eating behaviors. Athletes with eating disorders may strive for thinness to improve performance and to detect their level of fitness (eg, they mistakenly

perceive loss of menstrual cycle as an indicator of a good fitness level); however, dance teams may focus on body weight and body image criteria for admission to the team. As a result, dancers may receive the message that weight and appearance matter more than athletic ability.

Koutedaki and Jamurtas² recognized dancers as performing athletes. Yet dancers may not be included in the population traditionally considered athletes. Success and appearance in athletics and dance may require a particular physique, especially a lean, sometimes virtually prepubescent, look. Consequently, coaches, peers, and parents may pressure the athlete to be thin.^{3,4} In addition, demanding performance schedules and difficult choreography make a dancer's fitness and skill development important. In females, these physical demands and self-imposed expectations may lead to concerns regarding energy availability,

menstrual function, and optimal bone health, also known as the female athletic triad.

Although the prevalence of eating disorders varies widely,^{5,6} these conditions are on the rise in the athletic and dance populations.⁵ High rates have been documented in female athletes and dancers.⁵⁻⁸ More specifically, Johnson et al¹ estimated that 35% of female athletes were at risk for anorexia nervosa and 38% were at risk for bulimia nervosa. Byrne and McLean⁹ estimated that 31% of elite females in “thin-build” sports had clinical eating disorders, compared with 5.5% of the control population. Sundgot-Borgen and Torstveit¹⁰ estimated that 25% of female elite athletes in endurance sports, aesthetic sports, and weight-class sports had clinical eating disorders, compared with 9% of the general population. In addition to having higher rates of eating disorders,^{2,5} dancers were also more preoccupied with thoughts of eating and body image than nonathletes and nondancers.⁵ Female collegiate dancers are not only at risk because of their participation in dance but also because they are in college.⁷ Several reports indicate that the majority of college women engage in unhealthy weight-loss behaviors such as bingeing or purging, and 7% to 10% of college women may meet clinical diagnostic criteria for an eating disorder.^{11,12} College women are more likely to develop disordered eating than other age groups, in part because of the increased pressure and competition to succeed associated with the college environment.¹³ In addition, being in a new atmosphere for the first time (away from home) may also amplify the risk. Together, the factors may magnify the risk of developing a pattern of disordered eating. Most authors^{5,14-16} investigating disordered eating and distorted body image in dance-like activities have focused on ballet, gymnastics, or cheerleading. Limited research exists on majorettes, dance line members, and color guard participants, who collectively form auxiliary units.

Auxiliary units perform with university bands during athletic events (eg, football, basketball) and are not traditionally included as part of the athletic population. As a result, these groups may have been overlooked in eating-disorder research. Auxiliary members, however, experience physical, emotional, and time demands comparable with those placed on their collegiate athletic peers. Today's society may establish expectations regarding the image and appropriate appearance of auxiliary dance team members that are similar to those faced by athletes. Finally, choreography and the types of uniforms worn by these auxiliary members may also increase the pressure to maintain a low body weight or leanness (or both).^{5,10,17,18}

Our purpose was to estimate the prevalence of disordered-eating risk characteristics and behaviors (dieting, oral control, and bulimia) in auxiliary unit members and to compare their perceived and ideal body images in performance attire and daily clothing. A secondary purpose was to compare auxiliary members classified as at risk (AR) for potential eating-disorder characteristics and behaviors versus those not at risk (NR) according to their Eating Attitudes Test (EAT)-26 total scores for (1) disordered-eating characteristics, (2) perceived and ideal body images in performance attire and daily clothing, and (3) anthropometric measurements. With the current cultural emphasis on physical appearance, body size, and body fat, many college women have become overly

preoccupied with appearance and weight status^{19,20}; coupling these factors with the demands of dancing makes screening for potential eating disorder behaviors vital.

