Screening techniques for pathological eating behaviors in female collegiate athletes

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2010
Dedication

To my Mom and Step-Dad, Trina and Jeff and to my sister, Lyndsay for their enduring love, support and encouragement over the past two and a half years.

To my best friend, Leslie-Ann, for always being there for me no matter what time of day.

To my classmates who have been there for me through both the fun times and hard times of PA school and always helping each other and being there for each other through it.
Acknowledgements

Thank-you

To Professor Jay Peterson, MSBS, PA-C, for accepting me as your student advisee for this project. It would not have been what it is without your advice, critiques and meticulous attention during this project.

To the University of Toledo PA committee members: Chair Hogue, Professor Gardner, Professor Gentry, Professor Kenter, Professor McCollough, Professor Moynihan and Professor Peterson for their assistance and patience during the scholarly project process.
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Introduction

Eating Disorders in the Female Population

The female population faces everyday stigmas in the media and within their environmental surroundings that are linked to valuing thinness as beauty and glamour. Society’s fascination with a female’s gaunt physique can easily sway women into finding an approach to adhere to this view of being beautiful. In order for this population to succeed in maintaining a figure that meets their personal demand, they may opt to exercise and to eat healthy. These two options are normally beneficial in maintaining optimal health; however, when taken to an extreme can precipitate into negative consequences. The physiological and/or psychological effects may sequelae into more serious conditions like pathological eating behaviors (eating disorders, subclinical eating disorders/disordered eating, athletica anorexia and excessive exercise) (Reinking, 2005; Sundgot-Borgen, 1993). The Diagnostic and Statistical Manual of Mental Disorders Fourth Edition (DSM-IV) eating disorders include: anorexia nervosa (AN), bulimia nervosa (BN) and eating disorders not otherwise specified (EDNOS) which are stringently defined and have been found more common among females than males (Association, 2000). The prevalence of AN during a female’s lifetime is 0.5% while BN is slightly more common at 1-3%
(Association, 2000). These eating disorders are most common in adolescent females with a prevalence of 1% for AN and 3-10% for BN. Eating disorders also carry psychological co-morbidities and physiological negative outcomes which contribute to significant morbidity and mortality rates when compared to unaffected individuals (Table 1) (Sullivan, 1995, 2002).

Many risk factors contribute to females who exhibit eating disorders and disordered eating such as: genetics, culture, media, stress, depression or personality disorders, negative influences by peers, family and even interpersonal pressures (Black, 1991c). AN and BN each have their own distinct risk factors. Examples of AN risk factors are middle to upper socioeconomic status, participating in sports that focus on thinness and aesthetics or a family history of eating disorders (Walsh, Wheat, & Freund, 2000). Examples of BN risk factors include substance abuse, alcohol abuse or sexual abuse, depression or inability to lose weight with prior efforts (Walsh, et al., 2000; Zerbe, 1992).
Background

Pathological Eating Behaviors in Female Collegiate Athletes

“No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance”. This statement was made by President Richard Nixon referencing the enacting of Title IX on June 23, 1972. The outcome of this act reduced the discrimination and disparity between male and female athletes by allowing equal opportunity in the participation of sports. Due in large part to Title IX, the number of female collegiate athletes from 1972 to 2007 proliferated from 32,000 to greater than 100,000 (Mitchell & Ennis, 2007).

During the 1980’s, shortly after the legislation process of Title IX occurred, pathological eating behaviors became recognized in female athletes (Beals & Hill, 2006; Black, 1991b). Different methods, assessment strategies and sample sizes have been used in research to determine the prevalence of pathological eating behaviors such as eating disorders, disordered eating, subclinical eating disorders, pathogenic weight control methods and “at risk” of developing an eating disorder. These variations have prevented researchers from
discovering the exact prevalence of pathological eating behaviors in female college athletes. Despite this, research has clearly established that female athletes have higher rates of pathologic eating than female non-athletes and also male athletes (Engel 2003, Sundgot-Borgen 2004). Additionally, female college athletes who participate in sports focusing on a lean physique have a higher propensity to exhibit pathologic eating than athletes participating in other sports (Carter and Rudd 2005, Reinking 2005).

The reasons for the female collegiate athlete subset to exhibit atypical eating behaviors are multifactorial. In addition to the risk factors associated with the female gender, female college athletes also undergo the transition from home life to the stressors of living on their own and achieving good grades along with the additional demands to perform well in their sport (Montgomery, 2003; Schwitzer, Rodriguez, Thomas, & Salimi, 2001). In addition, they express unique dispositions of perfectionism and personal high demands for success. An external affliction that contributes to these behaviors is the athletic environment. For example, a simple negative remark from a coach can magnify the negative way the female athlete feels about her body, alter performance and lower self esteem. Strength coaches’ demands, pressures from teammates, competition
between teammates, the importance of winning, revealing athletic apparel, public weigh-ins and body fat percentages play a role as well (Black, 1991d; Brownell, Rodin, & Wilmore, 1992a; Reel, 1996). Type of sport classifications such as having to “make weight,” being judged based upon physical appearance, or needing a thin physique in order to perform well are also causative factors (Johnson, 1991; Sundgot-Borgen, 1994). Sundgot-Borgen (1994) defined triggers for pathologic eating in elite female athletes. Traumatic events like an injury or illness which hinders the athlete from participating in competition and practice is a contributor. Females also have the fear of gaining weight thus not achieving best physical appearance if the inception of menarche is too early. Dieting at a young age or a coach’s suggestion to diet to improve performance are also contributory features (Sundgot-Borgen, 1994).

There are several eating disorder questionnaires that were developed for the general population that have often been utilized in an attempt to determine the prevalence of eating disorders among female college athletes (Tables 2, 3, 4, 5). It has been determined, however, that surveys designed for the general population have uncertain accuracy and/or lack validation for screening female college athletes (Brownell, et al., 1992a; Nagel, Black, Leverenz, & Coster, 2000). They have
numerous downfalls which hinder the ability to capture pathological eating in female college athletes. General population eating disorder questionnaires are geared toward a person who does not participate in strenuous physical activity, like a college athlete does. Therefore, questions on most of the general population surveys will not produce accurate results when asked to female college athletes. For example, the general population questionnaire, EAT, contains questions such as: “Do you find yourself preoccupied with food?”, “Do you exercise strenuously to burn off calories?”, “Do you have regular menstrual periods?” and “Are you preoccupied with the thought of having fat on your body?” (D. M. Garner & Garfinkel, 1979). The previous questions could be answered by female athletes where it would falsely place them in the eating disordered category; however, it may be natural or normal for the female college athlete to display these characteristics. Additionally, some of the surveys, EAT, BULIT and BULIT-R, use out-dated DSM-III criteria. DSM-IV criteria should be applied as a standard in current practice to insure accurate diagnosis. The SCANS, BSQ and EDI focus strictly on eating disorders: AN and BN and not on disordered eating. The JWHS-76 is a questionnaire for high school students with a greater focus on risk factors and safety than eating problems in adolescents (Steiner, Pavelski, Pitts, & McQuivey, 1998). The EDE interview, however, has more positive
characteristics than other general population screening techniques. The EDE has better validity than self reports, allows the patient to discuss their concerns and the interviewer explains definitions of atypical eating behaviors (i.e. binge and purge). However, the interview takes 30 minutes to one hour and the interviewer must be trained on the technique of interviewing and rules of scoring (Z. Cooper, Cooper, & Fairburn, 1989; Z. Cooper & Fairburn, 1987a; Fairburn & Beglin, 1994). Some of the general population questionnaires have been shown to exhibit significantly high false positive and false negative rates and inaccurate results in female college athletes (Brownell, Rodin, & Wilmore, 1992b; O'Conner, Lewis, & Kirchner, 1995). Unless the researcher(s) opted to add or modify the questionnaire while assessing the prevalence rates, the questionnaires do not contain questions directed toward an athlete's lifestyle. There is presently no eating disorder screening tool used for the general population that has been validated for female college athletes.

Brownell, Rodin and Wilmore (1992) conducted a study involving 110 elite female athletes from seven sport groups who were administered the EAT questionnaire. The questionnaires were anonymous to both the researchers and coaches. Eighty seven athletes responded and none were found to be in the
“disordered eating” category of the EAT. Two years after the study, however, 18 of the athletes received treatment for an eating disorder. In another study by Brownell, Rodin and Wilmore, the EDI was administered to 14 female runners. Nine were found to be amenorrheic and three were identified as having possible eating disorder problems but not fulminant eating disorders. Four of the nine amenorrheic runners were later diagnosed with eating disorders, one with AN, two with BN and one with both. Based on this information, the authors reported that general population questionnaires do not provide accurate results for female athletes (Brownell, et al., 1992a).

O’Connor, Lewis and Kirchner (1995) investigated the EDI-2 questionnaire finding similar results as Brownell and colleagues. The research consisted of two studies. In the first study, 21 college women were administered the EDI-2 at two different points in time. The first time they were instructed to respond honestly and the second time taking the survey they were instructed to choose the answer that they thought would be the healthiest choice. Results showed significant differences between the honest and “fake” answers ($p < 0.05$). For instance, of the honest answers, no subjects were satisfied with their body and while giving fake answers all were satisfied with their body. In the second study, the fake survey developed from study
one was used to pinpoint female Division I college gymnasts and female college controls who responded with false answers on the EDI-2. After results were established, a total of twelve percent were found to parallel the “fake” survey from the first study (O'Connor, et al., 1995). They also found congruent results as the previously mentioned researchers did in which the general population instrument produces false results on female college athletes. O’Connor, Lewis and Kirchner (1995) concluded that the general population questionnaire, EDI-2, can be cheated.

