Behavioral, Psychological, and Physical Characteristics of Female Athletes With Subclinical Eating Disorders

Katherine A. Beals and Melinda M. Manore

The purpose of this study was to delineate and further define the behavioral, psychological, and physical characteristics of female athletes with subclinical eating disorders. Subjects consisted of 24 athletes with subclinical eating disorders (SCED) and 24 control athletes. Group classification was determined by scores on the Eating Disorder Inventory (EDI), the Body Shape Questionnaire (BSQ), and a symptom checklist for eating disorders (EDI-SC). Characteristics representative of the female athletes with subclinical eating disorders were derived from an extensive health and dieting history questionnaire and an in-depth interview (the Eating Disorder Examination). Energy intake and expenditure (kcal/d) were estimated using 7-day weighed food records and activity logs. The characteristics most common in the female athletes with subclinical eating disorders included: (a) preoccupation with food, energy intake, and body weight; (b) distorted body image and body weight dissatisfaction; (c) undue influence of body weight on self-evaluation; (d) intense fear of gaining weight even though at or slightly below (-5%) normal weight; (e) attempts to lose weight using one or more pathogenic weight control methods; (g) food intake governed by strict dietary rules, accompanied by extreme feelings of guilt and self-hatred upon breaking a rule; (h) absence of medical disorder to explain energy restriction, weight loss, or maintenance of low body weight; and (i) menstrual dysfunction. Awareness of these characteristics may aid in more timely identification and treatment of female athletes with disordered eating patterns and, perhaps, prevent the development of more serious, clinical eating disorders.

Key Words: disordered eating, body image disturbance, menstrual dysfunction, pathogenic weight control methods, exercise, dieting

Increasing evidence supports the existence of subclinical or partial eating disorder syndromes among athletes (5, 7, 16, 19, 21, 25, 31, 33, 36, 39, 41–43, 45,

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49). Reports of athletes with weight-control and body image problems resembling those of clinical eating disorder patients, but who lack the extreme psychopathological profiles, are appearing more frequently in both the research literature and popular press (5, 7, 19, 25, 28, 31, 33, 36, 39, 41, 42, 45, 49). Despite the apparent interest in these subclinical or partial eating disorder syndromes, few studies have deliberately investigated the nature and scope of these disorders, particularly as they relate to female athletes (31, 33, 41, 45). Indeed, few attempts have been made to identify, define, and measure the behavioral, psychological, and physical characteristics of female athletes with subclinical eating disorders (SCEDs).

In one of the first studies to systematically examine the spectrum of disordered eating behaviors, Button and Whitehouse (11) described a population of female college students (nonathletes) who manifested symptoms similar to anorexia nervosa but with less severity and frequency. The authors referred to this subclinical variant of anorexia nervosa as subclinical anorexia. A similar disorder, referred to as fear of obesity, was later observed by Pugliese et al. (34) in a small sample of adolescents (n = 14). These adolescents demonstrated a pattern of growth failure and delayed maturity due to malnutrition resulting from self-imposed energy restriction. The severe energy restriction self-imposed by these adolescents arose from an inordinate fear of becoming obese. Despite their body weight obsession, psychiatric interviews found no evidence of gross psychiatric disease or anorexia nervosa in the adolescents (34).

One of the first documented cases of SCEDs in athletes was a case study published in 1980 by Smith (39). This case study described a young male athlete who resorted to severe energy restriction and excessive weight loss in a misguided attempt to improve performance. While the excessive dieting and weight loss began as a means of improving athletic success, eventually it became the end in itself. The athlete's striking weight loss and food aversion developed consciously and voluntarily, in the absence of an organic disease, as it does in anorexia nervosa (1); however, there was no evidence of the accompanying psychopathological symptoms commonly seen in individuals with clinical eating disorders.

More recently, Sundgot-Borgen (41) has described a subclinical variant of anorexia nervosa referred to as anorexia athletica, and has developed a list of distinguishing features used to characterize the disorder (“features of anorexia athletica”). These characteristics were derived from the criteria for “fear of obesity” identified by Pugliese et al. (34). According to Sundgot-Borgen (41), the female athlete with anorexia athletica demonstrates an intense fear of gaining weight or becoming fat even though she is underweight (at least 5% below the expected normal weight for age and height for the general female population; ref. 41). This weight loss is achieved by a variety of pathological weight control techniques including severe energy restriction (<1,200 kcal/d), excessive exercise, self-induced vomiting, and/or the abuse of laxatives and diuretics (41).