METHODS

Participants and Procedures

The appropriate review boards for the protection of human subjects approved the study before data collection. A total of 101 female college students (ages = 19.2 ± 1.2 years) at 3 NCAA Division I institutions in the southeastern United States participated. Four university band directors and coaches for each auxiliary unit (color guard, dance members, and majorettes) were contacted to obtain permission for their institution to join in the study. Only 1 institution declined to take part. Participants included 35 of 62 (56%) from color guard units, 47 of 69 (68%) from university dance lines, and 19 of 29 (66%) from majorette groups. After permission was obtained from each band director and coach, individual auxiliary members were contacted by the primary investigator. In each case, auxiliary members were made aware of the risks and requirements for participating, both orally and during the written informed consent process, and were assured that participation was completely voluntary. For inclusion, each volunteer had to be between the ages of 18 and 25 years and had to have been a member of a collegiate auxiliary unit for at least 1 year. Each participant completed the personal information survey, the EAT-26, and the Figural Stimuli Survey before undergoing anthropometric measurements. Surveys and anthropometric measurements were conducted in a private room with no coaches or sponsors present to assure the privacy of each participant.

Instrumentation

Personal Demographic and Anthropometric Data. A questionnaire was used to acquire basic personal and demographic data, including the following: (1) college education level, (2) ethnicity, (3) dance background (type of dance, number of years dancing, and weight requirements), and (4) menstrual cycle function. The following supplemental questions regarding menstrual cycle were also included: (1) Have you ever missed a period for more than 3 months?; (2) Do you feel it is healthy and okay to miss a period?; and (3) Do you feel it is okay to miss a period over a long duration? In addition, volunteers also self-reported their height, current weight, highest weight, lowest weight, and ideal weight.

We assessed body composition using a 3-site (triceps, quadriceps, and suprailiac) skinfold procedure with Lange skinfold calipers (Beta Technology Inc, Cambridge, MD).²¹ The American College of Sports Medicine²¹ stated that body composition determined from skinfolds correlates ($r = 0.70$ to 0.90) with body composition determined by hydrodensitometry. In addition, the accuracy of predicting body fat percentage from skinfolds is approximately $\pm 3.5\%$, assuming that the appropriate technique and equations have been used.²¹ Generalized prediction equations for women (18–55 years) were used to calculate body density.²² We calculated percentage of body fat using population-specific formulas.²¹ Hip and waist circumfer-

ence were measured with a Guilick II tape measure (Country Technology Inc, Gays Mills, WI), and height and weight were assessed (model BWB-800 stadiometer and scale; Tanita Corp, Tokyo, Japan) according to American College of Sports Medicine standardized procedures.²¹

Pressured target weight was defined as a hypothetical estimate for those participants who did not meet the low and athletic guidelines for percentage of body fat.²³ The low and athletic guidelines for percentage of body fat may serve as a misconception for weight loss or weight gain, thereby potentially pressuring auxiliary members to lose or gain weight unnecessarily. We analyzed pressured target weight to determine how much weight an auxiliary unit member would have to lose or gain to stay within the low and athletic guidelines for percentage of body fat.²³ We calculated each participant's pressured target weight using the following equation: pressured target weight = lean body mass/(1.0 – pressured percentage of body fat). Measured body fat percentages from the skinfold measurements were used to determine pressured body fat estimates. In addition, pressured body fat in the pressured target weight calculation was determined with body fat percentage guidelines,²³ and we used these guidelines to calculate pressured target weight for those volunteers who had a body fat percentage above 20% or below 13%. Body fat percentages between 13% and 20% were considered low and athletic.²³ If the participant's measured body fat percentage was above 20%, then we used 20% for the pressured body fat percentage. We used 13% pressured body fat for those participants with less than 13% body fat.

Eating Attitudes Test-26. We administered the EAT-26 to screen for eating-disorder characteristics and behaviors. The EAT-26 was designed to provide a standardized measure of symptoms and characteristics of eating disorders.²⁴ This widely used and well-validated instrument has a reliability (internal consistency) of $\alpha = .90$.²⁴ Although not diagnostic, the EAT-26 is commonly used as a screening tool to identify early characteristics and behaviors indicating the potential presence of an eating disorder.²⁴ It contains 3 subscales: dieting, bulimia, and food preoccupation and oral control. Five supplemental questions identify risky behaviors involving purging, suicidal thoughts, binge eating, weight loss supplements, laxatives, and diagnosis of previous eating disorders. An EAT-26 score of more than 20 or a *yes* answer to 1 supplemental question identifies an individual as AR of eating disorder characteristics and behaviors. An EAT-26 score of less than 20 and *no* answers to all of the supplemental questions categorize the individual as NR for eating-disorder characteristics and behaviors.

Gender-Specific Body Mass Index Figural Stimuli Silhouette. A Gender-Specific Body Mass Index (BMI) Figural Stimuli Silhouette (Figural Stimuli Survey) was used to assess body dissatisfaction based on perceived and ideal body images.²⁵ Peterson et al²⁶ used a BMI-based silhouette matching questionnaire and found it valid in testing for body dissatisfaction. The Figural Stimuli Survey consists of 9 silhouettes, each associated with a number (1 through 9) representing a specific BMI ranging from 18.3 to 45.4 kg/m². Peterson et al²⁶ tested reliability for females' current body image ($r = 0.85$, $P < .0001$) and for ideal body image ($r = 0.82$, $P < .0001$). Images on the Figural

Stimuli Survey were a basis of comparison for 4 questions about perceived and ideal body image. Volunteers were asked to select the silhouette (from among those numbered 1 through 9) that best represented their answers for the following questions: (1) Which body image best represented your appearance in normal daily clothing?; (2) Which body image best represented how you would prefer to appear in normal daily clothing?; (3) Which body image best represented your appearance in performance uniform?; and (4) Which body image best represented how you would prefer to appear in performance uniform?

Data Analysis

We used SPSS (version 14; SPSS Inc, Chicago, IL) for all analyses. The power and sample size were determined with an α of .05 and a moderate effect size using the Cohen method.²⁷ Our power calculation indicated that we needed a sample of 100 participants. Prevalence of eating-disorder characteristics and behaviors was estimated using the number of AR individuals at a 95% confidence level. With χ^2 analyses, we examined the significance and distribution of variables, including college education level, ethnicity, dance background (type of dance, number of years dancing, and weight requirements), and menstrual cycle function and concerns. We also conducted χ^2 analyses to examine the type of auxiliary unit (color guard, dance line, or majorettes) and the AR and NR groups. In addition, we calculated independent-samples t tests with an a priori α level of $P = .05$ to compare AR and NR groups on EAT-26 total and subscale scores (dieting, bulimia, and oral control). Chi-square analyses were performed for the EAT-26 supplemental questions.

Independent-samples t tests with an a priori α level of $P = .05$ were used to compare AR and NR groups on self-reported measurements (height, current weight, ideal weight, highest weight, lowest weight), calculated measurements (BMI, difference between actual and ideal weights, target weight, and difference between actual and target weights), and actual measurements (height, weight, body fat percentage, waist and hip circumference). To assess equality of variances, we conducted the Levene test. We used a 2×2 repeated-measures analysis of variance to determine the main effect for body image related to both normal clothing and uniform type. This calculation was followed by paired-samples t tests to analyze the difference between actual BMI and perceived body image and self-reported BMI and perceived body image. Finally, independent t tests were used to compare body image scores from the Figural Stimuli Survey between groups.

RESULTS

Overall percentage and individual auxiliary unit results for education, ethnicity, dance experience, and weight policies for the particular auxiliary unit are reported in Table 1, and menstrual cycle function and supplemental questions are reported in Table 2. No differences were noted between education and ethnicity within auxiliary unit groups (color guard, dance, majorettes). Dance experience, uniform type, and self-reported weight policy within auxiliary units were different: χ^2_6 ($n = 101$) = 26.56, $P \leq .01$; χ^2_2 ($n = 101$) = 101.0, $P \leq .01$; χ^2_2 ($n = 101$) = 16.78, $P \leq .01$). Irregular and regular menstrual cycle

Table 1. Education Level, Ethnicity, Dance Experience, Uniform Type, and Weight Management Policies in Auxiliary Unit Members

