

Original article

Disordered eating among a multi-racial/ethnic sample of female high-school athletes

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Abstract

Purpose: To determine the prevalence of disordered eating (DE) attitudes and behaviors in a multi-racial/ethnic sample of female high-school athletes.

Methods: The Eating Disorders Examination Questionnaire (EDE-Q) was administered to 453 suburban female high-school athletes (277 Caucasian, 103 Latina, and 73 African American; aged 15.7 ± 1.2 years) during their competitive season.

Results: The prevalence of DE in the total sample was 19.6%; among the three ethnic groups, prevalence estimates were 19.2%, 18.4%, and 23.3% for African Americans, Caucasians, and Latinas, respectively. The prevalence estimates of binge eating (12.6%) and vomiting (7.8%) were significantly higher in Latinas as compared to African Americans (5.5%, 1.4%) and Caucasians (5.4%, 2.2%; $\chi^2 p < .05$). The prevalence of diuretic and laxative use was low among all athletes (< 3%), with no differences by ethnicity ($p > .05$). After adjusting for body mass index (BMI) and sport, analysis of covariance (ANCOVA) with Bonferroni post-hoc pair-wise comparisons indicated that Caucasian and Latina athletes scored higher than African Americans on all EDE-Q subscales except eating restraint, which was higher only in Caucasians compared to African Americans ($p = .001-.046$).

Conclusions: Caucasian and Latina female high-school athletes may be at greater risk for eating disorders than their African American peers. Furthermore, Latina athletes may be particularly at risk for binge-eating disorder. Culturally-sensitive behavioral interventions targeted specifically for high-school athletes are needed to reduce the risk of eating disorders and associated long-term health consequences in this population. © 2006 Society for Adolescent Medicine. All rights reserved.

Keywords: Adolescents; Eating disorders; Ethnicity; Exercise; Sport

Participation in competitive sports has greatly increased among female adolescents over the past few decades. With more girls being coached and trained at a very young age, and due perhaps to excessive pressure exerted by coaches

and parents, female athletes are becoming more susceptible at a younger age to extreme weight control practices to enhance performance [1]. Eating disorders and subclinical disordered eating (DE) attitudes and behaviors have been reported in girls as young as 6 years [2].

Although the prevalence of clinical eating disorders, including anorexia nervosa and bulimia nervosa, is low in both athletes and non-athletes [1], prevalence estimates of subclinical DE attitudes and behaviors have been reported

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as high as 62%, with most studies conducted in collegiate athletes [3–6]. Less is known regarding the prevalence of DE in high-school athletes. As DE puts women at greater risk for eating disorders and associated co-morbidities [7], early recognition of DE attitudes and behaviors is essential. DE behaviors such as restricting food intake to maintain low body weight while training, while seemingly less severe than bingeing, purging, or use of laxatives or diet pills, may lead to menstrual dysfunction and bone mass loss [8–10]. A recent study of young military women found that restricted food intake under controlled conditions elevated rates of biomarkers of bone turnover after just 5 days of moderate food restriction [11]. Thus, young female athletes who chronically restrict energy may not be optimizing bone mineral accrual during their critical adolescent years, and therefore may be placing themselves at risk for future osteoporosis.

Most clinical reports of eating disorders in adolescents indicated that this serious health concern occurred mostly in Caucasian women [8,12]. However, several recent studies have shown the existence of eating disorders and DE behaviors in women and girls from other ethnic groups [13,14]. Higher prevalences of bingeing, vomiting, and bulimia [14,15] have been reported in adolescent female Asian Americans compared to Caucasians, whereas African American women typically report fewer eating disorder symptoms compared to Caucasian women [8,13]. Much less is known regarding eating attitudes and behaviors of Latina women and girls. A study of non-athletes reported more body dissatisfaction in Latinas compared to Caucasian girls [16], whereas another study that included Latina, Asian, and Caucasian college women reported few ethnic differences in DE after controlling for group differences in body mass index (BMI) [17]. Thus, the different findings may be due to group differences in body weight, which has been shown to influence scores on eating behavior questionnaires [18].