Despite the apparent specificity to athletic populations, the “features” of anorexia athletica may not always be appropriate for identifying female athletes with subclinical or partial eating disorders. Some of the “features” are not well-defined (e.g., no definitions are given for distorted body image, excessive fear of becoming obese, or compulsive exercise), while others may be too restrictive or exclusionary (e.g., delineating an energy intake of <1,200 kcal/d or a weight loss of >5% of body weight).
The most recently published *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)* (1) includes a set of diagnostic criteria designed to address eating disorders that do not meet the criteria for anorexia nervosa or bulimia nervosa (i.e., eating disorders not otherwise specified—EDNOS). A limitation of the EDNOS is that it operates by a process of elimination, such that an individual is thought to suffer from a subclinical or partial eating disorder if he or she meets some, but not all, of the diagnostic criteria for anorexia nervosa or bulimia nervosa. For example, one of the EDNOS criteria requires that the individual meet “all of the features of Anorexia Nervosa except absence of menses” (1). Besides not specifically delineating characteristics that may be unique to those with subclinical or partial eating disorder syndromes, the EDNOS do not address circumstances inherent to the sport setting or diagnostic issues that may be specific to female athletes. Thus, the EDNOS may not be an appropriate screening tool for SCEDs in physically active women or female athletes.

Indeed, currently there are no available criteria specifically designed to identify SCEDs in female athletes. This is due in part to the fact that, to date, the study by Sundgot-Borgen (41) is the only one that has specifically and deliberately studied SCEDs in female athletes, and it was undertaken on a sample of Norwegian athletes. Thus, the purpose of this study was to delineate and further define the behavioral, psychological, and physical characteristics of female athletes presenting with partial or SCEDs. Delineation of such characteristics will add valuable information to the current knowledge of disordered eating in female athletes. In addition, awareness of such characteristics may aid in more timely identification and treatment of female athletes with disordered eating patterns and, perhaps, prevent the development of more serious, clinical eating disorders.

**Methods**

**Subject Selection and Classification**

Female athletes residing in Maricopa County, Arizona, between the ages of 18–36 years, were recruited via flyers distributed at Arizona State University and local community colleges, road (running) races, fitness facilities, and swimming, cycling, and running clubs. For the purposes of this study, a female athlete was defined as one who was currently training a minimum of 6 hr/week for her sport. Subjects were initially screened for SCEDs using a comprehensive health history and a battery of self-report eating disorder questionnaire including the Eating Disorder Inventory (EDI; Drive for Thinness [DT], Body Dissatisfaction [BD], and Bulimia [BUL] subscales; ref. 24), the Body Shape Questionnaire (BSQ; ref. 14), an eating disorder symptom checklist (EDI-SC; Psychological Assessment Resources, Inc.), and the DSM-IV criteria for anorexia nervosa or bulimia nervosa (1). To be initially classified as having a subclinical eating disorder, an athlete had to demonstrate a high score (associated with disordered eating) on at least three of the five self-report instruments (i.e., the DT, BD, BUL of the EDI, the EDI-SC, and the BSQ) and meet at least two but fewer than four of the DSM IV criteria for anorexia or bulimia nervosa (1, 14, 24, 25). Conversely, to be initially classified as a control subject, the athlete could exhibit no more than one high score on the aforementioned self-report instruments and meet no more than one of the DSM IV criteria (1, 14, 24, 25).
Individuals who clearly evidenced a clinical eating disorder (1, 10) or reported being clinically diagnosed and/or treated for an eating disorder were excluded from the study. None of the athletes screened for SCEDs reported currently suffering from a clinical eating disorder.

Approximately 65 subjects were screened until 25 athletes with a subclinical eating disorder (SCED) and 25 control athletes were identified and selected for participation in the study. One SCED and one control athlete were later excluded because of admitting to underreporting energy intake. Thus, the number of subjects included in the final data analysis was 48, 24 SCED and 24 control athletes. All procedures were approved by the University Institutional Review Board for Human Subjects.

**Characteristics of Subclinical Eating Disorders**

All subjects underwent an in-depth interview to further verify the initial group classification (i.e., SCED or control) and provide insight into the behavioral and psychological characteristics common to athletes presenting with subclinical eating disorders (15). The in-depth interviews lasted from 30–120 min and followed the Eating Disorder Examination developed by Cooper and Fairburn (15). The Eating Disorder Examination is a semi-structured interview that is designed to assess the spectrum of common eating disorder behaviors including abnormal eating patterns, body shape and weight obsessions, dieting, binge eating and purging behaviors, and body image distortions. Questions also probe possible predisposing or “trigger” factors that may have precipitated the development of the eating disorder behaviors. Some additional exercise/sport specific questions were included to assess the relationship between disordered eating and sport participation (e.g., possible role of sport participation, the coach, and/or teammates in the development of the disordered eating patterns, perceived pressure from coaches and/or teammates to eat a particular way or achieve a particular body weight). All interviews were conducted and analyzed by the primary investigator. An eating disorder specialist subsequently reviewed the subject’s responses to verify the primary investigator’s analysis and interpretation.