	Overall, % (n = 101)	Color Guard, % (n = 35)	Dance, % (n = 47)	Majorettes, % (n = 19)	P Value
Education level					.201
Freshmen	45.5	57.1	38.3	42.1	
Sophomores	26.7	25.7	34.0	10.5	
Juniors	14.9	8.6	14.9	26.3	
Seniors	12.9	8.6	12.8	21.1	
Ethnicity					.670
White	89.1	88.6	87.2	94.7	
Nonwhite	10.9	11.4	12.8	5.3	
Dance experience, y					<.01
0–4.9	49.5	60.0	44.7	42.1	
5–9.9	29.7	34.2	14.9	57.9	
10–14.9	7.9	2.9	14.9	0.0	
>15	12.9	2.9	25.5	0.0	
Uniform type reported					<.01
Midriff uniform	65.3	0.0	100	100	
No-midriff uniform ^a	34.7	100	0	0	
Weight policy					<.01
Yes	39.6	17.1	42.6	73.7	
No	60.4	82.9	57.4	26.3	

^a No-midriff uniform = 1-piece, slim-fit uniform worn by all color guard participants.

function across auxiliary unit groups were different (χ^2_2 [n = 101] = 6.27, $P = .04$). No differences were reported for all other menstrual cycle questions.

We used the EAT-26 scoring guidelines to define the AR group and to estimate the prevalence for at-risk eating-disorder characteristics and behaviors among auxiliary members at 29.7% (95% confidence interval [CI] = 20.8%,

38.6%). As a result of the small sample size within each auxiliary unit, we could not compare the differences among groups, but we did estimate prevalence for the color guard at 31.4% (95% CI = 29.9%, 32.9%), dance line at 25.5% (95% CI = 24.3%, 26.7%), and majorettes at 36.8% (95% CI = 34.6%, 39.0%). Although a χ^2 analysis indicated no differences within auxiliary unit groups for any supple-

Table 2. Menstrual Cycle Function and Beliefs in Auxiliary Unit Members

	Overall, % (n = 101)	Color Guard, % (n = 35)	Dance, % (n = 47)	Majorettes, % (n = 19)	P Value
Irregular periods?					.04
Yes	15.8	5.7	17.0	31.6	
No	84.2	94.3	83.0	68.4	
If irregular cycle, describe					.57
Had 6–10, but irregular	25.0	50.0	25.0	16.7	
Had 6–10, but missed a few in a row	43.8	50.0	50.0	33.3	
Had 3–6	18.7	0.0	25.0	16.7	
Did not menstruate	12.5	0.0	0.0	33.3	
Periods missed during					.63
Competitive season	10.1	11.4	4.4	21.1	
Offseason	5.1	5.8	4.4	5.3	
Both	11.1	11.4	11.2	10.5	
Have not missed a cycle	73.7	71.4	80.0	63.1	
Use birth control?					.02
Yes	27.7	17.1	25.5	52.6	
No	72.3	82.9	74.5	47.4	
Have you missed a period for 3 or more mo?					.14
Yes	6.9	0.0	10.6	10.5	
No	93.1	100	89.4	89.5	
Is it OK to miss a period occasionally?					.68
Yes	38.6	37.1	36.2	47.4	
No	61.4	62.9	63.8	52.6	
Is it OK to miss a period for a long duration?					.41
Yes	2.0	0	2.1	5.3	
No	98.0	100	97.9	94.7	

Table 3. EAT-26 Comparisons Between At-Risk (n = 30) and Not-At-Risk (n = 71) Groups of Auxiliary Unit Members

Dependent Variable	Overall, Mean ± SD	At-Risk Group, Mean ± SD	Not-At-Risk Group, Mean ± SD	t	P Value
EAT-26 (Total score)	9.1 ± 10.1	18.3 ± 13.6	5.14 ± 4.1	7.4	≤.01
Dieting	7.1 ± 12.9	16.5 ± 20.4	3.0 ± 3.5	5.4	≤.01
Oral control	1.7 ± 2.3	2.7 ± 3.3	1.3 ± 1.6	3.1	.02
Bulimia	1.3 ± 1.9	2.4 ± 2.9	0.86 ± 1.0	3.9	.01

Abbreviation: EAT-26, Eating Attitudes Test.

mental questions on the EAT-26, color guard members reported the highest frequency for binge eating (20%) and vomiting (14.3%), whereas majorettes reported the highest frequency for using laxatives or diet pills (26.3%). Supplemental questions for all participants also revealed that 14.9% engaged in binge eating; 18.9% used laxatives, diet pills, or diuretics to control weight; 9.9% vomited to control weight or shape; and 6.9% self-reported a history of amenorrhea (absence of the menstrual cycle for 3–6 months or longer in participants not taking oral contraceptives or female hormones) in their self-reported questionnaire.

The AR group had higher scores on the EAT-26 and subscales for dieting, bulimia, and oral control (Table 3). Group variances were different ($P \leq .01$), thus explaining the large SD of EAT-26 scores. An AR volunteer may have been at risk for eating-disorder behaviors but not necessarily eating-disorder attitudes according to the EAT-26 subscales. Further analysis of the answers to the EAT-26 supplemental questions demonstrated that 11.9% of the participants were categorized as AR because of eating-disorder behaviors and not eating-disorder characteristics (EAT-26 total score = <20). Percentages of AR auxiliary unit members in uniform attire were 28.8% for midriff uniforms and 31.4% for no-midriff (slim-fitting) uniforms, respectively. The differences between physical and calculated measurements in the AR and NR groups are shown in Table 4. The AR group had higher scores on 7 of the 15 measures; their body fat percentages ranged

from 10.6% to 39.6% and BMI ranged from 16.9 to 35.8 kg/m².

No main effect was noted for body image perception between daily normal clothing and performance attire (uniform); however, a main effect was present between perceived and ideal body image ($P = .01$). Thus, regardless of wearing daily normal clothing or a uniform, the perceived body image was different than the ideal body image: BMI = 23.8 ± 3.8 kg/m² and 20.7 ± 1.5 kg/m², respectively, for daily normal clothing and 23.1 ± 3.6 kg/m² and 20.6 ± 1.4 kg/m², respectively, for the uniform. The body image results were not different between the AR and NR groups for perceived or ideal BMI for normal daily clothing and performance uniforms (Table 5). Comparisons among all auxiliary members revealed no differences in either of the body image measures (ie, uniform, daily clothing).

DISCUSSION

Prevalence

Our results are consistent with those of previous authors^{1,5,14} who examined the prevalence of eating disorders in the traditional athletic setting. Johnson et al¹ stated that more than 13% of the female collegiate athletes they surveyed had clinically significant problems with eating disorders, whereas 35% and 38% were deemed to be

Table 4. Physical and Calculated Measurement Comparisons Between At-Risk (n = 30) and Not-At-Risk (n = 71) Groups of Auxiliary Unit Members

Dependent Variable	Overall, Mean ± SD	At-Risk Group, Mean ± SD	Not-At-Risk Group, Mean ± SD	t	P Value
Weight, kg					
Self-reported weight	61.3 ± 10.9	64.8 ± 12.2	59.8 ± 9.9	2.2	.03
Measured weight	61.5 ± 11.2	65.3 ± 12.9	59.9 ± 10.1	2.2	.02
Ideal weight	56.7 ± 7.0	58.4 ± 6.9	55.9 ± 6.9	1.7	.10
Highest weight	63.6 ± 11.8	68.2 ± 13.7	61.7 ± 10.5	2.6	.01
Lowest weight	56.5 ± 9.2	58.8 ± 10.8	55.5 ± 8.3	1.6	.11
Pressured target weight	59.8 ± 8.1	62.7 ± 8.7	58.5 ± 7.5	2.3	.02
Measured ideal weight	4.8 ± 5.9	6.9 ± 7.5	4.0 ± 4.8	2.3	.02
Measured pressured target weight	1.7 ± 4.3	2.6 ± 5.0	1.4 ± 3.9	1.3	.20
Hip circumference, cm	97.2 ± 9.2	100.8 ± 9.5	95.7 ± 8.7	2.4	.01
Waist circumference, cm	71.9 ± 9.1	74.4 ± 9.9	70.9 ± 8.7	1.7	.08
Height, cm					
Self-reported height	164.4 ± 7.1	166.2 ± 6.5	163.7 ± 7.2	1.6	.11
Measured height	165.1 ± 6.1	166.2 ± 6.2	164.7 ± 5.9	1.1	.26
Body composition					
Body fat, %	19.2 ± 5.5	19.9 ± 6.4	19.0 ± 5.1	0.76	.45
Calculated body mass index, kg/m ²	22.5 ± 3.7	23.7 ± 4.5	21.9 ± 3.3	2.1	.03
Self-reported body mass index, ^a kg/m ²	22.4 ± 3.5	23.5 ± 4.2	21.9 ± 3.2	1.9	.06

^a Self-reported body mass index was calculated using participants' self-reported height and weight measurements.