Carter and Rudd (2005) administered the Q-EDD (Tables 6,7) to identify male and female collegiate athletes who are “at risk” for eating disorders. The study took place during the 2001 and 2002 academic years at The Ohio State University. In 2001, 353 female athletes participated in the study and in 2002, 355 female athletes were involved. The mean age of the participants was 19.5 years. Three problems exist with the Q-EDD and its accuracy of detecting eating disorders in female athletes. First, only one question was changed from the original Q-EDD to make the questionnaire relative to the life of an athlete. The question was modified from “Do you exercise a lot?” to “Do you exercise in addition to your normal sport practice?” After the athletes completed the questionnaire, a
psychologist, athletic trainer and team physician scored each to determine if the athlete demonstrated eating problem symptoms. The psychologist then interviewed athletes with potential eating problems and offered them counseling and education. A chi-square analysis revealed that female athletes in 2001 expressed: 0% AN, 0% BN, 2.5% EDNOS and 19% subclinical eating disorders and in 2002 0% AN, 0% BN, 2.0% EDNOS and 17% subclinical eating disorders. The second problem was that the conclusions were comparable to studies that tested non-athletes with the Q-EDD in which results included: 0% AN, 0% BN, 2-3.6% EDNOS and 19-23% subclinical eating disorders. The last issue was that the psychologist discovered that dishonest responses were given by the female athletes when reviewing their medical charts during counseling that was offered. The psychologist diagnosed six percent with AN, BN or EDNOS which was greater than the amount found using the Q-EDD (Carter, 2005).

Doninger, et al. (2005) assessed 207 female college athletes to detect if the EAT would be a valid questionnaire for this subset. The athletes surveyed were from two Division I universities with a mean age of 19.61 years. Twelve varsity sport teams participated in the study (Table 4,5). According to the results of the EAT, six percent of the participants expressed eating disorder behaviors. The researchers began by
using the reliable confirmatory factor analysis to determine if the EAT items in previous studies on non-athletes would be satisfactory for a study on athletes. EAT items that were used on non-athletes failed to provide acceptable factor loadings and the authors concluded that it should not be used on athletes. Another downfall of the EAT questionnaire is that it utilizes DSM-III criteria which is outdated (Doninger, et al., 2005).

Identifying an athlete with an eating disorder tends to be more difficult in female college athletes compared to the general population due to the normative behaviors of athletes, like excessive exercise, lower body fat percentages, and eating particularly healthy to gain muscle mass. Some female college athletes have the ability to conceal their disordered eating symptoms due to their perfectionism and through learned conditioned responses (Currie & Morse, 2005). Additionally, some pathological eating symptoms may be deceiving or may be considered normal for a female college athlete. For example, amenorrhea is a major symptom of an eating disorder in female athletes but also may naturally occur from high intensity daily exercise when an eating disorder is not present (Drinkwater, 2005). Blood pressure lower than the accepted normal range, for instance, may be from athletic conditioning or due to acute fluid loss during practice if the athlete did not immediately
rehydrate. A resting heart rate lower than the accepted normal range is also common among athletes who do not have an eating disorder (Maron & Pelliccia, 2006).

In female college athletes with pathological eating behaviors physiologic outcomes are exacerbated when compared to the general population due to the additional sport demands. These exacerbated changes include gastrointestinal complaints, skin dryness, parotid gland swelling, depleted fuel stores, stress fractures, depression, dehydration, electrolyte imbalances, decreased endurance and strength, compromised immunity, delayed healing, seizures, hypotension, cardiac arrhythmias, bradycardia, hypothermia and potentially death (Beals & Manore, 2000; Quatromoni, 2008; Ting & Wallis, 2007). Female college athletes focus on performance in their sport at the present moment without thinking of potential harmful consequences in the future. Examples of future repercussions include: amenorrhea can cause permanent infertility, weight fluctuations cause an increased chance for hypertension, chronic hypokalemia leads to circulatory collapse and fat redistribution leads to a higher chance of cancer and cardiovascular disease (Black, 1991a). Disordered eating can cause specific subsequent dual effects on female athletes. Low energy sources combined with daily intensive exercise can lead to amenorrhea which
eventually causes an ensuing decrease in bone mineral density potentially developing into osteoporosis. These three components of disordered eating, amenorrhea and osteoporosis, make up the Female Athlete Triad (West, 1998). The female athlete triad has been studied in-depth, yet useful screening methods for early recognition of the three components is lacking.

Since the outcomes of pathological eating behaviors can have such harmful effects on athletes, clinicians, athletic trainers and coaches need to be aware of the psychological and physiological characteristics these patients may subtly express. The intervention of a screening technique specific to athletes prior to activity is imperative for early detection. The screening techniques presently used for the general population do not adequately provide sensitive and specific results when administered to the female college athlete. Pathological eating behaviors are highly prevalent and potentially devastating in the female collegiate athlete population, so there is an urgent need for a specific screening tool for this population. The purpose of this paper is to provide an evaluation and review of the screening tools that have been developed to screen female college athletes and to determine if there is substantial evidence to support their use clinically. Improved screening
for pathological eating behaviors may lead to earlier identification and treatment by PAs and other health care providers.
Definitions

**Amenorrhea:** Absence of menstrual bleeding which can be classified as either primary or secondary. Primary amenorrhea refers to a woman who has not had any menstrual bleeding by the age of 16, or is without sexual development by the age of 14. Secondary amenorrhea refers to a woman who has established menstrual cycles with an absence of menstrual bleeding for six months or for a length of time equivalent to a total of at least three of her previous cycle lengths (West, 1998).

**Anorexia nervosa (AN):** Diagnosed when all of the following criteria are met: when an individual induces weight loss leading to a body weight of less than 85% of a healthy norm or refusal to gain appropriate weight while growing taller; has an intense fear of gaining weight or becoming fat even though underweight; has a disturbance in the perception of body shape; and (in women) has missed three consecutive menstrual cycles. There are two types of anorexia nervosa, restricting type, when a person has not regularly engaged in binge-eating or purging behavior during the current episode of anorexia nervosa and binge-eating/purging type, when a person has regularly engaged in binge-eating or purging behavior during the current episode of anorexia nervosa (Andreasen, 2006).
**Athletica anorexia:** Intense fear of gaining weight or becoming fat even though underweight (at least 5% below expected normal weight for age and height for the general female population); weight loss is achieved by a variety of pathological weight control techniques including severe energy restriction (< 1,200 kcal/day), excessive exercise, self induced vomiting, and/or abuse of laxatives or diuretics (Sundgot-Borgen, 1993).

**Binge eating:** A period of overeating during which a larger amount of food is ingested that most people would eat during that time. The person feels they cannot stop eating nor has control over what or how much is consumed (Andreasen, 2006).

**Bulimia nervosa (BN):** Diagnosed when all of the following criteria are met: recurrent episodes of binge eating; a feeling of lack of control over eating during the binges; recurrent use of inappropriate compensatory behaviors to prevent weight gain, such as vomiting, use of laxatives or diuretics, strict dieting or fasting, or vigorous exercise; an average of two binge episodes weekly for three months; and persistent over concern with body shape and weight. Furthermore, the disturbance does not occur exclusively in the course of anorexia nervosa. There are two types of bulimia nervosa, purging type when the person has regularly engaged in self-induced vomiting or misuse of laxatives, diuretics, or enemas during the current episode of
bulimia nervosa and nonpurging type when the person has used other inappropriate compensatory behaviors, such as fasting or excessive exercise, but has not regularly engaged in self-induced vomiting or misuse of laxatives, diuretics, or enemas during the current episode of bulimia nervosa (Andreasen, 2006).

**Disordered eating/Subclinical eating disorders:** Some authors use the term disordered eating and others use subclinical eating disorders. Both illustrate a wide spectrum of harmful and often ineffective eating behaviors used in attempts to lose weight or achieve a lean appearance; the spectrum of behaviors ranges in severity from restricting food intake to binging and purging; less extreme behavioral indicators and psychological symptoms of anorexia nervosa and bulimia nervosa; two named types are athletica anorexia and eating disorder not otherwise specified; restrictive and/or pathogenic weight control behaviors that do not meet full diagnostic criteria to be considered eating disorders (Beals & Manore, 1999; Bonci, et al., 2008; Otis, Drinkwater, Johnson, Loucks, & Wilmore, 1997; Sundgot-Borgen & Torstveit, 2004).

**Eating disorder not otherwise specified (EDNOS):** Symptoms that do not meet the criteria for a more specific eating disorder (Andreasen, 2006).
Pathogenic Weight Control Methods: Behaviors such as self induced vomiting, excessive exercise, binging, fasting, diuretic use, laxatives, diet pills or very low calorie diets (Greenleaf, Petrie, Carter, & Reel, 2009; Sundgot-Borgen & Larsen, 1993).

Purging: Self induced vomiting or misuse of laxatives, diuretics or enemas (Andreasen, 2006).
Methods

A search for relative articles was performed using PubMed, CINAHL, SPORTDiscus, PSYCinfo and Science Citation Index. Articles that analyzed randomized controlled trials, cross sectional studies, articles comparing pathological eating screening techniques, systematic review articles and original research were included. The search terms used were: eating disorders, disordered eating, athletes and eating disorders, sports and eating disorders, female college athlete, pathologic eating, weight control behaviors, subclinical eating disorders, eating disorders and detection and screening and eating disorders. Additional sources were found in the reference sections of other articles used.

Inclusion criteria was confined to studies published in English within the past thirty years that analyzed female athletes aged 17-25 years. Studies that included one or more of the following disorders were used: anorexia nervosa, bulimia nervosa, eating disorder not otherwise specified and other pathogenic behaviors such as athletica anorexia, subclinical eating disorders, excessive exercise, purging behaviors and binge eating. Articles that analyzed screening tools or questionnaires for one or more of the aforesaid disorders for athletes and/or nonathletes were used.
Articles were excluded if they focused exclusively on eating disorders such as PICA and coprophagia. If males were included in the study, the primary focus was on the females’ results. Studies were excluded if the majority of the subjects were outside the age range of 17-25.

A total of 57 articles met criteria and were read and analyzed.
Literature Review

Seven questionnaires have been developed specifically for female college athletes (Table 8). The ensuing paragraphs provide descriptions of the athlete questionnaires, results and analysis of the criterion content and the pathologic eating behaviors in each study.

The SEDA (Black, 1991; Guthrie, 1985) was originated by Guthrie in her 1985 dissertation to determine the prevalence of eating disorders in male and female collegiate athletes. The questionnaire contains 33 items which are divided into three sections: self identification of an eating disorder, eating disorder contributors from the athletic environment and methods that may reduce eating disorders within this subset. The responses within the SEDA are scored on a ten point Likert scale ranging from “strongly disagree” to “strongly agree”. Content validity was obtained by having ten psychologists who had previous contact with eating disordered athletes review the questionnaire. The draft of the questionnaire was modified based on the psychologists’ advice. Test-retest reliability was established using a group of 30 male and female college athletes. Coefficient results for items on methods that would reduce eating disorders within this subset were 0.86 and
questions on eating disorder contributors from the athletic environment was 1.00 (Black, 1991e; Guthrie, 1985).

Guthrie (1985) used the SEDA along with three other questionnaires to determine the prevalence of eating disorders among college athletes, eating disorder contributors from the athletic environment and techniques that could be used to reduce the prevalence of eating disorders in collegiate athletes. The research study was conducted during 1984 and 1985 at five universities in Ohio with at least 10,000 students enrolled to best simulate Division I and Division II schools. The tests administered were the EDI, Binge Eating Questionnaire (BEQ), Purging Mechanism Inventory (PMI) and the SEDA. The BEQ is an eight item questionnaire using DSM-III criteria for bulimia and the PMI was created for this study which includes eight questions related to pathogenic weight control methods. One hundred and fifty-eight female athletes from eight sports volunteered for the study (Table 9). Internal consistency was assessed using Cronbach’s $\alpha$. An $\alpha$ of 0.90 was found for inquiries about eating disorder contributors from the athletic environment and an $\alpha$ of 0.73 was obtained for methods that would reduce eating disorders within this subset. In order to determine differences of eating disorders among the different
sport teams, a t-test and one way ANOVA were used based on results of the questionnaires.

According to the results of the EDI subscale Drive for Thinness, 15.2% of the female athletes were preoccupied with their weight. The three sports that were most preoccupied were: gymnastics (27.3%), synchronized swimming (23.5%) and swimming (22.2%) (Guthrie, 1985). Female athletes scored the worst on the EDI subscales: Drive for Thinness (M = 6.1), Body Dissatisfaction (M = 8.9) and Perfectionism (M = 6.1). The results of the BEQ indicated that 13.3% of women were considered bulimic based on DSM-III criteria. The sports that had the highest rates of bulimia were gymnastics (27.3%), synchronized swimming (23.5%), cross country (23.1%) and swimming (18.5%). On the PMI, 14.5% of female athletes reported increased amount of strict dieting and fasting and 39.2% exercised outside of their sport (Black, 1991e). The SEDA results discovered that 30% of females believed they previously had an eating disorder and 17.1% considered themselves to have an eating disorder at the time of survey administration (Table 9). The eating disorders the females self-identified themselves with were: AN restricting (7.4%), AN bulimic (11.1%), bulimia (18.5%) and binge eating (63.0%). Forty-four percent of females felt that college athletics made their eating disorder somewhat more of a
problem and 24.0% felt that college athletics made their eating disorder much more of a problem. The constituents that the athletes felt were most related to their eating disorder onset were athletic participation pressures (M = 4.8) and pressures from school (M = 3.6). Specific athletic environmental elements that athletes felt were pertinent to their pathologic eating behaviors were the items: “weight loss was required for performance excellence” (21.2%) and “weight loss was required to reach aesthetic ideals of beauty” (12.1%). The percentages for methods that athletes’ felt would decrease eating disorder rates were: “nutrition education and counseling before and during the athletic season” (22.6%), “create a policy where one will not be kicked off a team or lose a position if she seeks help for eating disorders” (14.7%), “provide psychological counseling before and during athletic season o help with stresses of sport” (14.6%), “focus on fitness rather than body weight and body fat ideals” (14.5%), and “athletic personnel to be sensitive with weight issues” (13.5%). Athletes were allowed to add other methods that they felt may help athletes from developing eating disorders. Examples added by athletes were: a team eating table before and during the season, provide eating disorder information to parents, psychological counseling for stressors of both academics and sport and less emphasis on winning. The
author suggested these thoughts should be added to the SEDA questionnaire in the future (Guthrie, 1985).

The Athletic Milieu Direct Questionnaire (AMDQ) (Nagel, et al., 2000) was developed to measure both eating disorders and disordered eating (ED/DE). The items were created by a review of the literature, DSM-III and DSM-IV eating disorder criteria and what the researchers considered to be athletic environmental effects on athletes’ weight and eating habits. A Pilot Test was initially performed on 175 female college athletes over a period of two years to test for readability, test-retest reliability, response distortion, content validity and criterion validity (Nagel, et al., 2000). Subsequently, one-hundred forty-nine female student athletes with a mean age of twenty years old from a single NCAA Division I university participated in a cross sectional study. Nine varsity sports and two club sports participated in the study (Table 10) which took place in two sessions. During the first session the athletes completed the AMDQ (119 items), EDI-2 (91 items) and the BULIT-R (36 items) questionnaires. The authors sought to compare the AMDQ to the two existing general population questionnaires to verify its accuracy of results and to lessen the amount of items within the AMDQ. During a second session, the EDE was administered to the same athletes. The authors hoped that this would confirm their
initial test results, obtain physical demographic data and to
determine which self-report questionnaire best identified
athletes with pathologic eating. The EDE results were
interpreted to place each subject into an “ED/DE” category or an
“OK” category. EDE scores ranged from 0-6, a score of 0-2
represented “normal”, 3 indicated the subject displayed
disordered eating symptoms and 4-6 meant subject had eating
disorder symptoms. If subjects were placed in the 4-6 range
they were then classified as having a specific eating disorder
based on DSM-III and DSM-IV criteria. From results of the EDE,
35% of the subjects were placed into the “ED/DE” category. Of
the “ED/DE” athletes 65% were considered to have disordered
eating, 8% EDNOS, 25% BN and 2% AN. Cheerleading contained 3 BN
and 1 NOS, dance company exhibited 3 BN and 1 AN, modern dance
and golf both contained 1 BN, gymnastics had 1 NOS, swimming
included 4 BN and 1 NOS, track and cross country had 1 BN and 1
NOS and basketball and softball had zero (Nagel, et al., 2000).

The AMDQ initially contained 119 questions but was reduced
by using item analysis. Items were retained if they met all
criteria. The criteria included: mean score for eating
disordered or disordered eating subjects must be significantly
greater ($p < 0.01$) than the mean score of non-eating disordered
(“OK” group), a significant predictor of an eating disorder
subject compared to an “OK” subject, $\alpha$ of 1%, 0.4 when tested for correlation with the total score, internal consistency using Cronbach’s $\alpha$ of 0.85, sensitivity of 80% and specificity of at least 75% - 80% (Nagel, et al., 2000). Of the original 119 items, 51 were found to meet the first two criteria. Three subsets were created from the retained items: AMDQ-1: 35 items; AMDQ-2: 19 items and AMDQ-3: 9 items (Nagel, et al., 2000).

Thirty-two of the 35 items in AMDQ-1 met all criteria (mean score for ED/DE subjects was significantly ($p < 0.01$) greater than the mean score for “OK” subjects, the items had a correlation with the total of 0.40, Cronbach’s $\alpha = 0.94$, sensitivity = 80.0%, specificity = 77.2%). Eighteen of 19 items within the AMDQ-2 met all criteria (mean score for ED/DE subjects was significantly ($p < 0.01$) greater than the mean score for “OK” subjects, the items had a correlation with the total of 0.40, Cronbach’s $\alpha = 0.90$, sensitivity = 80.0%, specificity = 75.3%). AMDQ-3 only had three of nine items meet the third criteria, where the items had to be 0.40 of total score. Cronbach’s $\alpha = 0.76$ indicated no items met criterion four; however, sensitivity and specificity were best at 82.0% and 80.0%, respectively. The AEBSC (a collaboration of items from all three tests) met all criteria (mean score for ED/DE subjects was significantly ($p < 0.01$) greater than the mean score for “OK”
subjects, the items had a correlation with the total of 0.40, Cronbach’s $\alpha = 0.96$, sensitivity = 70.6%, specificity 73.7%). The AMDQ subsets presented with better results than the EDI-2 and BULIT-R on seven of nine epidemiologic analyses. The average of the three AMDQ subsets results included: sensitivity 81.0%; false negatives 19.0%; positive predictive value 65.8%; negative predictive value 88.1%; yield 28.3%; accuracy 78.5% and validity 58.0%. Also, of all the tests, the AMDQ was the only test to meet sensitivity criterion (80% or higher), with the EDI-2 64%, BULIT-R 55% and AEBSC 70% (Nagel, et al., 2000).

The authors advise using the subsets that met criteria for early detection of disordered eating in female college athletes to prevent the problem from becoming a fulminant eating disorder (Nagel, et al., 2000).

The Female Athlete Screening Tool (FAST) (Table 11) (Affenito, et al., 1998; McNulty, Adams, Anderson, & Affenito, 2001) was developed to identify female college athletes with eating disorders and abnormal exercise habits. Primary confirmation of the FAST was illustrated in an abstract by Affenito (1998). This began by administering the FAST, BULIT-R and EDI-2 to 32 random Division I female athletes from the University of Connecticut. The results of the FAST were compared to the BULIT-R and EDI-2, with the FAST positively
correlating with the tests: BULIT-R \( r = 0.69 \), EDI-2 subscales Drive for Thinness \( r = 0.70 \), Bulimia \( r = 0.035 \), Body Dissatisfaction \( r = 0.78 \) and Perfectionism \( r = 0.48 \). To verify internal consistency Cronbach’s \( \alpha \) was used, scoring \( \alpha = 0.88 \) (Affenito, et al., 1998).

The FAST contains 33 questions that were produced by eating disorder specialists. Thirty questions are scored on a four point Likert scale with the choices “frequently”, “sometimes”, “rarely” or “never” or “strongly agree”, “agree”, “disagree” or “strongly disagree”; two questions were based on frequency of weighing oneself and not being able to compete because of injury; and one was a yes or no question asking if the subject was happy about her current weight (Affenito, et al., 1998; McNulty, et al., 2001).

Validity of the FAST (McNulty, et al., 2001) was ascertained by performing a study on three cross sectional groups that consisted of 41 total subjects with a mean age of 20.5. The three groups were: college athletes with eating disorders who were diagnosed by their sports medicine team \( n = 12 \): 3 crew members, 2 cross country and track athletes, 1 lacrosse player and 2 athletes in both soccer and softball), college athletes without eating disorders as the control group \( n = 14 \) and non-athletes with eating disorders, diagnosed via
mental health services, as a reference group (n = 15). The athletes were from a Division I university (University of Connecticut) and a Division III university (St. Joseph College). The groups completed the FAST, EDE-Q (the questionnaire version of the EDE), BULIT-R and EDI-2. Based on results of the surveys and taking into account each athlete’s menstrual history, weight and BMI, 42% were found to have fulminant eating disorders and 58% had subclinical eating disorders. The specific type of eating disorder present in the subjects was not specified in this publication; however, methods of weight control were specified. Of athletes with eating disorders, 33% practiced vomiting, 25% used laxatives, 25% used diuretics and 75% practiced excessive exercise. Internal consistency using Cronbach’s α was 0.87. Testing discriminant validity through the use of ANOVA, the authors noted that FAST scores appeared to differentiate between the groups: athletes with eating disorders = 92.5; non-athletes with eating disorders = 65.9 and athletes without eating disorders = 62.8. Additionally, the authors noted that the difference in scores between the groups confirms that the FAST is able to correctly classify athletes with eating disorders from athletes without eating disorders and athletes with eating disorders from non-athletes with eating disorders. The FAST was found to be interrelated with both the existing published eating disorder questionnaires (EDE-Q and EDI-2) with
a Pearson correlation coefficient of 0.60 and 0.89, respectively. The authors felt that a limitation of their study was that the FAST needs be tested on a larger sample size. Yet, they stated that it is an appropriate test to identify characteristics of female college athletes with eating disorders (McNulty, et al., 2001).

The Health, Weight, Dieting and Menstrual History questionnaire (HWDM) (Table 12) (Beals & Hill, 2006; Beals & Manore, 2002) was constructed by Beals and Hill who used information gathered via a literature review on disordered eating and from items of the EDI symptom checklist and the EDE-Q. The goal of the HWDM is to detect female college athletes with one or more of the components of the Female Athlete Triad [disordered eating behaviors, low bone mineral density and/or menstrual cycle irregularities (menstrual cycles that are not every 28-34 days, menstrual dysfunction: no periods, ≤ six or > 12 periods in the past year)] (Beals & Manore, 2002). Disordered eating was determined by direct written questioning if the athlete currently has or previously had an eating disorder or disordered eating characteristics. The HWDM entails 54 questions broken down into five categories. The five categories include: Demographic Information (eight questions); Musculoskeletal/Health History (four questions); Menstrual
History (nine questions); Nutrition History (18 questions) and Weight History (15 questions). The HWDM contains a variety of response choices for each question such as: yes or no; fill in the blank; Likert scales and frequency choices. The questionnaire was read by athletic disordered eating specialists to gain content validity (Beals & Hill, 2006; Beals & Manore, 2002).

The HDWM (Beals & Manore, 2002) was utilized to discover the prevalence of disordered eating, menstrual dysfunction and musculoskeletal injuries in female college athletes, to determine if there are differences in prevalence of the female athlete triad between sports and to discern if menstrual dysfunction and musculoskeletal injuries are directly proportional. Four-hundred and twenty-five female college athletes from seven universities with a mean age of 19 were used in this study. A total of 15 sports were divided into three groups: aesthetic (cheerleading, diving and gymnastics), endurance (basketball, cross country, middle distance and distance track events, field hockey, crew, soccer, swimming and water polo) and team/anaerobic (field events, golf, softball, tennis, volleyball). Disordered eating was determined via the EAT, EDI subscale Body Dissatisfaction and a direct question of previous or current eating disorders. An ANOVA was employed to
distinguish differences in disordered eating behaviors between the three groups. Using the direct questions, AN was found in 3.3% and BN in 2.3% of respondents. Five point six percent of the aesthetic sport participants had AN or BN; endurance sports contained 3.5% AN and 1.6% BN and team/anaerobic sports consisted of 1.0% AN and 2.1% BN. A chi-square analysis was applied to discriminate frequency of eating problems, disordered eating risks and menstrual dysfunctions between the three groups. According to the results of the HWDM, 65.9% have experienced a muscle injury and 34.3% suffered a bone injury with most occurring in aesthetic sports. Pathogenic weight control methods results via the HWDM included: 67% limited food choices, 42% restricted energy intake, 22% had a preoccupation with food, 6% binged, 11% fasted, 15% ate a low calorie diet, 4% used laxatives, 8% used diet pills and 7% practiced self-induced vomiting. Forty-three percent worried about becoming overweight and 55% felt pressure to sustain a certain weight. The mean age of menarche was 13.2 and delayed menarche was found in 7.4%. Oral contraceptive pills were taken by 26.7%, with 31% of those not taking oral contraceptive pills exhibiting irregular menstrual cycles: 1% had no menstrual cycle, 11.9% experienced less than or equal to 6 cycles in the past year and 8.4% had greater than 12 cycles in the past year. The athletes with irregular menstrual cycles were found to have higher scores on
the EAT and EDI Body Dissatisfaction subscale. The authors concluded that disordered eating and irregular menstrual cycles parallel each other in female college athletes (Beals & Manore, 2002).

Beals and Hill (2006) surveyed multiple sports and divided them into lean and non-lean groups depending on whether the sport focused on a lean physique or not. Sports that were considered ‘lean’ included: diving, cross country, swimming and track (sprinting events) and ‘non-lean’ included: field hockey, softball, tennis and field events in track and field. The study took place during the 2000-2001 and 2001-2002 sport seasons. One-hundred and twelve female athletes with a mean age of 19.5 from one Division II school participated in the study. Based on athletes’ responses, the researchers placed the subjects into one of three categories of disordered eating. The three categories and response rates of each were: clinical eating disorder, if one has or is currently diagnosed or being treated for an eating disorder (2.6%); self-diagnosed eating disorder, if the subject thought they may have an eating disorder and disordered eating behaviors (3.6%) and disordered eating behaviors, if the athlete was dissatisfied with her weight and if she practiced at least one pathologic weight control behavior in the past year (19.6%). The authors of this study considered
fasting, very low calorie diets (≤ 1,000 calories/day), vomiting, excessive exercise (additional exercise beyond regular training program) and laxative, diuretic and diet pill use as pathogenic weight control methods (Beals & Hill, 2006). A Chi-square analysis was utilized to find the difference between groups based on frequency of disordered eating, menstrual dysfunction and/or bone mineral density. Bone mineral density was assessed via a dual-energy x-ray absorptiometry (DEXA scan) of the spine. Four self reported eating disorders were found, with all participating in lean sports: two cross country, one track and one diver. The authors concluded that clinical eating disorders were present in three cross country runners, two with suspected AN and one with suspected BN. Disordered eating behaviors were found in 20% of all sports. Chi-square analysis found that there were no significant statistical differences between lean and non-lean sports demonstrating eating problems. The outcomes of the scoring of items and questions for menstrual function concluded that the mean age for menarche of both groups was 13.3 years of age. Of both categories of athletes combined, menstrual irregularity was established in 70%, with 41% exhibiting more menstrual irregularities during training season. Twenty-one percent of the female athletes presented with secondary amenorrhea. Forty-four percent of subjects were using oral contraceptive pills and 65% of these subjects were using
them to regulate their menstrual cycle. Overall, menstrual dysfunction was significantly different between lean athletes and non-lean athletes, 32% and 17%, respectively ($p = 0.053$). Using a Z score of less than $-2.0$, two cross country athletes fell into the low bone mineral density category and using a Z score of less than $-1.0$, 11 athletes were considered to have low bone mineral density; ten lean and one non-lean athlete. When using total results of all three components of the Female Athlete Triad, nine percent of athletes met criteria for two of the three components. One athlete met disordered eating and a low bone mineral density with a Z score of less than $-2.0$ and nine met disordered eating and menstrual dysfunction. The sports played by these respondents were not specified. One lean subject (cross country runner) met all three disorders using a Z score of $<-2.0$ and two lean athletes met all three disorders using a Z score of $<-1.0$. The authors mentioned that the results of disordered eating paralleled with previous studies that ascertained the prevalence of disordered eating using the EAT and EDI (Beals & Hill, 2006).

The College Health Related Information Survey (CHRIS) (Table 13) (Steiner, Pyle, Brassington, Matheson, & King, 2003) was created to evaluate the mental and general health of male and female college athletes. The researchers made the
questionnaire in a format that would allow the athlete to complete it in a timely manner to fit their busy schedules. The CHRIS is formatted based on the JWHS with adjustments that the authors felt were pertinent to the lifestyles of college athletes. These adjustments were identified based on a review of the literature and preexisting questionnaires. Four questions were added to the JWHS inquiring about athletes’ amount of satisfaction with work, family, friends and recreation. The responses were scored on a five point Likert scale where a higher number denotes a higher quantity of mental and general health issues. Changes were made on the questionnaire after a Pilot Study was performed on 50 random students. Subsequently, athletes from different sports teams read the questionnaire to confirm that it was relative to the life of a student athlete (Steiner, et al., 2003).

Four-hundred and eight Division I student athletes and 110 student non-athletes from Stanford University completed the questionnaire. Forty-four percent of the athletes surveyed were female with a mean age of 19.3 years and 49% of the non-athletes were female with a mean age of 21.0 years. Half of the questions were omitted during factor analysis for various reasons. The questions that were not answered positively by any student athletes were removed, as the authors felt this meant
they were not relative to the athlete’s life. The 32 questions that remained were divided into four groups: mental health problems, eating problems, risk behaviors and performance pressure. To determine internal consistency among the four factors a Cronbach’s $\alpha$ coefficient was utilized. Mental Health problems consisted of nine questions, $\alpha = 0.80$; Eating Problems contained 13 questions, $\alpha = 0.77$; Risk Behaviors enclosed four questions, $\alpha = 0.87$ and Performance Pressure was comprised of six questions, $\alpha = 0.71$. A Pearson Product Correlation revealed results between $r = 0.26 - 0.31$. To calculate discriminant analysis of the four factors between males and females and athletes and non-athletes an ANOVA was used. Significant differences were found between gender and athletes versus non-athletes. Statistics among different sports were not specified. Athletes scored better on all factors except Performance Pressure. The means for female athletes versus female non-athletes, respectively, were as follows: Mental Health Problems 1.3 and 2.0; Eating Disorders 1.7 and 2.0; Risk Behaviors 1.7 and 3.0 and Performance Pressure 2.9 and 2.8. The authors concluded that CHRIS is an acceptable survey for detection of mental and general health of college student athletes (Steiner, et al., 2003).
The Physiologic Screening Test (PST) was created by Black, Larkin, Coster, Leverenz and Abood (2003) to detect female college athletes who suffer from disordered eating and eating disorders. The goal was to disguise the survey by focusing on physiologic aspects of the athletes instead of direct eating disorder inquiries. The researchers hoped that this would decrease the amount of false responses by the athletes, allowing for correct identification of athletes at risk for eating disorders and existing eating disorders. The authors noted that the items within the PST are derived from signs and symptoms of eating disorders and disordered eating from multiple articles from the literature. The questionnaire contained 44 items: 12 self report questions, 15 interview questions and 17 physiologic measurements (Black, et al., 2003).

In order to determine which items were most accurate in detecting disordered eating and eating disorders, the PST along with the EDI-2, BULIT-R and EDE were administered to 148 Division I female college athletes with a mean age of 20.1. Athletes from ten Division I varsity sport teams and two club teams participated in the study (Table 14). The cross sectional study included two sessions excluding coaches and other athletic personnel. In the first session the athletes completed the EDI-2 and BULIT-R and in the second session they were administered
the EDE and the PST. The EDI-2, BULIT-R and the PST were all compared against results from the EDE interview. The Physiologic Screening Test’s epidemiologic analyses were compared with the EDI-2 and BULIT-R to verify which had the best results. Athletes were placed into the category of ED/DE (AN, BN, EDNOS-AN, EDNOS-BN, EDNOS-AN and BN, or DE) or labeled “OK” (Black, et al., 2003).

After statistical analysis was performed, the amount of items was reduced from 44 to 18: 6 questionnaire items, 8 self report interview items and four physiologic measurements (body fat percentage, waist to hip ratio, diastolic blood pressure and observation of enlarged parotid glands) (Black, et al., 2003). The questionnaire was tested for readability, response bias and test re-test reliability on 45 female athletes who were separate from the research study, however; no items were omitted or modified based on the athletes’ responses. The self report items had to meet three criteria in order to be saved for the final Physiologic Screening Questionnaire. The three criteria included: a significant $t$ test $p < 0.05$ of the mean item scores between eating disordered/disordered eating (ED/DE) and a non eating disordered/disordered eating group (OK group); a $p < 0.05$ score during logistic regression of the item showing that it is an analyst of ED/DE and if the item distinguished between ED/DE
and OK groups with a correlation of 0.40 between the item and the total score with a Cronbach’s $\alpha = 0.60$ (Black, et al., 2003). The interview and physiologic items had to meet the same first two criteria but the third criteria required a $p = 0.25$. The six self report items that were retained included: dizziness, abdominal bloating, abdominal pain and cramping, frequency of bowel movements, stool consistency and number of periods per year. These six items differentiated between the ED/DE and OK group with a mean score of 12.86 and 10.91, respectively and a logistic regression score of $P < 0.01$. Dizziness, abdominal bloating and abdominal pain and cramping inquiries scoring were on a five-point Likert scale ranging from “always” to “never”.

The eight interview questions that met criteria were: hours of exercise outside of competition, irregular menstrual cycle, lowest weight at present height and age at this weight, highest weight, difference between lowest and highest weight, seeing self as overweight and whether wanting to change or maintain weight. The four physiologic measurements that met criteria included: body fat percent, waist to hip ratio, standing diastolic blood pressure and enlarged parotid glands which were assessed by an exercise physiologist. Body fat was assessed by the use of skinfold calipers; waist to hip ratio was measured
using inelastic tape, standing diastolic blood pressure was
performed using a cuff and bladder with a sphygmomanometer and
parotid glands were looked at and palpated. The Physiologic
Screening Test had better scores than the EDI-2 and BULIT-R on
accuracy (80.7% vs. EDI-2, vs. BULIT-R), validity (63.9%), false
negatives (15.4%) and negative predictive value (91.3%). The
Physiologic Screening Test had 86.5% sensitivity and 77.7%
specificity which were much more precise scores than the EDI-2
(sensitivity 61.5% and specificity 74.2%) and BULIT-R
(sensitivity 26.9% and specificity 98.9%). The authors noted
that the BULIT-R categorized almost all athletes as being “OK”
due to its abnormally high specificity and low sensitivity.
Based on the Physiologic Screening Test results a total of 12%
were ED, 23% were DE and 65% were OK (Table 14). Cheerleading
contained the most eating disorders while gymnastics, cross
country and modern dance had the highest amount of disordered
eating. According to the authors, the Physiologic Screening
Test is adequate at detecting disordered eating and eating
disorders in female collegiate athletes. The authors stated
that the Physiologic Screening questionnaire will produce better
accuracy in identifying female college athletes than general
population questionnaires due to the indirect questions and
physiologic measurements. This method is meant to be less
confrontational toward the athlete and disguises the actual
reason for the test allowing better and earlier detection (Black, et al., 2003).

The ATHLETE questionnaire (Hinton & Kubas, 2005) is a questionnaire developed specifically for female college athletes. It is comprised of five subscales with a total of 39 items which are intended to evaluate psychological predictors of disordered eating. The subscales are: Drive for Thinness and Performance, Social Pressure on Eating, Performance Perfectionism, Social Pressure on Body Shape and Team Trust. Each subscale contains between five and twelve questions and responses are scored on a five-point Likert scale ranging from “strongly agree” to “strongly disagree”. A cross sectional study was conducted that involved 165 female Division I athletes representing three different universities and eight sports (Table 15). The EDI, SCANS, Q-EDD and the ATHLETE questionnaires were administered and completed by all of the subjects. The authors included the SCANS and EDI tests to compare with the ATHLETE in hopes of confirming that it measures what it is supposed to. The Q-EDD was used to assess the number of female athletes with eating disorders based on DSM-IV criteria and to verify that the ATHLETE correlates with it.

The ATHLETE began with nine subscales and 80 items. The subscales were derived from EDI subscales (Body Dissatisfaction,
Drive for Thinness, Interoceptive Awareness, Perfectionism, Ineffectiveness and Interpersonal Distrust) and were altered to focus on athletes. For example, the EDI Drive for Thinness subscale includes “excessive concern with dieting”, “preoccupation with weight” and “entrenchment in pursuit of thinness”. The ATHLETE questionnaire modified the Drive for Thinness subscale to “a desire to be leaner to improve performance or appearance” and “excessive/compulsive training above what is required”. SCANS subscales “social pressure on body shape and on eating behaviors” and “the importance of being an athlete on self-concept” were also included in the ATHLETE questionnaire. The items under each subscale were developed after gathering information via a literature review and through opinions of the authors and athletes who dealt with eating disorders in athletics. Seven of the nine subscales’ internal consistency fell into a range using Cronbach’s $\alpha$ of 0.73-0.88. The Ineffectiveness and Interoceptive Awareness subscales were omitted since they produced an internal consistency Cronbach’s $\alpha$ of less than 0.70. The internal consistency for each subscale is as follows: Drive for Thinness and Performance $\alpha = 0.91$; Social Pressure on Eating $\alpha = 0.91$; Performance Perfectionism $\alpha = 0.83$; Social Pressure on Body Shape $\alpha = 0.86$; Athlete Identity $\alpha = 0.75$ and Team Trust $\alpha = 0.77$. The Drive for Thinness and Performance and Social Pressure on Body Shape subscales were the
best at identifying psychological predictors of disordered eating via logistic regression when comparing the ATHLETE against the Q-EDD. When contrasting the ATHLETE questionnaire subscales to the EDI and SCANS subscales all were significantly correlated ($r = 0.454 - r = 0.798$, $p < 0.001$) except the Athlete Identity scale ($p = 0.003$) which was eliminated. All other subscales appeared to identify female college athletes with disordered eating psychological symptoms. Based on Q-EDD results in the study, 27 athletes exhibited disordered eating: two BN and three EDNOS, 22 had eating disorder behaviors and 138 (84%) of surveyed subjects displayed no eating disorders or disordered eating. Individual eating disorders or disordered eating breakdowns were not listed for specific sports. The authors believe that the ATHLETE questionnaire is able to identify the psychological features in female college athletes with pathological eating (Hinton & Kubas, 2005).
Discussion

The aforementioned screening questionnaires developed particularly for female college athletes focus on different aspects of the athlete. The surveys include questions pertaining to pathologic eating behaviors, psychological elements of eating disorders and physiologic features of abnormal eating behaviors in the female athlete. The pros and cons of each athlete questionnaire have been analyzed with an effort to help clinicians (like PAs) decide which screening test(s) to use.

The earliest athletic questionnaire, the SEDA (Black, 1991b; Guthrie, 1985) was introduced in 1985 in a dissertation by Guthrie. Guthrie’s three topics of interest: factors that provoke eating disorder development, specific factors that contribute to eating disorders in athletics and preventative measures to decrease eating disorders in athletes (Guthrie, 1985) are appropriate in detecting eating disorders. Discovering factors within the athletic milieu that are triggers for athletes’ pathological eating behaviors is important because this information may lead to improved prevention and treatment strategies. However, there are a number of reasons why the SEDA cannot presently be considered accurate in identifying athletes with pathological eating behaviors. The two other surveys
utilized along with the SEDA (BEQ and PMI) utilize DSM-III eating disorder criteria (BEQ) or were not previously validated (PMI). In 1985, Division I and Division II athletics were not as intense, with less pressure and demands placed on student-athletes. This would likely skew results if the SEDA is used now. Further, more epidemiological analyses need to be performed on the SEDA and should be compared with more recent athlete questionnaires. The three focal points identified by Guthrie may be useful in future questionnaires because they are pertinent to the lives of athletes. The SEDA should not be used on female college athletes until it has been modified to fit the most current DSM criteria and after more research has been performed analyzing its reliability and validity.

The AMDQ (Nagel, et al., 2000) is used to detect both eating disorders and disordered eating, which is beneficial because female athletes more often present with disordered eating rather than clinical eating disorders (Sanford-Martens, 2005; Sundgot-Borgen & Torstveit, 2004). However, the techniques used to create the survey items incorporated in the AMDQ are not appropriate. Both DSM-IV and DSM-III were used for eating disorder criteria. Since DSM-IV is the most current criteria, only it should be used. Another method used to create survey questions was by using what researchers believed were
athletic environmental effects on athletes' eating habits. These thoughts or items; however, were not stated in the research and thus cannot fully be analyzed. The three subsets of the AMDQ are confusing and the actual numbers of items or questions of the final questionnaire were not stated. Since the AMDQ produced high sensitivity and specificity, the authors should have provided the reader with the actual questionnaire or at least examples of the questions that were incorporated in the survey. This would allow future researchers to gain more information about the survey, trial it on additional athletes and potentially develop improved surveys. The AMDQ subsets appear to be accurate measures because they produced much better results on sensitivity, yield, accuracy and validity than the EDI-2 and BULIT-R. The percentages of athletes with eating disorders and disordered eating were similar to previous prevalence studies. The AMDQ should not be utilized to identify female college athletes with eating disorders or disordered eating until the most current DSM criteria is used. Subsequently, the questionnaire will need to be further tested on large samples of female college athletes before clinical use would be appropriate.

The FAST questionnaire (Affenito, et al., 1998; McNulty, et al., 2001) contains 33 items that inquire about the athletes'
psychological feelings dealing with weight concerns and non-confrontational questions focusing on physical features. This method is favorable since it has the capability to analyze dual aspects of the athletes’ life. The psychological inquisitions which center on perfectionism both in sport performance and physique appear to be appropriate for female college athletes. The physical inquisitions allow for truthful responses because the questions are objective and based on measurements which provide discrete results that can be statistically analyzed. The results of the two published studies evaluating the FAST indicate that it appropriately identifies female athletes with eating disorders, subclinical eating disorders and abnormal exercise habits. However, the low sample sizes (32 and 41 female subjects) used in the studies limit the current usefulness and general application of the results. In the study containing 41 subjects the FAST was able to distinguish between athletes with eating disorders from athletes without eating disorders and athletes with eating disorders from non-athletes with eating disorders. The ability of the FAST to discriminate between the groups is satisfactory; however, the questionnaire must be further studied on a much larger sample to assess epidemiologic analyses and verify it can consistently produce accurate results.
The HWDM questionnaire (Beals & Hill, 2006; Beals & Manore, 2002) was utilized to establish the prevalence of the Female Athlete Triad in female college athletes. The approaches that were used to formulate questions within the survey were via a literature review and general population published questionnaires: the EDI symptom checklist and the EDE-Q. The HWDM is lengthy and is the longest of the athlete questionnaires, including 54 questions. It is beneficial to determine if female athletes are at risk for or suffer from one or more of the components of the Female Athlete Triad; however, the focus of this literature review is on pathological eating, not low bone mineral density or menstrual irregularities. The HWDM includes multiple questions on demographic information, menstrual history, family history, nutritional history, and history of injuries but few questions that deal specifically with pathologic eating. The pathologic eating questions that are included in the HWDM are direct and the survey subject may feel that they are confrontational; which may inhibit the athlete from responding honestly. For instance, one section inquires if the athlete feels they have an eating disorder. The nutritional history section includes questions on specific types of foods and the amount of servings per day consumed of each. Athletes may not accurately know how many servings or each type of food they consume per day or may not want to devote that much
effort and time in determining the answer. The confrontational questions on pathologic eating and the tedious questions about specific amounts of food may lead to false responses from the athletes. The sample populations were of adequate size \([n = 112\) (Beals & Hill, 2006) and \(n = 425\) (Beals & Manore, 2002)] in both studies but the focus of the analysis was on discovering the prevalence of the Female Athlete Triad instead of investigating the accuracy on identifying eating disorders in female college athletes. Further, specific results for each eating disorder within different sports were not mentioned, prohibiting the ability to compare the HWDM against other studies. Further evaluation of the HWDM needs to be performed in order to determine internal consistency, sensitivity, specificity and validity in the female college athlete population.

The CHRIS questionnaire (Steiner, et al., 2003) was developed to detect mental and general health problems in male and female college athletes. The test was made using questions from the JWHS which was created for high school students and student athletes. The high school age group may have less stress and fewer or different sport and school demands compared to college athletes. Although the JWHS was adjusted to fit the lifestyle of college athletes, some of the questions are not pertinent for identifying those with pathologic eating. For
example, the Risk Behavior subscale’s questions ask about the use of seatbelts and helmets. Certainly, the answers to these questions do not provide the same level of risk behavior for adults (female college athletes) as they do for adolescents. Of the four subscales in the CHRIS, only two were directly related to athletes: eating problems and performance pressure. Additionally, some of the questions in the eating problems subscale may be perceived to be confrontational toward the athletes, with direct questions about the use of diet pills and laxatives, skipping meals or eating small portions to lose weight, and self-induced vomiting. Questions like these may make the athlete feel cornered, causing them to answer in a socially conforming way. Further, a question that refers to binge eating asks if the subject has a “problem with over-eating” (Steiner, et al., 2003). This is ambiguous toward the athlete population as athletes may eat more than they normally do (over-eat) to nourish themselves after a rigorous practice or competition. This item needs to be clarified on the questionnaire or via a face-to-face interview following the questionnaire to confirm that the athlete understood the language in the question correctly. The CHRIS was tested on 408 college athletes (180 females and 228 males). This is a larger population size compared to other athlete questionnaires; however, the sports or eating problem percentages within teams
and epidemiologic analyses were not mentioned in the study. Since the focus and majority of questions on the CHRIS deal with general and mental health, the questionnaire is not specific enough for the college athlete population or to screen for pathologic eating.

The purpose of the PST (Black, et al., 2003) is to detect both eating disorders and disordered eating. This is favorable since disordered eating has been found to be much more prevalent than clinical eating disorders. The test contains 18 items: six questionnaire items, eight self report interview items and four physiologic measurements (Black, et al., 2003). The amount of questions permits completion of the survey in a timely manner and the variety of question topics is valuable because it captures different aspects of the athlete’s life. There are two additional beneficial elements to this screening test. First, the questionnaire incorporates physiologic measurements pertaining to pathological eating: body fat percentage, waist to hip ratio, diastolic blood pressure and observation of enlarged parotid glands (Black, et al., 2003). Assessing physiologic measurements in female athletes makes the questionnaire less subjective and non-confrontational, allowing the females to feel more comfortable and hopefully answer truthfully. Secondly, the questionnaire was followed by and compared with the EDE
The EDE is beneficial in many ways including: ability to establish more accurate responses from the athlete, the interviewer is able to explain definitions that the athlete may not understand, the interviewer is able to describe eating disorder characteristics and it allows the athlete to discuss their concerns in detail (Z. Cooper, et al., 1989; Z. Cooper & Fairburn, 1987a). The interview also allows confirmation of responses on the PST, thus producing potentially more accurate results. The researchers applied meticulous criteria when choosing items to retain for the questionnaire by using a t test, logistic regression, sensitivity, specificity and Cronbach’s alpha. The PST produced superior results on epidemiologic analyses when compared to the general population questionnaires (EDI-2 and BULIT-R). The eating disorder prevalence results of the PST and the sports with these disorders are congruent with previous studies (Brelsford, Hummel, & Barrios, 1992; D. M. Garner, 1991; D. M. Garner, Rosen, & Barry, 1998). The PST has high sensitivity (86.5%) and specificity (77.7%), captures different features of pathologic eating in athletes and uses a method that is less confrontational towards athletes, suggesting that it is an acceptable screening test for female college athletes. Prior to potential use as a screening test by clinicians, additional
studies that include larger population samples need to be carried out to validate these findings.

The ATHLETE questionnaire (Hinton & Kubas, 2005) has the ability to identify psychological predictors of disordered eating in addition to screening female college athletes for pathologic eating. This is valuable because it allows female athletes to be identified prior to exhibiting disordered eating and therefore may allow for intervention that prevents clinical eating disorders. The questionnaire contains 39 items, which is an appropriate amount that allows the female athlete to complete the survey in a timely manner. This is favorable, especially for this population, based on their busy lifestyle. The modified subscales center on the female athlete and what she may be feeling during this demanding time in her life. The questionnaire parallels this by asking questions pertaining to pressures of the sport she is involved in, college academics, friends and family. Some pathologic eating questions seem confrontational toward the athlete that may lead to a false answer (“When practice is shorter or less intense than usual, do you compensate either by exercising on your own or by eating less?”). Other questions are written in a manner where it is less obvious to the athlete that it is asking about eating pathology (“Because of your sport, are you careful not to gain
weight?). This gives the questionnaire a balance which allows for more accurate and true responses. The high results of internal consistencies amongst all five subscales further confirm that it is a reasonable questionnaire for female college athletes. The actual questionnaire was not given in the study which makes it impossible to gain access to for further testing or clinical use. The epidemiologic results and breakdown of pathologic eating types were not provided for the ATHLETE questionnaire, so it cannot be compared with other studies. Again, provision of the actual questionnaire with the publication and additional research studies with large sample sizes are necessary prior to potential clinical use.
Conclusion

Pathologic eating in female college athletes is a topic that continues to be overlooked and thus goes unrecognized. Seven screening instruments have been created specifically for the female college athlete population and studied in an attempt to validate their results. Unfortunately, none are without shortcomings. Evidence-based practice does not presently support the use of any of these screening techniques. The questionnaire that is most favorable in detecting pathological eating in female college athletes still remains unanswered. Based on the literature, some questionnaires appear to be better than others but further research is needed to establish which questionnaire is best. Of the athlete screening questionnaires, the PST has the most potential due to its ability to identify female college athletes with both DE and ED. It contains self report questions, interview questions and physical measurements. The PST also had high percentages for both sensitivity (86.5%) and specificity (77.7%) (Black, et al., 2003).

In general, self-report questionnaires completed by female college athletes should be followed up with a face-to-face interview to confirm results. However, since the interview is time consuming and expensive it should only be utilized if the results of the questionnaire are significant for DE/ED symptoms.
A post-questionnaire interview can confirm the athlete’s responses, provide full definitions for ambiguous words and allow the athlete to talk freely & express her emotions to the trained interviewer. There is evidence indicating that questionnaires alone may not suffice in finding DE/ED in athletes due to dishonest answers or because of definitional reasons (O'Connor, et al., 1995; Wilmore, 1991).
Limitations and Areas for Future Research

There are several limitations and areas for future research in this area. First, only one or two research articles were available for the majority of questionnaires. This indicates more research per questionnaire needs to be performed. More studies need to be performed on each questionnaire in order to gather more information and to make comparisons between them. Small sample sizes were used in most of the current publications which can produce inaccurate results. Additionally, the sports that were assessed were different between studies making direct comparison impossible. In future research, larger sample sizes must be used and sport teams should be consistent between studies. Further, few published studies provided epidemiologic analyses. Researchers need to verify sensitivity, specificity, validity, accuracy and other epidemiologic analyses for all questionnaires in order to establish which is best. Not all studies specified percentages of ED or DE for sports; providing this may elucidate differences and variability between questionnaires.

Questionnaires should test for all aspects of pathologic eating behaviors such as: DE, pathogenic weight control methods and excessive exercise. Detecting these abnormal problems at an early stage may prevent them from developing fulminant eating
disorders. Assessing questionnaires solely for eating disorders will also produce inaccurate results due to strict DSM criteria. The use of DSM-III eating disorder criteria is no longer acceptable. When creating pathologic eating behavior surveys, the most current DSM criteria should be utilized. The questionnaire must be administered in the absence of athletic personnel so athletes feel comfortable answering truthfully.

In questionnaires, psychological and physiological questions should be asked and questions should be non-confrontational to prevent response bias. The amount of questions needed to detect pathological eating needs to be researched. Questionnaires need to be short to enable athletes to complete them in a timely manner, yet still be able to capture signs and symptoms of pathological eating efficiently.

To establish which screening technique is best, researchers should focus on comparing multiple population specific questionnaires to each other. Subsequently, the questionnaires should be administered to larger samples of female college athletes who represent a variety of sports. Another option is to create a new questionnaire utilizing information from the previous questionnaires and by making comparisons. Establishing the best questionnaire will hopefully allow for earlier
detection of and therefore reduce the prevalence of pathologic eating in female college athletes.
Clinicians (like PAs and athletic trainers) must use their clinical judgment and observations to identify female college athletes with pathological eating. The use of the PST survey is at the discretion of each clinician, as its reliability and validity have only been studied on small sample sizes. Eating disorders and disordered eating need to be viewed just like any other pathology. The female college athlete is at an age and position in life where eating healthy foods, consuming adequate calories and nutrients while obtaining the right amount of exercise are vital for not only for current sport performance, but more importantly for future health. Clinicians must be cognizant of the psychological and physiologic indicators that a female college athlete may suffer from pathological eating. The athlete may feel more comfortable talking to a PA since it is outside of the athletic environment. Therefore, it is important to be available to the athlete as well as respectful and understanding. If the athlete is identified as having multiple characteristics of pathologic eating, it is best to educate without being confrontational. Education should focus on adjusting atypical eating behaviors and including a discussion of potential negative consequences that can occur in the present
and in future years. The intervention of education should include an interdisciplinary team including: PAs or physicians whose focus is in the area of nutrition and psychologists. The PA should explain the importance of replacing calories and nutrients that are expended during strenuous physical activity. Information given on paper or pamphlet should be provided to the female athlete about different types of nutrients and foods that need to be consumed in order to fulfill the calories that are expended during exercise. This information could be given to the athlete during the annual physical exam prior to preseason.

The interdisciplinary team should be present at a yearly physical exam for female college athletes. This exam may include the use of the PST questionnaire, as discussed above and must be performed prior to preseason and away from athletic personnel besides the athletic trainer. The interdisciplinary team should be present because each will be looking at different health aspects of the athlete. Each team member should be aware and use their knowledge to look for signs of possible ED/DE. The physical exam should be performed in a private room away from other team members and coaches. In addition to the PST, the exam should include weight, body mass index (BMI), pulse, heart, lungs and abdomen. The female athlete’s last menstrual period should be documented and time should be allotted for the
athlete to ask questions. The physical exam can be assessed quickly and the physical measurements will allow for a baseline and to make comparisons for future physical exams.

Once positive screening findings indicate likely ED/DE, the female college athlete should seek a medical professional, a PA, MD and/or psychologist who specializes in this area of medicine. They then can specify the final diagnosis of whether the athlete does or does not have an ED/DE. The eating disordered athlete should generally not be removed from practice or activity, however, should continue to be followed up by a physician or PA. Being removed from activity may exacerbate the pathological eating because she may feel out of control, develop a lower self esteem and may continue or advance her disordered eating and excessive exercise (Currie & Morse, 2005; Sundgot-Borgen, 2002). However, action should be taken if the ED/DE athlete shows deleterious physical signs (i.e. cardiac myopathy, insomnia and electrolyte imbalances). The athlete should be removed from competition until she has received help from the interdisciplinary team and is in stable condition to return to competition.

Increasing awareness of, prevention strategies for and education about pathologic eating by health care providers will
allow for earlier diagnosis and hopefully a reduction in eating pathology in female college athletes.
References


Athletes with Eating Disorders and Disordered Eating.


### Table 1

**Psychological Co-morbidities and Physiological Consequences of Eating Disorders**

<table>
<thead>
<tr>
<th>Psychological Co-morbidities</th>
<th>Physiological Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AN</strong></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>Amenorrhea</td>
</tr>
<tr>
<td>Dysthymia</td>
<td>Bradycardia</td>
</tr>
<tr>
<td>Obsessive Compulsive Disorder</td>
<td>Cold intolerance</td>
</tr>
<tr>
<td></td>
<td>Continual weight loss</td>
</tr>
<tr>
<td></td>
<td>Dry skin</td>
</tr>
<tr>
<td></td>
<td>Edema</td>
</tr>
<tr>
<td></td>
<td>Gastrointestinal complaints</td>
</tr>
<tr>
<td></td>
<td>Hypoglycemia</td>
</tr>
<tr>
<td></td>
<td>Hypotension</td>
</tr>
<tr>
<td></td>
<td>Infertility</td>
</tr>
<tr>
<td></td>
<td>Insomnia</td>
</tr>
<tr>
<td></td>
<td>Irritability</td>
</tr>
<tr>
<td></td>
<td>Jaundice</td>
</tr>
<tr>
<td></td>
<td>Lanugo hair</td>
</tr>
<tr>
<td></td>
<td>Low BMI</td>
</tr>
<tr>
<td></td>
<td>Low weight</td>
</tr>
<tr>
<td><strong>BN</strong></td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>Acute pancreatitis</td>
</tr>
<tr>
<td>Depression</td>
<td>Callused knuckles</td>
</tr>
<tr>
<td>Mood disorders</td>
<td>Cardiac arrhythmias</td>
</tr>
<tr>
<td>Substance abuse</td>
<td>Cardiac myopathy</td>
</tr>
<tr>
<td></td>
<td>Chronic constipation</td>
</tr>
<tr>
<td></td>
<td>Electrolyte abnormalities</td>
</tr>
<tr>
<td></td>
<td>Enlarged parotid glands</td>
</tr>
<tr>
<td></td>
<td>Esophageal tear</td>
</tr>
<tr>
<td></td>
<td>Hoarse voice</td>
</tr>
<tr>
<td></td>
<td>Rectal prolapse</td>
</tr>
<tr>
<td></td>
<td>Teeth erosions</td>
</tr>
</tbody>
</table>

*Note: AN = Anorexia Nervosa; BN = Bulimia Nervosa; BMI = Body Mass Index*

*Note: This information is consolidated from the following sources: (Walsh, et al., 2000), (Association, 2000), (Zerbe, 1992), (Currie & Morse, 2005)*
Table 2

Common Eating Disorder Screening Techniques for the General Population

- Eating Attitudes Test (EAT)\textsuperscript{1}
- Eating Disorder Inventory (EDI)\textsuperscript{2}
- Bulimia Test-Revised (BULIT-R)\textsuperscript{3,9}
- Setting Conditions for Anorexia Nervosa Scale (SCANS)\textsuperscript{4}
- Body Shape Questionnaire (BSQ)\textsuperscript{5}
- Eating Disorder Examination (EDE)\textsuperscript{6,7}
- Eating Disorder Inventory-2 (EDI-2)\textsuperscript{8}
- Questionnaire for Eating Disorder Diagnoses (Q-EDD)\textsuperscript{10}
- Juvenile Wellness and Health Survey (JWHS-76)\textsuperscript{11}

Note: This information is consolidated from the following sources: \textsuperscript{1}(D. M. Garner & Garfinkel, 1979), \textsuperscript{2}(David M. Garner, Olmstead, & Polivy, 1983), \textsuperscript{3}(Smith & Thelen, 1984), \textsuperscript{4}(Slade, Phil, & Dewey, 1986), \textsuperscript{5}(J. P. Cooper, M.J., Cooper, & Fairburn, 1987), \textsuperscript{6}(Z. Cooper & Fairburn, 1987), \textsuperscript{7}(Z. Cooper, et al., 1989), \textsuperscript{8}(D. M. Garner, 1991), \textsuperscript{9}(Brelsford, et al., 1992), \textsuperscript{10}(Mintz, O'Halloran, Mulholland, & Schneider, 1997), \textsuperscript{11}(Steiner, et al., 1998)
<table>
<thead>
<tr>
<th>Questionnaire</th>
<th># of Questions</th>
<th>Question Type</th>
<th>Pathological Eating Behavior Tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAT</td>
<td>40</td>
<td>6 Point Likert Scale</td>
<td>AN</td>
</tr>
<tr>
<td>EDI</td>
<td>64</td>
<td>6 Point Likert Scale</td>
<td>AN and BN</td>
</tr>
<tr>
<td>BULIT-R</td>
<td>28</td>
<td>Multiple Choice</td>
<td>BN</td>
</tr>
<tr>
<td>SCANS</td>
<td>40</td>
<td>5 Point Likert Scale</td>
<td>AN</td>
</tr>
<tr>
<td>BSQ</td>
<td>34</td>
<td>6 Point Likert Scale</td>
<td>AN and BN</td>
</tr>
<tr>
<td>EDE</td>
<td>62</td>
<td>Interview Questions</td>
<td>AN and BN</td>
</tr>
<tr>
<td>EDI-2</td>
<td>91</td>
<td>6 Point Likert Scale</td>
<td>AN and BN</td>
</tr>
<tr>
<td>Q-EDD</td>
<td>50</td>
<td>&quot;Yes&quot; or &quot;No&quot;</td>
<td>AN Restrictor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AN Bulimic</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EDNOS Subthreshold Bulimia</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Menstruating AN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nonbinging Bulimia</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Binge Eating Disorder</td>
</tr>
<tr>
<td>JWHS-76</td>
<td>104</td>
<td>5 Point Likert Scale</td>
<td>General and Mental Health</td>
</tr>
</tbody>
</table>

Note: * = Not specified; AN = Anorexia Nervosa; BN = Bulimia Nervosa; EDNOS = Eating Disorder Not Otherwise Specified

Note: This information is consolidated from the following sources:
**Table 4**

*General Population Eating Disorder Screening Techniques’ Subject Information*

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th># of Subjects</th>
<th>Mean Age</th>
</tr>
</thead>
</table>
| EAT$^2$       | 2 Normal F groups: 34 & 59  
2 AN F groups: 32 & 33  
Normal M: 49  
Obese subjects: 16  
Clinically Recovered AN subjects: 9 | Normal F: 22.3  
AN F: 22.4  
Normal M: *  
Obese: *  
Clinically Recovered AN: * |
| EDI$^2$       | AN F: 113  
Normal F: 577  
Normal M: 166 | AN: 21.8  
Normal F: 19.9  
Normal M: 20.3 |
| BULIT-R$^{3,9}$ | BN F: 39 | * |
| SCANS$^4$     | Normal: 697 F; 25 M  
AN: 19 F; 1 M  
BN: 20 F | Normal: 18.3  
AN: 22.8  
BN: 22.6 |
| BSQ$^5$       | Normal: 535 F  
BN: 38 F | Normal F: 21.7  
BN F: 22.2 |
| EDE$^6,^7$    | Normal: 42 subjects  
AN: 47 patients  
BN: 53 patients | Normal: 21.3  
AN: 20.5  
BN: 22.1 |
| EDI-2$^8$     | 155 ED patients | * |
| Q-EDD$^{10}$  | Study 1: Normal F: 103; ED F: 33 | 19.0 |
| JWHS-76$^{11}$ | Normal: 1,769  
M: 52.1%  
F: 47.9% | 15.9 |

*Note: * = Not specified; AN = Anorexia Nervosa; BN = Bulimia Nervosa; F = Female(s); M = Male(s)
Continued from page 74

Note: This information is consolidated from the following sources:
## Table 5

**General Population Eating Disorder Screening Techniques’ Epidemiologic Analysis Information**

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Internal Consistency (Cronbach’s α)</th>
<th>Other Methods Used to Assess Validation</th>
</tr>
</thead>
</table>
| EAT¹          | 0.94                                | **Concurrent Validity:** \( r = 0.87, p < 0.001 \)  
**Discriminant Validity:** ANOVA found mean significant differences between normal, AN and obese groups \( p < 0.001 \)  
Clinically recovered AN subjects scored in normal range indicating EAT is accurate for this group |
| EDI²          | 0.63                                | **Criterion Validity** (t-tests & ANOVA): AN group had significantly higher (\( p < 0.001 \)) scores on all subscales than controls  
**Discriminant Function Analysis:** all subscales had 91.7% chance to correctly classify AN & controls |
| BULIT-R³,⁴    | 0.93                                | **Test-retest Reliability:** 0.83 (\( p < 0.05 \))  
**Construct Validity:** scores significantly correlated with symptom measures; binge eating (\( r = 0.65, p < 0.05 \)) and purging (\( r = 0.60, p < 0.05 \)) |
Continued from page 76

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Internal Consistency (Cronbach’s α)</th>
<th>Other Methods Used to Assess Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCANS⁵</td>
<td>0.66 – 0.90</td>
<td><strong>Discriminant Validity:</strong> ED patients scored significantly higher (p &lt; 0.001) than normal subjects</td>
</tr>
<tr>
<td>EDE⁶,⁸</td>
<td>0.67 – 0.90</td>
<td><strong>Discriminant Validity:</strong> ED patients score significantly higher (p &lt; 0.001) than normal subjects</td>
</tr>
<tr>
<td>BSQ⁷</td>
<td>*</td>
<td><strong>Discriminant Validity:</strong> ED patients scored significantly higher (p &lt; 0.000) than normal subjects</td>
</tr>
<tr>
<td>EDI-2⁹</td>
<td>0.44 – 0.93</td>
<td><strong>Test-retest Reliability:</strong> 0.79 – 0.95</td>
</tr>
<tr>
<td>JWHS-76¹⁰</td>
<td>0.56 – 0.81</td>
<td><strong>Spearman Correlation:</strong> (r = 0.06 – 0.59, p &lt; 0.05) [Kaiser’s Measure of Sampling Adequacy:** acceptable at 0.77</td>
</tr>
</tbody>
</table>

**Note:** * = Not specified; AN = Anorexia Nervosa; BN = Bulimia Nervosa; F = Female(s); M = Male(s)

**Note:** This information is consolidated from the following sources: ¹(D. M. Garner & Garfinkel, 1979), ²(David M. Garner, et al., 1983), ³(Smith & Thelen, 1984), ⁴(Brelsford, et al., 1992), ⁵(Slake, et al., 1986), ⁶(Z. Cooper & Fairburn, 1987b), ⁷(J. P. Cooper, et al., 1987), ⁸(Z. Cooper, et al., 1989) ⁹(D. M. Garner, 1991), ¹⁰(Steiner, et al., 1998)
### Table 6

**Questionnaire of Eating Disorder Diagnoses (Q-EDD) Subjects, Content Validity, Test-Retest Reliability and Convergent Validity**

<table>
<thead>
<tr>
<th>Study</th>
<th>Subjects</th>
<th>Content Validity</th>
<th>Test-retest Reliability</th>
<th>Convergent Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Revision of WMQ; 7 ED experts confirmed questions were appropriate and paralleled DSM-IV criteria</td>
<td>1-3 months ED &amp; nonED: 0.64 ED, Sx, Asx: 0.54</td>
<td>Compare diagnoses of Q-EDD against scores on BULIT-R &amp; EAT BULIT-R scores of the Q-EDD BN vs nonBN t (133) = 6.67, p &lt; 0.0001 EAT scores of the Q-EDD AN vs nonED t (104) = 3.65, p &lt; 0.001</td>
</tr>
<tr>
<td>Study 1</td>
<td>1,400 F</td>
<td>*</td>
<td>1-2 weeks ED &amp; nonED: 0.94 ED, Sx, Asx: 0.85</td>
<td>ANOVA: Q-EDD (ED, Sx, Asx) &amp; EAT F (2, 158) = 24.13, p &lt; 0.0001</td>
</tr>
<tr>
<td>Study 2</td>
<td>167 F</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Study 3</td>
<td>37 F:</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

Note: ED = Eating Disorder; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; WMQ = Weight Management Questionnaire; PWCM = Pathogenic Weight Control Methods; Sx = Symptomatic; Asx = Asymptomatic

Note: This information is consolidated from the following sources: (Mintz, et al., 1997)
<table>
<thead>
<tr>
<th>Study</th>
<th>Interscorer Agreement</th>
<th>Criterion Validity</th>
<th>Incremental Validity</th>
<th>Predictive Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Compare diagnoses by Q-EDD against clinical interviews</td>
<td>Test agreement of Q-EDD diagnoses against clinical interviews diagnoses against agreement of published instruments diagnoses against clinical interviews diagnoses</td>
<td></td>
</tr>
<tr>
<td>Study 1</td>
<td>100%</td>
<td>Accuracy</td>
<td>BULIT-R &amp; