Eating disorder symptoms in former female college gymnasts: relations with body composition\textsuperscript{1–3}

Patrick J O'Connor, Richard D Lewis, Elisabeth M Kirchner, and Dane B Cook

ABSTRACT The purpose of this investigation was to describe eating disorder symptoms in 36.6 ± 3.8-y-old former college gymnasts as well as relations between body dissatisfaction and body composition. Former college gymnasts (n = 22) and age- (2 ± SE difference: 0.05 ± 0.26 y), height- (0.47 ± 0.75 cm), and weight-matched (2.20 ± 0.30 kg) control subjects (n = 22) participated. Current and past symptoms were assessed by using the Eating Disorders Inventory-2 (EDI-2) and visual analog scales. EDI-2 body-dissatisfaction scores were correlated with assessments of body composition by dual-energy X-ray absorptiometry. Weight preoccupation was stable across the life span for control subjects but was lower before former gymnasts had begun gymnastics training and higher for former gymnasts when they were participating in college gymnastics (P = 0.03). Current levels of body dissatisfaction were more strongly related to actual minus ideal body-weight discrepancy scores (r = 0.77) than to percentage fat (r = 0.50) for the former gymnasts whereas the opposite was true for the control subjects (r = 0.51 and 0.77, respectively). These results suggest that symptoms of eating disorders abate after retirement from gymnastics and that concerns about achieving an ideal body may be a more important determinant of body dissatisfaction than percentage body fat for gymnasts. \textit{Am J Clin Nutr} 1996;64:840–3.

KEY WORDS Aging, body dissatisfaction, body fat, body image, body weight, eating disorder symptoms, female athletes, gymnastics

INTRODUCTION

In recent years, much attention has been directed to the problems associated with disturbed eating behavior in female athletes. A major focus has been the examination of relations between and among disordered eating, amenorrhea, and osteoporosis (1–3). It has been hypothesized that participation in sports such as gymnastics (in which low fat body conveys a performance advantage) is a risk factor in the development of eating disorders (3).

Early reports from one group indicated that pathogenic weight-control behaviors were extraordinarily high in college gymnasts (4, 5). However, recent studies using validated psychometric instruments showed that eating-related disturbances in college gymnasts are not as prevalent or extreme as those initially reported (6–10). Nevertheless, in our opinion the weight of the available evidence does suggest that college gymnasts are more concerned about their body weight than are both nonathletes and most other athlete groups.

It is unclear whether the increased weight preoccupation observed in groups of college gymnasts is pathological or if it represents a healthy commitment to the achievement of athletic excellence. It has been proposed that a mental illness of any kind (eg, schizophrenia, depression, or eating disorders) is inconsistent with optimal athletic performance, and there is substantial evidence that athletes tend to have healthy psychological profiles (11).

Little is known about alterations in weight-related affect and cognitions after retirement from sports. One plausible hypothesis is that being removed from the gymnastics subculture eliminates the social pressure to be thin and should, therefore, reduce symptoms of eating disorders. Alternatively, it is possible that decreases in energy expenditure associated with a reduction in physical training after termination of a gymnastics career promotes changes in body composition that provoke increased weight preoccupation. This possibility might be augmented by the fact that most college-level gymnasts are leaner than average college students.

Relations between body composition and psychological constructs of relevance to eating disorders such as body dissatisfaction have been examined in nonathlete samples (12). However, less attention has been paid to these relations in athlete groups. Knowledge about the determinants of body dissatisfaction is important because this construct has repeatedly been implicated in the development of eating disorders in several longitudinal investigations (13–16).

The purpose of the present investigation was to address the following three questions in a group of former female college gymnasts: 1) Is the presence of eating disorder symptoms high \(\approx 15\) y after college?, 2) Do symptoms of eating disorders change over the life span?, and 3) What is the strength of relations between body dissatisfaction and body composition?

\textsuperscript{1} From the Departments of Exercise Science and Foods and Nutrition, University of Georgia, Athens, and Lenoir Memorial Hospital, Kinston, NC.