While most data on DE in athletes are from studies in college women, many female collegiate athletes reported that their DE behaviors began in high school or earlier [19]. To our knowledge, only one study has reported ethnic comparisons of DE attitudes and behaviors in high-school athletes [20]. Those investigators found higher scores on the Eating Disorder Inventory (EDI) in an urban sample of Caucasian and Latina high-school athletes as compared to African Americans [20]. Thus, more information is needed to better understand the influence of race/ethnicity on eating attitudes and behaviors among young athletes.

Cultural norms regarding body image and weight control practices are important considerations when developing interventions to reduce health risks associated with DE. Identifying cultural differences in DE attitudes and behaviors is the first step toward designing such interventions. Therefore, the purposes of this study were to determine and compare prevalence estimates of DE in a multiethnic sample of female high-school athletes, and to determine the

influence of BMI and sport on eating attitudes and behaviors in high-school athletes.

Methods

Participants

A total of 513 female athletes, 13–18-years-old, were recruited from six high schools in southern California. The sample represented a response rate of 79.6% of all athletes listed on the team rosters at the time of data collection. Girls were included if they were actively competing in one of the school's 10 sports teams during their respective sport season. Six racial/ethnic groups were originally assessed: African American, Caucasian, Latina, Asian, Filipino, and "Other." The athletes were asked to indicate on a questionnaire the group they considered their primary ethnicity. If an athlete identified herself as more than one racial/ethnic group, the categorization used by Neumark-Sztainer et al [21] was applied. For example, participants indicating Latina and Caucasian ethnicity were coded as Latina. Due to the small number reporting Asian, Filipino, or "Other" race/ethnicity (12% of the total sample, combined), these girls were excluded from analyses. Thus, the final sample was comprised of 453 athletes, including 277 Caucasian (61%), 103 Latina (23%), and 73 African American (16%) athletes. The sports represented in the sample (most to least participants) were: track and field, cross-country running, tennis, volleyball, basketball, softball, soccer, swimming, lacrosse, and field hockey. The athletes and their parent or legal guardian (if under 18 years) gave written consent to participate. The study received approval by the university's Institutional Review Board.

Procedures

The Eating Disorders Examination Questionnaire (EDE-Q) was used to identify DE. The EDE-Q is the self-report version of the EDE [22], which was designed as a structured interview for diagnosing eating disorders. Fairburn and Beglin [23] adapted the items from the EDE and made them suitable for a self-report measure. The EDE-Q assesses the core pathology of eating disorders using a time-frame of the past 4 weeks. Four subscales, including dietary restraint, eating concern, shape concern, and weight concern; a global score (mean of all subscales); and pathogenic behaviors, including binge eating, vomiting, use of diuretics, and laxative use are scored on a six-point rating scale, with higher numbers indicating more eating disturbances. The four subscales of the EDE-Q correlate well with the EDE ($r = .79-.81$) [23,24]. Pathogenic behaviors have moderate to very high correlations with the EDE ($r = .60-.88$), with the exception of binge eating ($r = 0.45$) [23]. The EDE-Q has also been shown to have excellent test-retest reliability [25].

Table 1
Physical characteristics of high-school female athletes by ethnic group

	African American N = 73		Caucasian N = 277		Latina N = 103	
	Mean	SD	Mean	SD	Mean	SD
Age (years)	15.5	1.2	15.7	1.2	15.8	1.2
Height (cm)	164.9	7.0	166.6 ^a	7.4	163.4 ^a	6.5
Weight (kg)	65.4 ^{a,b}	12.6	60.2 ^a	9.7	60.4 ^b	8.4
BMI (kg/m ²)	24.0 ^{a,b}	4.0	21.7 ^{a,c}	3.1	22.7 ^{b,c}	2.8

^{a,b,c}Groups that share the same superscripts are significantly different at $p < .05$.