**Energy Balance**

Energy intake and expenditure were determined using 7-day weighed food records and 7-day activity logs, respectively. Subjects weighed and measured their food for 7 consecutive days using a calibrated food scale (Health-O-Meter) and measuring cups. Daily activity and programmed exercise were recorded at 15–30 min intervals for each 24-hr period. In-depth verbal and written instructions were given to subjects to ensure accurate recording of food and activity. The primary investigator reviewed the completed diet and activity records with each subject to verify the types and amounts of food eaten and daily activity undertaken. The diet and activity records were analyzed using the Food Processor Plus analysis program (v. 5.0, ESHA Research, Salem, OR). This program provides an estimate of total daily energy expenditure by totaling resting metabolic rate (47), daily activity, programmed exercise, and the thermic effect of food.
Anthropometric Measurements

Anthropometric measures including height, weight, waist and hip circumferences, and body composition were taken on each subject. Body composition was estimated using hydrostatic weighing (9), with the residual volume measured using the oxygen dilution technique (50). Four subjects were unable to undergo hydrostatic weighing; thus, for these individuals skinfold measurements were used to estimate body composition. A trained researcher took skinfold measurements with a calibrated Harbinger caliper at four sites (ileum, abdomen, thigh, and tricep), and body composition was determined (26).

Statistical Analyses

Except for frequencies, the results are expressed as mean values with standard deviations. Where comparisons between the groups were made (e.g., anthropometric data, EDI subscale scores, energy balance data), one-way analysis of variance (ANOVA) was used. Results of multiple ANOVAs were subjected to the Bonferroni correction to control for alpha inflation (30). For comparison of the groups regarding frequency, chi-square analysis was used. The overall experimental wise alpha was set at $p < .05$. Significance levels after Bonferroni corrections were set between $p < .006$ and $p < .02$, depending upon the number of comparisons made.

Results

Subject Characteristics

The subjects were involved in a wide range of sports; however, most (75%) participated in endurance sports (e.g., running, triathlons, cycling, swimming, basketball, tennis), with a smaller percentage (25%) participating in more aesthetic or strength sports (e.g., dance, body building). Approximately 84% of the athletes were currently competing at the local or national level. There were a similar number of SCED and control athletes participating in each sport examined. No significant differences were found between the groups for any of the demographic or anthropometric variables examined (see Table 1). Most of the SCED (92%) and control athletes (92%) had body mass index (BMI) values within or below the recommended optimal values (i.e., 20–25; ref. 6). In addition, there were no differences within each group in the number of athletes having BMIs that fell either above or below this recommended range. No athlete had a BMI value $\leq 17.5$ kg/m², a frequently used cut-off value used to determine when an individual meets the weight criteria for anorexia nervosa (1).

Energy Balance

Estimated total daily energy expenditure was not significantly different between the groups; however, energy intake was significantly lower in the subclinical group than in the control group ($p < .004$; Table 1). Thus, the SCED group demonstrated a higher degree of negative energy balance (−516 kcal/d) than the control group (−96 kcal/d; $p < .001$). In fact, the SCED group reported a mean energy intake that was only 79% of energy expenditure, whereas the control group reported a mean energy intake that was 96% of energy expenditure ($p < .004$).
Table 1 Demographic, Anthropometric, and Energy Balance Data for Female Athletes With Subclinical Eating Disorders (SCED) and Control Athletes (Mean ± SD)

<table>
<thead>
<tr>
<th>Variable</th>
<th>SCED athletes (n = 24)</th>
<th>Control athletes (n = 24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>26.9 ± 5.1</td>
<td>28.2 ± 5.5</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>166.7 ± 6.6</td>
<td>163.8 ± 11.9</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>61.1 ± 8.1</td>
<td>58.5 ± 8.5</td>
</tr>
<tr>
<td>Body Mass Index (kg/m²)</td>
<td>22.0 ± 2.5</td>
<td>21.1 ± 2.1</td>
</tr>
<tr>
<td>Body Fat (%)</td>
<td>22.2 ± 5.1</td>
<td>19.5 ± 5.8</td>
</tr>
<tr>
<td>Fat mass (kg)</td>
<td>13.6 ± 4.9</td>
<td>11.7 ± 5.2</td>
</tr>
<tr>
<td>Fat-free mass (kg)</td>
<td>49.8 ± 12.4</td>
<td>46.0 ± 6.4</td>
</tr>
<tr>
<td>Energy intake (kcal/day)</td>
<td>1,989 ± 314*</td>
<td>2,293 ± 393</td>
</tr>
<tr>
<td>Energy expenditure (kcal/day)</td>
<td>2,504 ± 230</td>
<td>2,398 ± 215</td>
</tr>
<tr>
<td>Energy balance (kcal/day)</td>
<td>-516 ± 336**</td>
<td>-98 ± 361</td>
</tr>
<tr>
<td>Energy intake as a percent of energy expenditure</td>
<td>79% ± 12%*</td>
<td>96% ± 16%</td>
</tr>
<tr>
<td>Total weekly exercise (min/week)</td>
<td>Mean ± SD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>622 ± 281</td>
<td>360–1,075</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>546 ± 218</td>
</tr>
</tbody>
</table>

*Measured hydrostatically, with the exception of 4 subjects who were measured with skinfold calipers.

Energy balance = energy intake – energy expenditure.

*SCED athletes are significantly different from control athletes, p < .004, using one-way ANOVA.

**SCED athletes are significantly different from control athletes, p < .001, using one-way ANOVA.

Eating Disorder Symptoms

The EDI and BSQ scores for the two groups are presented in Table 2. As previously described in the methods section, the scores on the BSQ and the DT, BD, and BUL subscales of the EDI were used to initially classify the subjects as SCED or control; thus, we expected a significant difference between the two groups. It is important to note, however, that the scores reported by the SCED athletes on the DT, BD, and BUL subscales of the EDI were not only lower than those typically reported for female athletes suffering from clinical eating disorder (25, 41) but are consistent with those reported for other highly active women demonstrating disordered eating behaviors (25, 31, 41). With the exception of the subscales identified above and the Interoceptive Awareness subscale scores, there were no significant differences between the two groups for any of the other EDI subscales including, Maturity Fears, Perfectionism, Interpersonal Distrust, and Ineffectiveness. This would, again, indicate that, while the SCED group clearly exhibited disturbances in eating patterns and body image, they did not demonstrate the psychopathological symptoms of those with clinical eating disorders (1, 24, 25, 41).
Table 2  Eating Disorder Inventory (EDI) and Body Shape Questionnaire (BSQ) Scores for Female Athletes With Subclinical Eating Disorders (SCED) and Control Athletes as Compared to EDI scores Reported for Athletic Females With Subclinical Eating Disorder Syndromes (a) and Clinical Eating Disorders (b) (Mean ± SD)

<table>
<thead>
<tr>
<th>Variable</th>
<th>SCED athletes (n = 24)</th>
<th>Control athletes (n = 24)</th>
<th>Garner et al. 1987&lt;sup&gt;a&lt;/sup&gt; (n = 13)</th>
<th>Parker et al. 1994&lt;sup&gt;a&lt;/sup&gt; (n = 29)</th>
<th>Garner et al. 1984&lt;sup&gt;b&lt;/sup&gt; (n = 129)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDI—drive for thinness</td>
<td>9.8 ± 5.0&lt;sup&gt;*&lt;/sup&gt;</td>
<td>1.2 ± 0.2</td>
<td>9.4 ± 4.9</td>
<td>7.9 ± 6.6</td>
<td>11.3 ± 7.0</td>
</tr>
<tr>
<td>EDI—bulimia</td>
<td>2.4 ± 3.6&lt;sup&gt;**&lt;/sup&gt;</td>
<td>0.2 ± 0.7</td>
<td>1.1 ± 2.1</td>
<td>2.4 ± 3.1</td>
<td>1.8 ± 3.5</td>
</tr>
<tr>
<td>EDI—body dissatisfaction</td>
<td>13.2 ± 8.5&lt;sup&gt;*&lt;/sup&gt;</td>
<td>5.1 ± 6.7</td>
<td>12.5 ± 7.3</td>
<td>8.4 ± 6.5</td>
<td>11.9 ± 7.9</td>
</tr>
<tr>
<td>EDI—interoceptive awareness</td>
<td>2.7 ± 3.4&lt;sup&gt;**&lt;/sup&gt;</td>
<td>0.5 ± 0.9</td>
<td>3.3 ± 3.6</td>
<td>2.6 ± 3.2</td>
<td>9.2 ± 6.9</td>
</tr>
<tr>
<td>EDI—perfectionism</td>
<td>7.1 ± 4.8</td>
<td>4.7 ± 3.9</td>
<td>7.7 ± 4.5</td>
<td>NA</td>
<td>8.9 ± 5.3</td>
</tr>
<tr>
<td>EDI—interpersonal distrust</td>
<td>1.9 ± 2.0</td>
<td>1.3 ± 3.2</td>
<td>2.4 ± 2.1</td>
<td>3.1 ± 3.7</td>
<td>6.9 ± 5.3</td>
</tr>
<tr>
<td>EDI—ineffectiveness</td>
<td>3.4 ± 5.0</td>
<td>0.5 ± 1.7</td>
<td>4.8 ± 5.8</td>
<td>1.6 ± 2.8</td>
<td>11.4 ± 8.4</td>
</tr>
<tr>
<td>EDI—maturity fears</td>
<td>2.5 ± 3.8</td>
<td>0.8 ± 1.1</td>
<td>7.7 ± 4.3</td>
<td>1.9 ± 2.9</td>
<td>4.8 ± 5.1</td>
</tr>
<tr>
<td>EDI total score</td>
<td>43.0 ± 23.9&lt;sup&gt;*&lt;/sup&gt;</td>
<td>14.4 ± 11.4</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>BSQ score</td>
<td>106 ± 26&lt;sup&gt;*&lt;/sup&gt;</td>
<td>63 ± 17</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Note. NA = not available.
*SCED athletes are significantly different from control athletes, p < .001, using one-way ANOVA.
**SCED athletes are significantly different from control athletes, p = .004, using one-way ANOVA.
Eating Behaviors/Dieting Methods

Information derived from the health and dieting history questionnaire and the in-depth interview delineated some profound differences in eating and dieting behaviors between the SCED and control athletes (Table 3). Significantly more SCED than control athletes reported deliberately restricting the types and amounts of foods they consumed, avoiding “bad” foods (e.g., high fat, high sugar, high calorie) and setting dietary boundaries or following strict dietary rules (e.g., restricting energy intake or fat grams to a specific amount, avoiding specific foods or food groups, eating only certain times of the day) in an effort to either control their weight ($p < .001$). In addition, significantly more of the SCED than control athletes who followed dietary rules reported feeling extreme guilt upon breaking a dietary rule ($p < .001$). Significantly more SCED than control athletes reported frequently or always experiencing guilt after consuming a meal, whether it be a large or normal sized meal ($p < .001$). Finally, the SCED athletes frequently reported a lack of variety in their dietary habits, including the types and amounts of foods they consumed, thus indicating that their diets and dietary habits were regimented and tightly controlled. In contrast, the control athletes enjoyed and maintained a high degree of variety in the diets and dietary habits.

Table 3 Frequency of Dietary Practices and Eating Behaviors Reported by Female Athletes With Subclinical Eating Disorders (SCED) and Control Athletes

<table>
<thead>
<tr>
<th>Variable</th>
<th>SCED athletes ($n = 24$)</th>
<th>Control athletes ($n = 24$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently restricting energy intake for weight loss.</td>
<td>100%*</td>
<td>21%</td>
</tr>
<tr>
<td>Currently limiting intake of “bad” foods* for weight loss.</td>
<td>100%*</td>
<td>33%</td>
</tr>
<tr>
<td>Setting dietary boundaries or following strict dietary rules.</td>
<td>100%*</td>
<td>21%</td>
</tr>
<tr>
<td>Experience guilt and self-anger at breaking a dietary rule.</td>
<td>95%*</td>
<td>20%</td>
</tr>
<tr>
<td>Frequently-always experience guilt after eating a large meal.</td>
<td>92%*</td>
<td>8%</td>
</tr>
<tr>
<td>Sometimes-frequently experience guilt after eating regular meal.</td>
<td>58%*</td>
<td>0%</td>
</tr>
<tr>
<td>Using low-fat or non-fat foods frequently or always.</td>
<td>92%*</td>
<td>50%</td>
</tr>
<tr>
<td>Little or no variety in eating habits.</td>
<td>79%*</td>
<td>16%</td>
</tr>
<tr>
<td>Little or no variety in types and amounts of foods consumed.</td>
<td>83%*</td>
<td>13%</td>
</tr>
<tr>
<td>Currently practicing one or more pathogenic weight control method.</td>
<td>58%*</td>
<td>0%</td>
</tr>
</tbody>
</table>

*SCED athletes are significantly different from control athletes, $p < .001$, using CHI Square analysis.

*Bad foods* were most often described as high fat, high sugar, and/or high kcal.

*Dietary rules consisted of restricting energy intake (kcal) or fat grams to a specific amount, avoiding specific foods or food groups, or eating only certain times of the day.

Pathogenic weight control methods included, fasting, very-low-calorie-diets ($<1000$ kcal/day), excessive exercise (exercise in excess of that deemed necessary for success in their sport), vomiting, use of diet pills, diuretics, and/or laxatives.
Significantly more SCED than control athletes reported currently practicing one or more pathogenic weight control methods including fasting, very-low-calorie diets (<1,000 kcal/d), vomiting, excessive exercise (exercise in excess of the training required for their sport), and the use of diet pills, diuretics, and/or laxatives; \( p < .001 \). Similarly, 83% of SCED athletes versus only 33% of controls reported having practiced one or more pathogenic weight control methods in the past \( (p < .001) \). Among the SCED athletes currently practicing pathogenic weight control methods, the most common methods reported were excessive exercise (71%), fasting or very-low-calorie diets (43%), and the use of diet pills (21%).

**Body Image Disturbance**

Table 4 outlines the body image disturbance characteristics reported by the groups. Significantly more SCED than control athletes expressed moderate-to-extreme dissatisfaction and frequent preoccupation with body weight and body shape \( (p < .001) \). Both body weight and shape were more important to how the SCED athletes viewed or evaluated themselves as individuals. It is not surprising, then, that significantly more SCED than control athletes indicated that gaining 2.27 kg (5 lb.) would negatively affect their self-image and feelings of self-worth and frequently or always feared becoming fat or fatter \( (p < .001) \).

The SCED athletes also experienced a greater degree of body image distortion than control athletes. Even though the SCED athletes were, on average, at or slightly below recommended body weight for height, most (88%) perceived themselves to be slightly-to-very overweight. Moreover, while there were no significant differences between the SCED and control groups in mean body weight or body fat percentage, only 8% of the SCED athletes indicated that they were at their self-defined "ideal" body weight. This is in sharp contrast to control athletes, 50% of whom reported that they were at their "ideal" body weight \( (p < .001) \). In addition, the

<table>
<thead>
<tr>
<th>Variable</th>
<th>SCED athletes ( (n = 24) )</th>
<th>Control athletes ( (n = 24) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate to extreme body weight dissatisfaction</td>
<td>63%*</td>
<td>8%</td>
</tr>
<tr>
<td>Preoccupation with body weight</td>
<td>71%*</td>
<td>0%</td>
</tr>
<tr>
<td>Body weight largely determines self-concept</td>
<td>63%</td>
<td>29%</td>
</tr>
<tr>
<td>Body size largely determines self-concept</td>
<td>96%</td>
<td>58%</td>
</tr>
<tr>
<td>A 2.25 kg (5 lb.) weight gain would negatively self-esteem</td>
<td>75%*</td>
<td>17%</td>
</tr>
<tr>
<td>Fear becoming fat/fatter</td>
<td>83%*</td>
<td>8%</td>
</tr>
<tr>
<td>Currently at ideal weight</td>
<td>8%*</td>
<td>52%</td>
</tr>
<tr>
<td>Often or always feels fat</td>
<td>75%*</td>
<td>0%</td>
</tr>
</tbody>
</table>

*SCED athletes are significantly different from control athletes, \( p < .001 \), using CHI square analysis.
SCED athletes reported a greater discrepancy between their actual and ideal body weight than the control group (4.0 kg vs. 2.1 kg, respectively). Finally, significantly more SCED than control athletes reported that they often or always “felt fat” ($p < .001$).

**Menstrual Status**

Because amenorrhea is considered a key diagnostic criterion in diagnosing anorexia nervosa in females, the incidence of amenorrhea and general menstrual dysfunction was examined in the present study. The overall incidence of menstrual dysfunction (including amenorrhea, oligomenorrhea, and irregular cycle lengths) was higher in the SCED group (61%) than in the control group (35%), although this difference was not statistically significant ($p = .08$). It should be noted that more SCED (50%) than control athletes (33%) reported currently using oral contraceptives. Many athletes who experience menstrual irregularities or amenorrhea will use birth control pills to regulate the menstrual cycle. In this study more of the SCED ($n = 5$) than control athletes ($n = 1$), who reported currently menstruating, were taking birth control pills as a means of regulating their menstrual cycle.

**Discussion**

The purpose of this study was to identify and more clearly define the distinguishing behavioral, psychological, and physical characteristics of female athletes with SCEDs. To delineate these characteristics, we identified a sample of female athletes presenting with SCEDs and, via extensive self-report data and in-depth interviews, determined the behavioral, psychological, and physical characteristics that clearly differentiated them from a sample of non-eating disordered control athletes. These characteristics, which are summarized in Table 5 (Characteristics of SCEDs), are a valuable addition to the currently available diagnostic criteria (i.e., EDNOS and Features of Anorexia Athletica) and may be more appropriate for identifying female athletes with SCEDs for several reasons, each of which is discussed below.

**Classification Criteria**

The Characteristics of SCEDs outlined in Table 5 provide more specific definitions for the behaviors demonstrated by athletes with SCEDs than either the EDNOS or the Features of Anorexia Athletica. For example, both the EDNOS and the Features of Anorexia Athletica list distorted body image, preoccupation with body size/weight, and fear of gaining weight or becoming fat as diagnostic criteria; however, neither define these terms nor indicate how these behaviors may be assessed or measured. The Characteristics of SCEDs more explicitly define these behaviors and provide a means of measuring them by indicating some possible cut-off scores on routinely administered tests/instruments (i.e., the EDI, ref. 24, and the BSQ, ref. 14).

**Behaviors Responsible for Weight Loss**

Another advantage of the Characteristics of SCEDs is that they focus more on the athlete’s weight control behaviors than on the amount of weight lost or a particular body weight. A frequent criticism of the diagnostic criteria currently available for
Table 5  Characteristics of Female Athletes With Subclinical Eating Disorders (Characteristics of SCEDs)

- Preoccupation with food, calories, and body weight (e.g., a score ≥ 9 on the Drive for Thinness subscale, a score of ≥ 5 on the Bulimia subscale of the Eating Disorder Inventory (EDI; ref. 24), and/or positive responses to questions concerning these issues on the Eating Disorder Examination (EDE; ref. 15). (+)

- Distorted body image and/or dissatisfaction with body weight and/or shape (e.g., a score ≥10 on the Body Dissatisfaction subscales of the EDI, ref. 24; a score ≥ 90 on the Body Shape Questionnaire, ref. 14; and/or positive responses to questions concerning these issues on the EDE, ref. 15). (+)

- Undue influence of body weight and/or body shape on self-evaluation (e.g., the athlete indicates that body weight and/or body shape are one of if not the most important factors influencing self-evaluation and determining self-worth). (+)

- Intense fear of gaining weight, becoming fat, and/or feeling fat even though at or slightly below (-5%) normal weight for height, and/or body fat for sport (ref. 38; e.g., the athlete reports frequently or always worrying about weight gain, fearing becoming fat or fatter, and feeling fat). (+)

- Attempts to reduce body weight or maintain a lowered body weight and sport using one or a combination of the following methods: (+)
  - severe restriction of energy intake;\(^a\)
  - severe limitation food choices and/or food groups;\(^b\)
  - excessive exercise;\(^c\)
  - pathogenic weight control methods (fasting, self-induced vomiting, laxative, and/or diuretic use).

- Food intake governed by strict dietary rules and/or dietary boundaries (e.g., restriction of calories or fat grams to a specific amount, avoidance of specific foods or food groups, eating only certain times of the day, chronic avoidance of “bad” foods) accompanied by extreme feelings of guilt and/or self-hatred upon breaking a rule or surpassing dietary boundaries. (+)

- Absence of medical illness or affective disorder explaining energy restriction, weight loss, and/or the maintenance of low body weight or body fat percentage. (+)

- Menstrual dysfunction\(^d\) (-)

Note. (+) = absolute criteria, (-) = relative criteria.
\(^a\) Energy intake (kcal/d) ≤ 80% of energy expenditure (kcal/d).
\(^b\) As evidenced by food frequency, diet history or 7–14-day diet records.
\(^c\) More than necessary for success in the sport and/or as compared to athletes of similar fitness levels.
\(^d\) Primary amenorrhea, secondary amenorrhea, oligomenorrhea, anovulation, or shortened luteal phase.
identifying eating disorders, particularly of the subclinical variety, is the overemphasis on body weight in diagnosis (44). Just as important as a low body weight are the motives for the weight control and the methods used to achieve and maintain weight loss. An athlete should not have to meet a weight criterion to be diagnosed with disordered eating and warrant treatment; it should be enough that the athlete demonstrates significant body image disturbance and pathological weight control behaviors. The Characteristics of SCEDs describes a variety weight control methods that not only were used by the SCED athletes but have been reported frequently in the literature on disordered eating in athletes (5, 16, 19, 31, 36, 41, 45).

While it is important to focus more on the methods utilized for weight control, the focus should not be so narrow or restrictive as to exclude a portion of the population of interest. Some of the criteria contained within the Features of Anorexia Athletica may be too narrow in scope and thus may lead to misclassification (i.e., false negatives). For example, one of the Features of Anorexia Athletica is that the athlete restrict energy intake to < 1,200 kcal/d (41). The use of an absolute energy intake (i.e., < 1,200 kcal/d), overlooks the different energy requirements of individual athletes and ignores the issue of energy deficit. An athlete expending 3,000 kcal/d, but only consuming 1,500 kcal/d, would be considered in severe energy deficit. Yet, based on the Features of Anorexia Athletica, this athlete would not be classified as subclinical. Moreover, 1,200 kcal/d is below the estimated RMR for most females (22), particularly female athletes. Rather than using an absolute energy value, a better, more individualized criterion to describe "low energy intake" would be one that identifies the magnitude of the energy deficit, such as examining energy intake as a percentage of energy expenditure. The Characteristics of SCEDs define low energy intake as a percentage of total daily energy expenditure (i.e., energy intake ≤ 80% of energy expenditure). While other studies have reported low energy intakes in female athletes with disordered eating (4, 12, 13, 20, 37, 40), none examined energy balance (i.e., energy intake relative to expenditure). Thus, it is difficult to compare the results of the present study to those of previous investigations. Further research is required to determine if the magnitude of energy deficit described in Characteristics of SCEDs is appropriate.

