

Comparison of Exercise and Eating Between College and Former High School Athletes

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Abstract

Background: Although college students are more likely to exhibit characteristics of eating disorders than other age groups, results are mixed as to whether college athletes are more at risk for disordered eating than non-athletes or former high school athletes.

Objectives: The purpose of this cross-sectional study was to determine if collegiate male and female athletes are more likely to exhibit characteristics of an eating disorders compared to college males and females who participated in high school sports but did not continue playing collegiately.

Patients and Methods: A survey consisting of the eating attitude test 26 (EAT-26), the body shape questionnaire (BSQ) and three sections of the eating disorder inventory (EDI) body dissatisfaction (EDIBD), drive for thinness (EDIDFT) and the bulimia (EDIBUL) was administered to collegiate athletes (n = 107), former high school athletes (n = 152), and those who did not play sports in high school (non-athletes) (n = 31) in April and May of 2011.

Results: A comparison of collegiate athletes, high school athletes, and non-athletes resulted in ANOVA significant ($P \leq 0.05$) for EAT ($F = 6.145, P < 0.002$), EDIDFT ($F = 4.834, P < 0.009$), EDIBUL ($F = 4.264, P < 0.015$), EDIBD ($F = 12.734, P < 0.001$), and BSQ ($F = 10.998, P < 0.001$).

Conclusions: The results of this study do not support previous findings that athletes are more likely to exhibit characteristics of an eating disorder than non-athletes as athletes scored significantly lower on the EAT, EDIDFT, EDIBD, and BSQ. Although no significant difference was found between high school athletes and non-athletes, high school athletes on average scored lower on all five measures. These results reveal that more research needs to be conducted to determine if one of these groups is at a greater risk of an eating disorder than the other.

Keywords: Disordered Eating, Body Satisfaction, Participation in Sports

1. Background

Thirty-eight percent of college students exhibit characteristics of anorexia nervosa or bulimia and 44% percent have frequently dieted (1). In comparison, lifetime prevalence estimates of anorexia nervosa, bulimia nervosa, and binge-eating disorder were 0.3%, 0.9%, and 1.6%, respectively, in adolescents in the general population (2), showing that disparities between the prevalence of eating disorders in high school and college exist.

Transition from secondary education to college or university is demanding for all students. However, the stress associated with this transition as well as the increased pressure to balance the demands of sports training and school-work can also influence eating behaviors in athletes (3, 4). These pressures along with a college student's desire to maintain or achieve a thin body can lead to pathogenic eating behaviors which might lead to disordered and binge eating (5-8) and make college male and female athletes

more at risk for eating disorders than non-athletes (3, 9, 10). Added to that, managing athletes with eating disorders is difficult from the medical, psychological and sports perspectives (11). Black et al. (12) stated that college female athletes are two to three times more likely to meet the criteria for an eating disorder than non-athletes. Results from a cross-sectional study comparing the energy balance of 80 female high school athletes and 80 female non-athlete, found that both groups showed relatively no signs of disordered eating (13), supporting the hypothesis that female high school athletes may not be at as much risk for an eating disorder as female college athletes. In a study with high school athletes, Martinsen and Sundgot-Borgen (14) reported higher incidence of eating disorders in athletes (7%) than non-athletes (2.3%).

Gutgesell et al. (15) reported that non-athletes might be as much or more at risk for eating disorders. They collected female college athletes' and non-athletes' weight

and desired weight as well as information about their meal patterns, methods of gaining or losing weight, and eating behaviors and found that non-athletes were more likely to eat fewer meals per week, reported more often that they were too heavy, and used more weight loss methods. Dibartolo and Shaffer (16) supported this finding and compared these two groups but measured eating attitudes, body satisfaction, reasons for exercise, and psychological well-being (12). The athletes reported less eating disorder characteristics, healthier psychological functioning, and more motivation to exercise because of enjoyment instead of weight loss (16). McLester et al. also reported lower risk of eating disorders in female student athletes (17)

Although both male and female athletes may exhibit lower body weight or fat percentage and more anxiety, the differences in disordered eating between males and females are not well understood (6). Although studies often find that eating disorders are more prevalent in females (8), much of the disordered eating research has been on females with research concerning males limited and with mixed findings (16, 18). Eating disorders are still thought of as a female disease which could cause males to be under-represented (19). Franco et al. found that the majority of 340 male college students felt dissatisfied about their weight (20) and Ousley et al. (21) severity of symptoms in men and women with eating disorders (21, 22). Bramon-Bosch et al. (23) stated that compared to females, eating disorders in males have a stronger psychiatric link with suicidal behaviors. Male athletes sometimes suffer from reverse anorexia, an obsession with increasing muscle mass which often leads to the use of anabolic steroids (24), and almost 50% of male athletes would like to change their body shape (25, 26). Baum (6) determined that the ban of anabolic steroids by sport management organizations is causing some male athletes to manipulate their diet and physical activity in dangerous ways, and recognized an increase in preoccupation with body image by male athletes, especially in the sports of football, baseball, and track and field.

Although there has been significant improvement in the treatment of eating disorders in the last decade, more research is needed (27). Only six studies, all in non-athletes, reported reduced symptoms though six months (28). In a study of a promising prevention program targeting student athletes, Martinson et al. reported no new cases of eating disorders at the intervention schools while cases at the control schools were reported at 13 percent (29).

Among the most commonly used surveys to measure eating behaviors are the eating attitudes test (EAT) (30). The body shape questionnaire to determine if an individual exhibits preoccupations concerning their body image and weight (31), and the eating disorder inventory (EDI)

which measures obsessive eating behaviors and weight preoccupation (32). IEAT was found to be the most effective of these eating disorder surveys with athletes (33). However, when used together, these instruments identify both those at risk for an eating disorder and causative factors. Black et al. (12) compared the eating behaviors of female college athletes and female college non-athletes by rating subjects on seven different categories including anorexia nervosa (AN), bulimia nervosa (BN), not otherwise-specified AN, not otherwise-specified BN, not otherwise specified AN or BN, disordered eating, or no eating disorders-disordered eating. They found that twice as many athletes were at risk for disordered eating instead of an individual eating disorder (12). By using these categories, specificity in eating behaviors can be better identified. By better understanding the use of eating behavior surveys with athletes and non-athletes, the needs of individuals with disordered eating patterns may be identified earlier, leading to better recovery outcomes.

2. Objectives

The objective of this study was to determine if collegiate male and female athletes are more likely to exhibit characteristics of an eating disorder compared to college males and females who participated in high school sports but did not continue playing collegiately.

3. Patients and Methods

A cross-sectional study was approved by the university of Mississippi's Institutional Review Board (IRB) and conducted to compare the eating behaviors of males vs. females, both separately and as collegiate athletes vs. high school athletes vs. non-athletes.

3.1. Subjects

Subjects were recruited in each of three categories: non-athletes (college students who had not participated in organized school sports beyond primary school), former high-school athletes (college students who participated in organized sports in preparatory school but not in college), and college athletes (students who were currently participating in college sports). The college athletes were recruited from freshmen, sophomore, junior, and senior male and female collegiate athletes from the sports of baseball, basketball, football, track and field, soccer, softball, cheerleading or dance, as well as an "other" collegiate sports options. Non-athletes and high-school athletes were recruited from classes open to the general student population. The study examined group differences for collegiate

athletes ($n = 107$), former high school athletes ($n = 152$), and those who did not play sports in high school (non-athletes) ($n = 31$).

3.2. Measures

The eating attitude test-26 (EAT-26) is a 26 item, 6 point Likert scale inventory (30) that is used to examine subjects' attitudes and beliefs about food and their possible relation to disordered eating (34). The specific behaviors that EAT-26 measures are dieting (15 items), bulimia and food preoccupation (6 items), and oral control (7 items) (26). The eating disorder inventory (EDI) is a 64 item, 6 point Likert scale inventory with 8 subscales that indicate obsessive eating concerns and weight preoccupation related to eating disorders (31). In this study, the body dissatisfaction subscale (EDIBD), drive for thinness subscale (EDIDFT), and bulimia subscale (EDIBUL) was implemented. The body shape questionnaire-34 (BSQ) is a 34 item, 6 point Likert scale to determine if an individual exhibits preoccupations concerning their body that are related to bulimia nervosa and anorexia nervosa (30).

These surveys have been validated in a variety of populations (12, 30, 32). Although, the EAT-26 does not have the capacity for diagnosing clinical eating disorders it has proven effectiveness in identifying those who may be at risk for an eating disorder (12, 16). The BSQ has been validated in a number of languages and continues to be a reliable measure for assessing body dissatisfaction and low self-esteem (30, 32). Both of these instruments have been used jointly to identify the participants at-risk for an eating disorder.

3.3. Procedure

Subject recruitment and survey administration occurred during class time or team meetings during April and May of 2011. Students, age 18 years or older, were informed about the study and given the option to participate or not. Participants completed a cover letter with the sport(s) they played in high school (if applicable), the sport they play in college (if applicable), their college classification, and their gender. If their sport was not listed on the cover letter, an "other" option was available to check. Along with the cover letter the students also completed a survey. When they finished, the cover letter attached to the survey was deposited in a container provided by the researcher. Surveys and cover letters that were found incomplete were discarded.

3.4. Analysis

A comparison of eating behaviors of males vs. females; collegiate athletes vs. high school athletes vs. non-athletes;

and male and female collegiate athletes vs. high school athletes vs. non-athletes using the EAT, EDIDFT, EDIBUL, EDIBD, and BSQ was done. The students, all age 18 or older, scores above 20 on the EAT-26 (16) and or above 120 on the BSQ identify an individual at risk for an eating disorder. Also, the higher the score on the EDI, the more an individual poses at risk (35). A one-way analysis of variance (ANOVA) was conducted to determine whether there is a difference in eating behaviors and body image in collegiate athletes, high school athletes, and non-athletes. Two-tailed independent-sample T tests for equality of means (equal variances not assumed) were computed to examine differences between all males and females. A $P \leq 0.05$ was considered statistically significant. All analyses were performed SPSS Statistics 22 (IBM corporation Armonk, New York, United States).

4. Results

A total of 290 useable surveys were analyzed. Of those, 196 were completed by female subjects and 94 by males. Completion by subject age was: 18 years of age, 39 total (15 females, 24 males); 19 years of age, 83 total (65 females, 18 males); 20 years of age, 90 total (73 females, 17 males); and 21 years of age or older, 78 total (43 females, 35 males). Completion by category was: collegiate athletes, 107 total (76 females, 31 males); high school athletes, 152 total (100 females, 52 males); and non-athletes, 31 total (20 females, 11 males).

For both genders combined when comparing collegiate athletes, high school athletes, and non-athletes, the ANOVA was significant for EAT ($F = 6.145$, $P < 0.002$), EDIDFT ($F = 4.834$, $P < 0.009$), EDIBUL ($F = 4.264$, $P < 0.015$), EDIBD ($F = 12.734$, $P < 0.001$), and BSQ ($F = 10.998$, $P < 0.001$). Post hoc comparisons using Dunnett's C test were conducted. Regarding EAT, EDIDFT, EDIBD, and BSQ, college athletes scored significantly lower than high school athletes and non-athletes. Although high school athletes scored lower on average than non-athletes in all five measures, no significant difference was found between these two groups. There was no significant difference between collegiate athletes, high school athletes, and non-athletes regarding EDIBUL (Table 1).

When separating to determine gender difference in athletes, ANOVA was significant for the female only sample for EAT ($F = 4.194$, $P < 0.017$), EDIBD ($F = 12.116$, $P < 0.001$), and BSQ ($F = 10.009$, $P < 0.001$). No significant difference was seen in ANOVA for EDIDFT and EDIBUL. Post hoc comparisons with the use of Dunnett's C was used for EAT, EDIBUL, EDIBD, and BSQ. Because Levene's test for the equality of variances was not significant for EDIDFT, the Tukey test was used. Regarding EAT, female collegiate athletes scored

Table 1. ANOVA of Collegiate Athletes vs. High School Athletes vs. Non-Athletes^a

	EAT	EDIDFT	EDIBUL	EDIBD	BSQ
Collegiate athletes (n = 107)	6.32 ± 6.81	2.74 ± 4.45	0.91 ± 2.15	4.61 ± 5.60	61.82 ± 34.79
High school athletes (n = 152)	9.30 ± 8.49	4.30 ± 5.61	0.67 ± 1.40	7.74 ± 6.95	78.42 ± 38.14
Non-athletes (n = 31)	10.65 ± 7.13	5.68 ± 5.88	1.90 ± 4.21	10.90 ± 9.16	94.35 ± 46.72
ANOVA F	6.145	4.834	4.264	12.734	10.998
P value	0.002	0.009	0.015	0.001	0.001

Abbreviations: BSQ, body shape questionnaire; EAT, eating attitudes test; EDIBD, eating disorder inventory-body dissatisfaction; EDIBUL, eating disorder inventory-bulimia; EDIDFT, eating disorder inventory-drive for thinness.

^aValues are expressed as mean ± SD.

significantly lower than female high school athletes, while female high school athletes and female non-athletes did not differ significantly. With regards to EDIBD and BSQ, female collegiate athletes scored significantly lower than both female high school athletes and female non-athletes. Although female high school athletes scored slightly lower than female non-athletes in EDIBD and BSQ, no significant difference was found between female high school athletes and female non-athletes in these measures. There was no significant difference between female collegiate athletes, female high school athletes, and female non-athletes regarding EDIDFT and EDIBUL (Table 2).

ANOVA was also conducted for the male only sample but was significant only for EDIDFT ($F = 4.956$, $P < 0.009$). The ANOVA was not significant for EAT, EDIBUL, EDIBD, or BSQ. Post hoc comparisons with the use of Dunnett's C were estimated for EDIDFT and did not find any significant differences between the three male groups (Table 3). In comparison to males, the two-tailed independent-sample T tests showed that females scored significantly higher on the EAT ($t = -3.186$, $P < 0.002$), the EDIDFT ($t = -4.897$, $P < 0.001$), EDIBD ($t = -4.075$, $P < 0.001$), and BSQ ($t = -6.618$, $P < 0.001$). No significant differences were found regarding EDIBUL (Table 4).

5. Discussion

The results of this study do not support the hypothesis that male and female athletes are more likely to exhibit characteristics of an eating disorders compared to college male and female high school athletes. Specifically, collegiate athletes scored significantly lower on the EAT, EDIDFT, EDIBD, and BSQ compared to high school athletes. These results are not consistent with other findings that collegiate athletes are more at risk for an eating disorder compared to non-athletes (5, 8). The results however are consistent with Dibartolo and Shaffer's (16) findings that collegiate athletes reported less eating disorder characteristics when

compared to non-athletes. Although no significant difference was found between high school athletes and non-athletes, high school athletes on average scored lower on all five measures. These results reveal that more research needs to be conducted to determine if one of these groups is at a greater risk of an eating disorder than the other.

When males and females were analyzed separately based on athlete status, female collegiate athletes were less likely to exhibit characteristics of an eating disorder compared to high school athletes and non-athletes on most measures. These results do not support research, including Raymond-Barker et al. (36), that have found that female collegiate athletes are more at the most risk for eating disorders. Although female high school athletes on average scored lower compared to non-athletes, no significant differences were found. This result as well as the finding that no significant differences were found in the measures of EDIDFT and EDIBUL, reveal that more research needs to be conducted to determine if there is a difference in eating patterns of these female groups. Results also found no significant difference in the male sample of collegiate athletes, high school athletes, and non-athletes in all five measures. This is consistent with findings from Franco et al. (20) reporting that males are less likely to develop of an eating disorder compared to females.

In addition, this study also showed that females as a whole are more likely to exhibit characteristics of an eating disorder compared to males which is consistent with most studies including Franco et al. (20). This study could also be consistent with the statement made by Papatthomas and Lavalley (19) that because eating disorders are associated as a female disease this could cause eating disorders to be underreported in males.

Overall results revealed that collegiate athletes were less likely to exhibit characteristics of an eating disorder. This is consistent with Malinauskas et al. (37) who stated that college students are adapting to a different schedule which can in turn lead to a different eating pattern. The

Table 2. ANOVA of Female (N = 189) Collegiate Athletes vs. High School Athletes vs. Non-Athletes^a

	EAT	EDIDFT	EDIBUL	EDIBD	BSQ
Female collegiate athletes (n = 64)	6.89 ± 7.94	3.45 ± 5.27	0.89 ± 2.39	4.59 ± 5.58	66.86 ± 34.40
Female high school athletes (n = 99)	10.58 ± 8.93	5.53 ± 6.11	0.85 ± 1.57	9.45 ± 7.25	90.94 ± 37.78
Female non-athletes (n = 26)	10.58 ± 6.18	5.46 ± 5.63	2.00 ± 4.52	11.08 ± 9.12	98.12 ± 45.87
ANOVA F	4.194	2.692	2.424	12.116	10.009
P value	0.017	0.121	0.077	0.001	0.001

Abbreviations: BSQ, body shape questionnaire; EAT, eating attitudes test; EDIBD, eating disorder inventory-body dissatisfaction; EDIBUL, eating disorder inventory-bulimia; EDIDFT, eating disorder inventory-drive for thinness.

^aValues are expressed as mean ± SD.

Table 3. ANOVA of Male (N = 101) Collegiate Athletes vs. High School Athletes vs. Non-Athletes^a

	EAT	EDIDFT	EDIBUL	EDIBD	BSQ
Male collegiate athletes (n = 43)	5.47 ± 4.60	1.67 ± 2.53	0.93 ± 1.75	4.63 ± 5.71	54.33 ± 34.41
Male high school athletes (n = 53)	6.91 ± 7.05	2.00 ± 3.58	0.34 ± .96	4.53 ± 4.99	55.04 ± 26.03
Male non-athletes (n = 5)	11.00 ± 11.92	6.80 ± 7.69	1.40 ± 2.19	10.00 ± 10.42	74.80 ± 51.44
ANOVA F	1.891	4.956	2.824	2.22	0.989
P value	0.098	0.009	0.065	0.012	0.086

Abbreviations: BSQ, body shape questionnaire; EAT, eating attitudes test; EDIBD, eating disorder inventory-body dissatisfaction; EDIBUL, eating disorder inventory-bulimia; EDIDFT, eating disorder inventory-drive for thinness.

^aValues are expressed as mean ± SD.

Table 4. Two-tailed Independent T-tests of Males vs. Females^a

	EAT	EDIDFT	EDIBUL	EDIBD	BSQ
Males (n = 101)	6.50 ± 6.48	2.10 ± 3.60	0.64 ± 1.02	4.84 ± 5.69	55.71 ± 31.22
Females (n = 189)	9.32 ± 8.42	4.82 ± 5.83	1.02 ± 2.43	8.03 ± 7.44	83.77 ± 39.67
T statistic	-3.186	-4.897	-1.647	-4.075	-6.618
P value	0.002	0.001	0.077	0.001	0.001

Abbreviation: BSQ, body shape questionnaire; EAT, eating attitudes test; EDIBD, eating disorder inventory-body dissatisfaction; EDIBUL, eating disorder inventory-bulimia; EDIDFT, eating disorder inventory-drive for thinness.

^aValues are expressed as mean ± SD.

transition from high school to college can possibly create stress on a college student as they try and adapt to a new environment. No longer having adult supervision and more independence can often lead to unhealthier eating patterns and choices. This could have an effect on high school athletes that do not continue playing a sport at a collegiate level because they might not be aware of the proper ways to exercise because they no longer have a sport to keep them motivated. In the effort to maintain or lose weight, a high school athlete that is unaware of the proper way to exercise and diet in college could possibly be at risk of over-exercising or under-eating to make up for the sport(s) they are no longer playing. Although, there was no significant

difference between high school athletes and non-athletes, high school athletes scored slightly lower in the measures on average, revealing they might be less likely to develop an eating disorder compared to non-athletes. This result might be because a non-athlete has never played a sport and therefore might not exercise or be physically active on a regular basis. Lack of exercise along with changes in eating patterns and possibly consumption of unhealthier foods in college might put a non-athlete at the most risk of gaining weight. In order to prevent weight gain and maintain or achieve a thin figure, a non-athlete might try to manipulate their diet in an unhealthy way to make up for their lack of exercise. Although this research study

provided many significant results, there were still some mixed findings concerning female collegiate athletes, high school athletes, and non-athletes as well as insignificance regarding male and female high school athletes compared to non-athletes. Therefore more research needs to be conducted focusing on these groups and to determine the different factors that affect eating and exercise behaviors in order to reduce the risk of an eating disorder in collegiate athletes, college students that played sports in high school, and college non-athletes.

It is important to note that this study included a sample of convenience in which results were obtained from participants at the university of Mississippi, therefore different results could be found if this study was conducted at other universities. The university of Mississippi does not participate in some sports that are offered at other schools such as swimming, gymnastics, and wrestling. Not having these sports to account for at the collegiate level could have had an effect on the results of the collegiate athletes. To better understand the risk of eating disorders in these different groups, it would be helpful not only to conduct this study at other universities. This would help to determine if specific sports have effect on eating patterns and body image. Another limitation of this study is the small sample ($n = 31$) of non-athletes, which could have affected the results. Future research that includes a larger sample size of non-athletes to compare to collegiate athletes and high school athletes is needed to develop a better understanding of the risks of eating disorders in these groups. Another limitation to note is that all results were self-reported which could lead participants to under-report or over-report symptoms of an eating disorder which could affect results.

Footnotes

Authors' Contribution: Study concept and design, this work was the thesis project of Laura L Blair the first author and the head of her graduate committee. Melinda Wells Valliant developed the research questions and designed the study; acquisition of data, Laura L Blair collected the data; analysis and interpretation of data, Laura L Blair analyzed the data and assisted by Melinda Wells Valliant, Kathy B Knight, and John C Garner; drafting of the manuscript, Kathy B Knight and Melinda Wells Valliant helped draft the manuscript from the thesis; critical revision of the manuscript for important intellectual content, All Authors helped revise the manuscript; statistical analysis, Laura L Blair performed the statistical analysis; administrative, technical, and material support, Melinda Wells Valliant provided this support; study supervision, Melinda

Wells Valliant, Kathy B Knight and John C Garner all helped supervise the study and writing of the manuscript.

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