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\textsuperscript{3} Address reprint requests to PJ O'Connor, Department of Exercise Science, 115-L Ramsey Center, University of Georgia, Athens, GA 30602-3654. E-mail: poconnor@uga.cc.uga.edu.

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SUBJECTS AND METHODS

Subjects
Twenty-two former college gymnasts with a mean (± SD) age, height, and weight of 36.6 ± 3.8 y, 161.9 ± 6.1 cm, and 58.7 ± 7.0 kg, respectively, participated. A substantial effort was made to recruit an adequate number of participants. Recruitment was made by contacting gymnastics training centers, coaches, and former gymnasts throughout the southeastern United States. Each initial contact was asked to provide the names and phone numbers of other potentially eligible participants. Age- (36.6 ± 4.2 y), height- (162.3 ± 5.6 cm), and weight- (60.9 ± 7.9 kg) matched control subjects were recruited from the local community via flyers, radio, and newspaper advertisements for women within a certain age, height, and weight characteristics. The control subjects reported no history of participation in college athletics, and most were members of the university community (faculty, staff, or family of faculty or staff). Approximately 10% of the former gymnasts who were eligible to participate were ultimately unable to do so, but only because of difficulty in scheduling travel to the testing site from out of state. Most individuals in both groups indicated that the ability to obtain information about their bone health contributed to their willingness to participate. All participants read and signed an informed consent document that had been approved by the Institutional Review Board for Human Subjects at the University of Georgia.

Measures

Current symptoms of eating disorders
The Eating Disorders Inventory-2 (EDI-2) was used to measure 11 constructs that have theoretical relevance to eating disorders. An extensive body of literature supports the validity of the nonprovisional subscales, especially “drive for thinness,” “bulimia,” and “body dissatisfaction” (17). A body-weight discrepancy score was also obtained (18). The discrepancy score was computed by subtracting self-reported ideal body weight from actual body weight.

Changes in symptoms of eating disorders across the life span
Visual analog scales (VAS) were used by the participants to quantify their recollections about “preoccupation with thinness” and “satisfaction with body shape.” The scales were 100 mm in length, contained two verbal anchors (“not at all” and “very much”), and were administered with three different instructional sets for the purpose of obtaining recollections from three time periods. The former gymnasts were instructed to use the following time frames: “over the last 5 y,” “during the years you were a college gymnast,” and “during the years before you began regular gymnastics training.” The control subjects were instructed to use the following time frames: “over the last 5 y,” “during the college-aged years,” and “before puberty.” The former gymnasts started participating in gymnastics on average at 11.9 ± 0.9 y of age, about the typical age of menarche.

Body composition
Dual-energy X-ray absorptiometry (DXA; QDR-1000W; Hologic, Inc, Waltham, MA) was used to assess percentage body fat, bone mineral density, and fat-free soft tissue mass. A detailed report of the body-composition data are available elsewhere (19). The validity of DXA in measuring body composition is well established. For example, body fat estimates of women with DXA have been highly related to hydrostatic weighing both in our laboratory (19; Pearson r = 0.90) and in other laboratories (20; r = 0.91).

Statistical analysis
EDI-2 scores between the former gymnasts and control subjects were compared by using independent t tests. Life-span data were analyzed by using a mixed-model analysis of variance (ANOVA) with Huynh-Feldt adjustments to identify group (gymnasts compared with control subjects) and time (before, during, and after college) main effects as well as group × time interactions. Pearson product-moment correlations were used to examine relations between body dissatisfaction and body composition. Effect size was calculated by taking the difference in group means and dividing this difference by the pooled SD (21). Data are reported as means ± SDs.