Table 5. Body Image Comparisons Between At-Risk (n = 30) and Not-At-Risk (n = 71) Groups of Auxiliary Unit Members

Dependent Variable, kg/m ²	Overall, Mean ± SD	At-Risk Group, Mean ± SD	Not-At-Risk Group, Mean ± SD	<i>t</i>	<i>P</i> Value
Perceived image in normal clothing	23.1 ± 3.8	23.8 ± 3.2	22.8 ± 3.9	1.2	.22
Ideal image in normal clothing	20.7 ± 1.5	20.4 ± 1.4	20.9 ± 1.5	-1.3	.20
Perceived image in uniform	23.1 ± 3.6	23.8 ± 3.4	22.7 ± 3.6	1.4	.17
Ideal image in uniform	20.6 ± 1.4	20.3 ± 1.5	20.7 ± 1.4	-1.4	.16

at risk for anorexia nervosa and bulimia nervosa, respectively. In addition, Black et al¹⁴ estimated the highest eating-disorder prevalence to be among cheerleaders (33%); they also found that disordered eating occurred frequently among gymnasts (50%), modern dancers (45%), and cross-country athletes (45%). Sundgot-Borgen and Torstveit¹⁰ estimated eating-disorder prevalence for female athletes in aesthetic sports (eg, gymnastics, dancing, figure skating, diving) at 42%, endurance sports (eg, aerobics, long-distance running) at 24%, technical sports (eg, bowling, golf) at 17%, and ball game sports (eg, team handball, soccer, tennis, volleyball) at 16%.

The prevalence of eating disorders in auxiliary units members was higher than the estimated prevalence in the general female college population.^{28,29} More specifically, Anstine and Grinenko²⁸ surveyed 402 college females and estimated that 17% had potential risk for eating disorders, whereas Hoerr et al²⁹ estimated a 10.9% rate of eating disorders in college sorority members. Although we did not investigate possible contributing factors, the high prevalence estimation in female auxiliary members could be linked to a variety of factors, including self-esteem, self-imposed expectations regarding weight and its relation to performance and performance attire, societal pressures relating to body image, and expectations regarding weight and body fat.^{9,30,31} Depending on the type of auxiliary unit (color guard, dance, majorette), these females may feel immense pressure from the viewing audience, which may be as large as 100 000 fans, to be thin. This pressure can also stem from the culture of the auxiliary unit, which may favor weight requirements or a thin appearance with no curves (or both). In addition, Delinsky and Wilson³² noted that disordered eating increased during females' first year of college and is predicted by prospective dieting and concerns about weight. It is important for instructors, administrators, and medical personnel to be aware of both the prevalence of these behaviors and the medical complications associated with eating disorders, as the latter are potentially irreversible and life threatening. The authors (unpublished data, 2007) found that 89% of the studied university bands with auxiliary units (n = 47/53) did not have medical personnel (team physician or athletic trainer) to oversee auxiliary unit members. Assistance from the team physician or an athletic trainer—health care personnel who are trained in recognizing symptoms and preventing eating disorders—might enable AR females to be identified.

Dieting, Weight Loss, and Menstrual Cycle Function

The AR group displayed a greater difference between ideal weight and measured weight than the NR group. This discrepancy may indicate a larger degree of body dissatisfaction within the AR group and would partially explain the more frequent reports of dieting and bulimia to control

weight in the group. The reasons for which auxiliary unit members engage in dieting and vomiting to control weight are speculative. In addition to body dissatisfaction, the ideal of thinness in society may contribute to behaviors such as excessive or extreme dieting, unhealthy eating patterns, and preoccupation with food; it may also contribute to lower self-esteem, drug and alcohol abuse, and adverse physical and mental health in general.^{33,34} Use of laxatives, diet pills, or diuretics by auxiliary members seeking to control weight creates a concern for future medical risks. Medical complications associated with eating disorders (starvation and weight loss) include amenorrhea, reduced basal metabolic rate, cardiac arrhythmia, cardiac muscle wasting, reduced ventricular mass, sinus bradycardia, constipation, renal failure, decreased bone density, and hypercholesterolemia.³⁵⁻³⁷ We did not investigate other pathologic and potentially harmful methods (eg, excessive exercise, fasting, starvation) of weight loss in this study. However, pathologic weight-loss techniques, while not necessarily predisposing athletes to the development of eating disorders, can be important clinical considerations. The value of educating auxiliary members about and monitoring them for the use of pathologic weight-loss methods warrants further investigation. A large percentage of auxiliary members felt it was "OK" to occasionally miss a menstrual period, but 98% felt that missing periods for a long period of time was unhealthy. These findings were considered positive, because most of the participants knew that it was unhealthy to stop menstruating. Those who felt it was "OK" to miss a period may not completely understand the health consequences of irregular menstrual cycles. Females who miss 3 menstrual cycles or have any menstrual dysfunction (eg, oligomenorrhea) should seek further consultation with a physician.³⁸ Bone mineral density (BMD) declines as the number of missed menstrual cycles accumulates,^{39,40} and the loss of BMD may not be fully reversible.^{41,42} Severe undernutrition (eg, fasting or extreme dieting) impairs reproductive and skeletal health³⁸ and has the potential to be extremely unhealthy but may be practiced only occasionally by auxiliary unit members.

Body Image (Figural Stimuli Silhouette)

Body image is a broad construct that refers to visual images of and attitudes toward the body. Understanding how female auxiliary unit members perceive their bodies may have practical implications for weight loss and disordered eating. Stuhldreher and Ryan⁴³ found that college women generally perceive themselves as heavier than they want to be. Mossavar-Rahmani et al⁴⁴ noted that the more inaccurate a woman's estimate of her body size, the more likely she was to be dieting. Our findings were similar to those reported by Stuhldreher and Ryan.⁴³ In both the AR and NR groups, actual BMI was less than

perceived BMI in both normal clothing and performance uniforms (Table 5). The Figural Stimuli Silhouette score indicated that respondents perceived themselves as heavier than the silhouettes corresponding with their actual calculated BMIs, a trend that held true regardless of attire (normal versus performance). Although we did not find a difference between groups for perceived and ideal BMI for normal clothing and performance uniforms, participants in both groups reported lower ideal BMI in their performance uniforms than in normal clothing. Thus, participants felt that they should look smaller when wearing their performance attire, which also explains the association between ideal BMI in normal clothing and in performance attire and the EAT-26 total score. Body image and body dissatisfaction may be affected by performance attire (midriff or no-midriff, 1-piece, slim-fitting uniform). Although this association does not fully explain the variance we observed, fully appreciating this relationship is an important step in understanding and preventing unwarranted expectations, which could lead to unhealthy practices to achieve a desired physical appearance.

Anthropometric Measurements

Participants of all shapes and sizes were included in our study. The mean measured body weight for the AR group was higher than for the NR group, and actual weights for both groups were slightly higher than their target weights. Eating-disorder risk is difficult to ascertain from weight alone without considering body fat percentage. Average body fat percentages for the AR and NR groups were within normal range, but several volunteers in both groups were in the high or very high range for increased risk of obesity, which could lead to self-reported ideal weight being much lower than actual measured weight. We did not categorize specific auxiliary units for size and shape. This factor is important when assessing individuals for potential eating disorders, as physical characteristics alone do not represent a predisposition for eating disorders. We believe that physical measurements (eg, percentage of body fat, weight, height, and waist and hip circumferences) may reflect the type of performance attire worn by auxiliary members. Those performing in midriff and no-midriff, slim-fitting uniforms may seek a smaller body size, resulting in being underweight, whereas those wearing less-revealing performance attire may not be as concerned with body size. Although health risks associated with obesity continue to be a concern, the potential for eating disorders in overweight auxiliary members should be appreciated. Misconceptions may exist regarding a relationship between body size and the presence of an eating disorder that, to our knowledge, are unfounded. A common misperception would be that disordered eating may be more common in individuals fitting the stereotypical excessively lean or small body size, but those who are viewed or categorized as overweight or obese are rarely assumed to have disordered eating.

Limitations

We examined potential eating-disorder characteristics and behaviors in collegiate female auxiliary unit members. We used the EAT-26 to identify individuals at risk or displaying risk behaviors of eating disorders. Although the

EAT-26 is a widely used and psychometrically sound instrument, it is a screening and not a diagnostic tool. The Eating Disorder Examination,⁴⁵ a semistructured investigator-based interview, is currently regarded as the most established inventory for assessing eating disorders.⁴⁶ Because we screened for, rather than diagnosed, eating-disorder characteristics and behaviors, we cannot definitely conclude that members in the AR group actually had a disorder. Causes of false-positive, high EAT-26 scores may include participants with disordered eating or eating-disorder partial syndrome (Tables 3 and 4). Obsessive dieters without morbid concerns or generally disturbed individuals who respond positively on surveys without having significant eating concerns could also display inflated EAT-26 scores in the absence of a diagnosable eating disorder.^{47,48} In addition, because of the way the EAT-26 is structured, it is possible to have similar mean values for the AR and NR groups.

Our sample was limited to NCAA Division I institutions in the southeastern United States. Eating disorder prevalence and body image perception may vary by institutional classification or geographic region. Future research of a national sample of auxiliary unit members from different collegiate divisions needs to be conducted. Although we included 3 types of auxiliary units in our sample, we did not have an even distribution of participants in each group, which would have allowed us to estimate the prevalence of eating disorder risk specific to each auxiliary unit. Larger sample sizes of individual auxiliary unit types (eg, color guard, dance, majorettes) would permit prevalence for each individual group to be estimated.

An additional possible limitation is that we gathered data during the spring semester. The performance season for auxiliary units is the fall semester, during football season. Pressures facing unit members during the performance season may be different, perhaps resulting in many AR classifications and more incongruous body-image perceptions. Following up with these volunteers during their performance season would be interesting; it might allow us to determine if their eating disorder risk and body dissatisfaction are magnified.

CONCLUSIONS

Our findings validate concerns that collegiate auxiliary unit members may have an unacceptable prevalence of eating disorders and highlight the need to examine and address unhealthy weight-management behaviors independent of eating-disorder status. Female college auxiliary unit members possessed characteristics indicative of increased risk for developing eating-disordered thoughts and behaviors. Uniform type may influence body image and body dissatisfaction. Regardless of body size, unit members may be at risk for eating disorders, and anthropometric measures, not self-reported measurements alone, should be used for any risk assessment.

According to NCAA Bylaw 17.1.5 (“Mandatory Medical Examination”), Prior to participation in any practice, competition or out-of-season conditioning activities (or, in Division I, permissible voluntary summer conditioning in basketball and football or voluntary individual workouts pursuant to the safety

exception), student-athletes who are beginning their initial season of eligibility shall be required to undergo a medical examination or evaluation administered or supervised by a physician (eg, family physician, team physician).⁴⁹

Auxiliary units are not governed by the NCAA, nor do they have a standard governing body to require a preparticipation examination; therefore, at this time, auxiliary units are not required to have preparticipation examinations. The NCAA recognizes the importance of early identification of health concerns associated with the female athlete triad⁵⁰ and supports inclusion of screening for indicators, but the NCAA does not identify required elements of preparticipation examinations. Instead, the NCAA looks to the medical community (national organizations, local campuses, and their medical staffs) to do so. The American College of Sports Medicine and the National Athletic Trainers' Association both identify strategies and recommendations for screening, management, and prevention of the female athlete triad and disordered eating in athletes.^{38,51} We strongly recommend that preparticipation physicals with appropriate screening tools for eating disorders be implemented before the performance season.

In summary, education and screening for disordered-eating characteristics and distorted body image in auxiliary unit members would help health care professionals ascertain risk levels and identify the potential need for medical coverage, including athletic training, for these auxiliary units. Screening for and identifying the prevalence of disordered-eating characteristics would also emphasize the importance of improving training techniques, providing nutritional education, maintaining healthy body weight, and using effective measures for preventing eating disorders. Administrative attention to eating-disorder screening and prevention programming would also likely have a positive effect on this unique group of athletes.

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