The EDE-Q was administered during the third or fourth week of the sport season using a standardized semi-structured interview procedure. Athletes met in groups of 5–20, with a research associate for every five athletes. The athletes were asked to sit apart and not talk or share their responses. One research associate re-stated the purpose of the study, emphasized confidentiality of data, and then proceeded to define terminology, e.g., a bulimic episode, and explain the questionnaires before girls were permitted to begin recording answers. Following completion of the questionnaires, height and weight were measured without shoes by project staff.

Quality assurance procedures for administration of questionnaires included scripting of instructions and several training sessions in which the research associates practiced administering the questionnaires. Test-retest reliability of the study measures was determined in a preliminary study by administering the questionnaires twice in a 7–10-day period to 30 high-school female athletes not participating in the study. Inter-rater reliability was determined by having three pairs of project staff each administer the questionnaires to two peers over a 7-day period.

DE was defined based on norms for young female adolescents [26]. EDE-Q scores of 1–2 are considered normal, a score of 3–4 is consistent with subclinical severity of DE, and a score of 4 or greater is considered to be of clinical severity [26]. For data analysis, EDE-Q scores were treated as continuous and dichotomous variables. To determine athletes with DE versus those with normal eating behavior, we used a cutoff score of 4.0 or greater to conservatively estimate the prevalence of DE behaviors. A score of ≥ 4.0 indicated that the respondent had experienced a behavior or attitude on more than half of the days over the past 4 weeks. The following scoring rubric was used to determine those with DE: A mean score of ≥ 4.0 on either the weight concern or shape concern subscale; a mean global score of ≥ 4.0 ; and/or > 1 episode of self-induced vomiting, binging with loss of control, diuretic use or laxative use over the past 28 days [23,26]. The weight concern and shape concern subscales were used individually in the scoring rubric because higher scores on these scales are predictive of eating disorders and general psychopathology [7,27].

Statistical analysis

Descriptive statistics (mean \pm standard deviation [SD]) were computed for physical characteristics of participants and for each of the four EDE-Q subscales and global score. One-way analysis of variance (ANOVA) was computed to compare the three ethnic groups on age, height, weight, and BMI. Bonferroni post-hoc tests were used for pair-wise comparisons. Initially, we used χ^2 analyses to determine differences in ethnic distributions across schools. We also tested for possible clustering effects in DE behaviors across the six schools, using ANOVA to determine main effects for ethnicity and school, and their interactions, for each EDE-Q subscale and global score. As BMI and type of sport have been shown to influence eating attitudes and behaviors [1,17], we also used analysis of covariance (ANCOVA), with BMI and sport as covariates, to compare main effects for ethnic group differences in the EDE-Q subscales and global score. Bonferroni tests were employed for post-hoc pair-wise comparisons among the three ethnic groups. χ^2 analyses were also used to determine differences in prevalence estimates of DE and pathogenic behaviors among the three groups. SPSS (version 11.5, SPSS, Inc., Chicago, IL) was used for all data analyses.

Results

Test-retest intraclass correlation coefficients (ICC) for the EDE-Q global score, subscales, and pathogenic behaviors, excluding binge eating, ranged from $r = .84$ to $.92$. The ICC for the number of binge episodes in the past 28 days was $r = .37$. Inter-rater reliability coefficients were $r = .92$ to $.96$.

Means and SD for age, height, weight, and BMI are shown in Table 1. The three groups were similar in age; however, Caucasian girls were taller than Latina girls ($p < .05$). Caucasians and Latinas weighed less than African Americans ($p < .05$), but did not differ from each other. BMI was highest in African Americans compared to the other groups ($p < .05$); BMI was also higher in Latinas as compared to Caucasians ($p < .05$).

We found a significant association between school and ethnic status ($p = .003$). ANOVA to determine possible

Table 2
EDE-Q subscales and global score by athletes' ethnic status

	African American N = 73		Caucasian N = 277		Latina N = 103	
	Mean	SD	Mean	SD	Mean	SD
Restraint	1.03	1.34	1.20	1.32	1.31*	1.25
Eating concern	0.62	0.78	0.76*	0.92	0.90*	0.99
Weight concern	1.56	1.48	1.77**	1.50	1.96**	1.49
Shape concern	1.80	1.56	2.12**	1.48	2.32**	1.52
Global score	1.24	1.17	1.46**	1.18	1.63**	1.13

* $p < .05$; ** $p < .001$ compared to African Americans after adjusting for BMI and sport, ANCOVA.

clustering effects of eating behaviors by individual schools indicated a main effect for school ($F = 2.49$, $p = .03$) for only the eating concern subscale. There were no significant interaction effects for ethnicity by school for any of the DE variables ($p > .05$).

Means and SD of the EDE-Q subscales and global scores are presented in Table 2. After adjusting for BMI and specific sport, ANCOVA showed significant effects of ethnicity on all subscales and on the global score ($p < .001-.04$). Bonferroni post-hoc analyses showed that Caucasians and Latinas did not differ from each other on any subscale; however, compared to African Americans, both of these groups had significantly higher global and subscale scores, with the exception of eating restraint, which was higher only in Caucasians compared to African Americans ($p = .001-.05$).

Overall, 89 (19.6%) athletes were classified with disordered eating. Among the three ethnic groups, 14 (19.2%) African American, 51 (18.4%) Caucasian, and 24 (23.3%) Latina athletes met the criteria for DE. There were no significant ethnic group differences in the percentage of athletes classified at risk.

Table 3 shows the prevalence estimates of pathogenic behaviors of the three ethnic groups. The EDE-Q uses a time-frame of the past 28 days rather than a 3-month period used in the DSM-IV criteria to determine DE behaviors. When reporting the prevalence of binge eating, vomiting, and laxative or diuretic use, we included these behaviors

only if they were reported more than once in the past 28 days. Based on this time-frame, 9.5% of the total sample reported that they engaged in one or more pathogenic eating behaviors. A significantly higher prevalence estimate of vomiting (7.8%) was found in Latina athletes compared to African Americans (1.4%) and Caucasians (2.2%, $p < .05$). Similarly, binge-eating prevalence was significantly higher in Latina athletes (12.6%, $p < .05$), as compared to African American (5.5%) and Caucasian athletes (5.4%). The prevalence estimates of diuretic and laxative use was very low ($< 3\%$) among all athletes and did not differ among the three groups.

Table 4 compares the EDE-Q scores of the athletes in our study to (1) a reference population of girls of similar age [26], and (2) to a group of elite collegiate athletes with diagnosed eating disorders [28]. Girls in our sample with normal eating behaviors had EDE-Q scores similar to those from the reference population of approximately 800 female adolescents with normal eating behaviors [26]. Moreover, the athletes in our sample who met the criteria for DE had EDE-Q scores very similar to those of athletes with eating disorders [28]. The t-tests comparing our athletes with DE to those with normal eating behaviors indicated highly significant differences for all subscales (Table 4, $p < .0001$), thus illustrating that the EDE-Q discriminated very well between those with normal versus DE behaviors.

Table 3
Prevalence of pathogenic behaviors by ethnic group

Behavior ^a	African American N = 73		Caucasian N = 277		Latina N = 103	
	n	%	n	%	n	%
Binge eating	4	5.5	15	5.4	13	12.6*
Vomiting	1	1.4	6	2.2	8	7.8*
Use of laxatives	2	2.7	2	.7	3	2.9
Use of diuretics	2	2.7	3	1.1	0	0

^a Behavior reported to have occurred on > 1 day in the past 28 days.

* χ^2 p -value $< .05$.

Table 4
Group mean (± 1 SD) characteristics of EDE-Q subscales and global score for athletes with normal eating behavior vs. DE, and for previously published comparison groups

EDE-Q subscales	Normal eating behavior (<i>N</i> = 364) Mean (SD)	DE ^a (<i>N</i> = 89) Mean (SD)	DE behavior in elite runners ^b (<i>N</i> = 29) Mean (SD)	Raw score means in young adolescent girls ^c (<i>N</i> = 808) Mean (SD)
Weight concern	1.31 (2.07)	3.73 (1.42) ^d	3.12 (0.27)	1.8 (1.7)
Shape concern	1.64 (1.12)	4.09 (1.27) ^d	3.82 (0.22)	2.2 (1.7)
Global score	1.08 (0.83)	3.04 (1.05) ^d	3.01 (0.22)	1.6 (1.4)

^a DE: Athletes whose mean scores were ≥ 4 on weight concern, shape concern, global score, and/or reported > 1 pathogenic behavior in the past 28 days.

^b Data from Ref. 28, mean age = 27.3 years.

^c Data from Ref. 26, mean age = 13.4 years.

^d DE group vs. normal eating behavior group, $p < .0001$, independent *t*-test.

Discussion

The results of our study indicate that Caucasian and Latina high-school female athletes are at a greater risk for developing DE disorders than their African American peers. Our findings are consistent with those previously reported for a sample of female athletes from urban high schools, in which Caucasian and Latina athletes were equally dissatisfied with their body weight and shape, whereas African American athletes were more satisfied with their weight and less preoccupied with being thin despite their higher BMI [20]. Others have reported that African American women tend to have greater acceptance of their appearance and greater satisfaction with their weight and shape, and therefore are less likely to engage in DE behaviors than Caucasian women [8,29]. These findings suggest that cultural standards and parental influence regarding body image may over-ride any peer influence by teammates who they interact with on a daily basis.

Approximately 20% of the athletes were classified with DE in the clinically-significant range [30]. In the general adolescent population, the reported prevalence of disordered eating attitudes in the clinically significant range for body weight and shape concern ranged from 13% to 20% [26], thus, the percentage of high-risk girls in the present study falls at the upper end of reported prevalence estimates of the general adolescent population. However, the mean EDE-Q scores of our DE subgroup were very similar to those reported in a small sample of young adult female runners, all of whom had been diagnosed with eating disorders [28]. Our DE subgroup's scores were also similar to those reported for women with binge-eating disorder [31]. Thus, based on scores from other samples with diagnosed eating disorders, the athletes in our sample classified with DE appear to be at high risk for developing an eating disorder.

In our total sample, the average prevalence estimates of pathogenic behaviors, including binge eating, vomiting, use of laxatives, or use of diuretics to control body weight

ranged from approximately 1% for diuretic and laxative use, to 7% for binge eating. There is evidence that binge eating may be overestimated by the EDE-Q [32]. To reduce this possibility, we emphasized that a binge episode consisted of both eating an unusually large amount of food and feeling a loss of control while doing so.

Our prevalence estimates for pathogenic behaviors are slightly lower than those previously reported for collegiate or elite athletes [4,33,34]. While the number of girls who met the "at risk" criteria for engaging in pathogenic behaviors was relatively small ($n = 43$; 9.5%), one third (14 of 43) reported that they engaged in two or more of the four pathogenic behaviors assessed by the EDE-Q. Although few athletes engaged in pathogenic behaviors for weight control, over 60% of these athletes engaged in these behaviors at least once per week. Given their young age, these athletes may be at high risk for developing serious short- and long-term health problems associated with DE.

The prevalence of binge eating (12.6%) and vomiting (7.8%) was significantly higher among Latina athletes as compared to the African American and Caucasian athletes. Moreover, the frequency of vomiting episodes reported by Latinas was high. Seven of the eight Latina girls who reported vomiting did so on four or more of the past 28 days. We interpret these findings cautiously, as the total number of athletes reporting pathogenic behaviors was relatively small. Nonetheless, the individuals practicing these behaviors may be at high risk for serious medical complications.