RESULTS

The EDI-2 data are presented in Table 1. The mean EDI-2 scores for the former gymnasts were lower than the normative means for every variable. The former gymnasts were similar to the control subjects on all variables except that the former gymnasts had significantly lower asceticism (P = 0.003) and body-dissatisfaction scores (P = 0.025) than the control subjects. This latter finding is consistent with the lower (P = 0.001) percentage body fat in the former gymnasts (23.6 ± 4.1%) than in the control subjects (28.7 ± 5.4%). The fat-free soft tissue mass was nonsignificantly higher (P = 0.30; effect size = 0.33) in the gymnasts than in the control subjects (42.2 ± 3.9 and 40.8 ± 4.6 kg, respectively). The former gymnasts had significantly greater bone mineral density at every site tested compared with the control subjects (19).

The gymnasts and the control subjects reported similar ideal body weights (55.1 ± 4.1 and 54.5 ± 5.2 kg, respectively). The

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Eating Disorders Inventory-2 (EDI-2) subscale scores for norms, former gymnasts, and control subjects</th>
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<tbody>
<tr>
<td></td>
<td>Norms (n = 205)</td>
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<tr>
<td>Drive for thinness</td>
<td>5.5 ± 5.5</td>
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<tr>
<td>Bulimia</td>
<td>1.2 ± 1.9</td>
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<tr>
<td>Body dissatisfaction</td>
<td>12.2 ± 8.3</td>
</tr>
<tr>
<td>Ineffectiveness</td>
<td>2.3 ± 3.6</td>
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<tr>
<td>Perfectionism</td>
<td>6.2 ± 3.9</td>
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<tr>
<td>Interpersonal distrust</td>
<td>2.0 ± 3.1</td>
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<tr>
<td>Interceptive awareness</td>
<td>3.0 ± 3.9</td>
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<tr>
<td>Maturity fears</td>
<td>2.7 ± 2.9</td>
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<tr>
<td>Asceticism</td>
<td>3.4 ± 2.2</td>
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<tr>
<td>Impulse regulation</td>
<td>2.3 ± 3.6</td>
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<tr>
<td>Social insecurity</td>
<td>3.3 ± 3.3</td>
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1 ± SD.  
2 EDI-2 college female norms are from Tables 10 and 11 in reference 17,  
3 Significantly different from gymnasts, P < 0.05.
gymnasts had smaller body-weight discrepancy scores (3.42 ± 4.41 kg) than the control subjects (6.29 ± 6.56 kg). These differences were not significant (P = 0.098), but represented a moderate effect (effect size = 0.51), thus the sample size was inadequate to detect a moderate effect.

Preoccupation with thinness across the life-span data are presented in Figure 1. A significant group × time interaction (P = 0.03) and post hoc tests revealed that preoccupation with thinness scores were stable across the life span for the control subjects, but were low before college and elevated during college for the former gymnasts when compared with control subjects.

Satisfaction with body-shape data across the life span are presented in Figure 2. A significant group × time interaction (P = 0.046) was observed because the former gymnasts became more satisfied with the shape of their body after college whereas the control subjects reported a large reduction in body-shape satisfaction after college compared with the college years.

For the former gymnasts, the EDI-2 body-dissatisfaction-scale scores were strongly related to the body-weight discrepancy scores (r = 0.77, P < 0.001), moderately related to body weight (r = 0.60, P = 0.03), percentage body fat (r = 0.50, P = 0.02), and fat-free soft tissue mass (r = 0.47, P = 0.03), but weakly related to whole-body bone mineral density (r = 0.10, P = 0.65). For the control group, the current body-dissatisfaction-scale scores (EDI-2) were highly related to percentage body fat (r = 0.75, P = 0.001), moderately related to body-dissatisfaction scores (r = 0.51, P = 0.02), and body weight (r = 0.40, P = 0.06), but weakly related to fat-free soft tissue mass (r = 0.10, P = 0.65) and whole-body bone mineral density (r = 0.23, P = 0.31).

DISCUSSION

One main finding of this investigation was that there were not many eating disorder symptoms in female gymnasts ≈15 y after their retirement from the sport. The former gymnasts had scores on the EDI-2 indicating fewer symptoms of eating disorders than both age-, height-, and weight-matched control subjects and published normative data (17). The former gymnasts had a lower percentage body fat than the control subjects, which may have served as the biological basis for the lower body-dissatisfaction scores in the gymnasts than in the control subjects. In addition, former female college gymnasts reported that they were more satisfied with the shape of their body and less weight-preoccupied in retirement than they had been when they were college gymnasts. Thus, the data suggest that preoccupation about weight occurring in association with participation in college gymnastics (7, 9) abates after retirement from the sport. Also supportive of this notion is the fact that the former gymnasts had macro- and micronutrient intakes within the recommended range (19) whereas the diets of college gymnasts were inadequate in this regard (22).

A second main finding of this investigation was that greater fluctuation in preoccupation with thinness was reported across the life span of the gymnasts compared with the control subjects. The control subjects, who did not participate in college athletics, reported little change in their preoccupation with thinness across the prepuberty, college, and postcollege time frames (range of mean VAS score: 48–54). In contrast, the former gymnasts reported less preoccupation with thinness before puberty (mean VAS score: 26), greater preoccupation with thinness during college (mean VAS score: 71), and similar, though slightly lower, preoccupation with thinness after college (mean VAS score: 44) compared with control subjects. We were unable to find comparative data published in the literature concerning eating disorder symptoms in either prepubertal gymnasts or former college gymnasts. The finding of elevated preoccupation with thinness in college gymnasts is consistent with prior reports about college gymnasts (5, 7).

We are unaware of prior research examining relationships between body composition and eating disorder symptoms in gymnasts or athletes. We focused on body dissatisfaction because this construct has been one of the best predictors of who develops eating disorders in several independent, longitudinal studies (13–16). A primary finding of this investigation was that body dissatisfaction was more strongly related to the discrepancy between ideal and actual body weight than to
percentage body fat for the gymnasts whereas the reverse was true for the control subjects. This suggests that former gymnasts give more importance to how they differ from their ideal weight than to body fat per se in judging how satisfied they are with their body. This may explain why college gymnasts report body-dissatisfaction scores in the normal rather than lower than normal (ie, more satisfied) range, despite having a mean body fat percentage (16.9%; 22) that is lower than that of most women their age (24.0%). Although accurate information about the participants’ body composition during college was unavailable, it is likely that the body fat percentage increased over the intervening 15 y for both groups. Nevertheless, the former gymnasts reported becoming more satisfied with the shape of their body whereas the control subjects reported becoming less satisfied with the shape of their body after college. We speculate that after retirement the gymnasts subscribed to a different ideal body weight that was less discrepant from their actual body weight, resulting in less body dissatisfaction. In contrast, we also speculate that the increased actual percentage body fat combined with the greater emphasis placed on percentage body fat by the control subjects may account for the reduced satisfaction with their body shape.

In evaluating the contribution of this investigation to the literature it is important to appreciate several of its limitations. A relatively small number of former gymnasts were tested and no effort was made to identify a specific population of former gymnasts (eg, National Collegiate Athletic Association—Division I) or to select random samples from such a population. Without this type of design, it is not possible to rule out the possibility of sampling bias influencing the present findings. In addition, these women competed in an era when the sport of gymnastics was undergoing rapid change. Over the past 15–20 y, increased emphasis has been placed on artistics; ie, aerial movements in which having less percentage body fat provides a performance advantage (23). Thus, it is possible that the apparent abatement of eating disorder symptoms during retirement from gymnastics in this group may not generalize to the competitive gymnasts of today for whom leanness is an even more important determinant of performance success.

The VAS is a widely accepted method for assessing psychological constructs. However, there is a lack of data concerning the psychometric properties of the tool we devised to assess weight-related constructs. Moreover, recollections about specific feelings about body weight and/or shape clearly can fade over a time span of decades. Thus, the data concerning changes in symptoms over the life span of the gymnasts are limited by the recall method we used and are not as strong as longitudinal data. Nevertheless, we felt that data obtained via retrospective recall might provide preliminary insight into whether weight-related psychological differences between gymnasts and non-athletes emerged before or during college. We recently initiated a longitudinal study of prepubertal gymnasts to more conclusively address this issue.

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REFERENCES