**Absolute Versus Relative Criteria**

Another advantage of the Characteristics of SCEDs is that it may more appropriately distinguish between absolute and relative classification criteria. An absolute criterion is considered one that must be met to confirm the diagnosis: A relative criterion is one that is not necessary for identification, but its presence helps verify the existence of the disorder. All of the criteria listed in the EDNOS are absolute; thus, an individual must meet all EDNOS criteria to be diagnosed as such (1). One of the absolute criteria in the EDNOS is that the woman experiences regular menses (1). For the general female population, the use of menstrual dysfunction, or the lack thereof, as an absolute diagnostic criterion may be appropriate. However, for the female athlete, menstrual status is probably not a suitable criterion for diagnosing SCEDs (44). Menstrual dysfunction has been shown to be prevalent in active females and is associated with a number of factors, only one of which appears to be disordered eating (18, 44, 46). Therefore, using menstrual dysfunction as an absolute criterion for identifying SCEDs in female athletes might lead to misclassification. The research literature and the results from the present study do suggest, however,
that there is a higher prevalence of menstrual dysfunction in female athletes who suffer from disordered eating (12, 23, 27, 29, 42). Thus, menstrual dysfunction has been included in the Characteristics of SCEDs as a relative criterion.

The Features of Anorexia Athletica do differentiate between absolute and relative criteria; however, in many cases, the distinctions are contrary to existing research and the results of the present study. For example, two of the Features of Anorexia Athletica—distorted body image and compulsive exercise—are designated relative criteria. Yet, based on findings from previous research (16, 32, 37, 45, 48) and the results of the present study, these two criteria should be designated as absolute criteria. In addition, the Features of Anorexia Athletica designate a weight loss of > 5% of expected body weight as an absolute criterion. Yet, as previously mentioned, the athlete's current body weight may not be as important in diagnosis as the rationale behind the desire to lose weight and the methods used to achieve the weight loss (44). Only one of the SCED athletes in this study met the weight loss criterion specified in the Features of Anorexia Athletica (41). Thus, using only the features of anorexia athletica as a screening tool would have resulted in the misclassification most of the SCED athletes. It should be noted, however, that the absolute and relative criterion designations are preliminary and should be substantiated with further research.

**Specificity to Female Athletes or Highly Active Women**

The Characteristics of SCEDs were largely derived from highly active females identified with SCEDs and, therefore, should be fairly specific to this population. In contrast, the criteria contained within the EDNOS were not derived from an athletic population and thus may not address the circumstances and issues unique to female athletes. While the Features of Anorexia Athletica are presumed to be specific to female athletes, they were not derived from an athletic female population with SCEDs but, rather, from a study done on a small sample of adolescents (nonathletes) suffering from "fear-of-obesity" (34).

**Limitations of the Study**

The results of this study provide additional insight into the area of disordered eating in female athletes; however, there are certain limitations that should be addressed. First, the Characteristics of SCEDs summarized in Table 5 were largely derived from a small sample of young female athletes participating in thin-build sports (e.g., cross-country, track, triathlons, duathlons, swimming, tennis, cycling, bodybuilding). The authors fully realize the limitations of generalizing from a small, fairly exclusive sample. Nonetheless, it should be noted that most of the characteristics included in the Characteristics of SCEDs can be supported and/or substantiated by existing literature on disordered eating in female athletes. Still, further research is necessary to verify the validity and reliability of the characteristics of female athletes with subclinical eating disorders.

A second limitation is that self-report data (i.e., EDI and BSQ scores) were used to further define some of the Characteristics of SCEDs. The validity and reliability of self-report data, particularly in those with eating disorders, has been frequently and justly questioned (11, 24, 25, 41, 44). Future research should seek to determine if the characteristics identified in the SCED athletes in this study can be
generalized to other populations of female athletes, for example, female athletes of varying ages and participating in other sports, including those that do not emphasize leanness.

**Conclusions and Applications**

This study identified and defined the behavioral, psychological, and physical characteristics of female athletes presenting with SCEDs. Awareness of such characteristics is of value to professionals working with female athletes as they may promote more timely identification of athletes at risk for eating disorders. Early identification of disordered eating is important for three reasons. First, research indicates that many cases of anorexia nervosa and bulimia nervosa begin as subclinical variants of these disorders, and early identification and treatment may prevent the development of a clinical eating disorder (44). Second, the rate of recovery from an eating disorder is thought to be directly related to the severity of the disorder. If the disorder can be detected early, treatment is likely to proceed more quickly, thereby leading to a more positive outcome (44). Finally, the severe energy restriction combined with the high levels of physical activity seen in athletes with disordered eating not only places them at risk for poor nutritional status but also for a number of health problems including chronic fatigue, compromised immune function, poor or delayed healing, anemia, electrolyte imbalances, endocrine abnormalities, menstrual dysfunction, and reduced bone density (2, 3, 8, 12, 29). Thus, early identification and intervention may prevent not only the development of a clinical eating disorder but also the potential health consequences that typically accompany them.

**References**