The failure to determine the influence of body weight or BMI on ethnic group differences in eating behaviors has likely contributed to the conflicting results reported in the literature [35,36]. Previous studies examining DE behaviors in young women found that BMI is one of the strongest predictors of weight control behaviors [21,35,37] and body dissatisfaction [16,35]. In the present study, BMI was a significant covariate in all four EDE-Q subscales and global score. Our findings of higher DE scores among Caucasians

and Latinas, as compared to African American girls, are consistent with those reported in a previous study that found Caucasian and Latina female high-school athletes had greater body dissatisfaction and drive for thinness than African American athletes [20]. Additionally, a study of college women found that scores on only the eating restraint subscale remained higher in Caucasians compared to Latinas after controlling for higher BMI in Latinas [17]. These findings indicate that body weight or BMI may have a confounding effect on EDE-Q subscale scores associated with weight and shape concerns, and therefore should be controlled for when assessing EDE-Q scores.

Based on several studies that reported greater eating disturbances in athletes participating in “aesthetic” sports or those that favor leanness [1,38–40], we adjusted our analyses by sport. In contrast to previous reports, we found that sport was not a significant covariate for any of the EDE-Q subscales. We speculate that this finding might be partially explained in that our sample included athletes of all levels of competition and that many athletes participated in multiple sports rather than specializing in a single sport.

A limitation of this study was the lack of measures of socio-economic status (SES) and acculturation. We recognize that these factors could potentially influence eating attitudes and behaviors [14]. The schools that participated in the study were located in communities that varied economically; however, the differences in eating behaviors we observed among the ethnic groups did not differ across schools. This finding suggests that the results were not likely influenced directly by SES. Regarding degree of acculturation, many participants were of mixed ethnicity, particularly those of Mexican American descent. Although few cases, those who reported their ethnicity as both Latina and Caucasian were designated as Latina. As cultural norms and practices that might influence body image, eating behaviors, and dietary practices may vary widely among the families of those athletes, the findings should not be generalized to these racial/ethnic groups at large. Another limitation was the use of a questionnaire, rather than one-on-one interview, to assess eating attitudes and behaviors. However, we took precautions to improve the quality of the data gathered. First, the high inter-rater reliability estimates of the EDE-Q indicated that our research associates were proficient and consistent in administering the questionnaires. Second, the research associates became familiar with the athletes by visiting three team practices prior to data collection. At those visits, they announced the study, collected informed consents, and explained the meaning of and procedures for ensuring confidentiality. Third, we administered the questionnaires in small groups, first defining pertinent terminology and reading aloud questions that are prone to misinterpretation. The research associates remained available to privately address any questions the athletes had while completing the EDE-Q. Finally, given the cross-sectional design of the study, we have exam-

ined only a “snapshot” of DE during the athletes’ competitive season. Tracking of these athletes throughout their high-school years will provide valuable information regarding possible fluctuations in eating attitudes and behaviors during in-season and off-season.

In summary, after controlling for BMI and sport, compared to African Americans, the Caucasian and Latina athletes in our study reported higher levels of eating disturbances, including dietary restraint, weight, shape, and eating concern. Overall, nearly one fifth of the athletes were classified with DE. Although the prevalence of pathogenic behaviors was comparatively low among the total sample of athletes, Latinas reported much higher rates of binge eating and vomiting compared to the other two groups of athletes. We recommend that coaches and health care professionals working with athletes be aware of the existence of DE and its similarities and differences among athletes of different race/ethnic groups, and recognize their responsibilities in helping athletes develop healthy eating attitudes and behaviors. Given increasing evidence that DE behaviors are prevalent among young female athletes, behavioral interventions are needed to reduce the risk of serious health consequences associated with chronic eating disturbances.

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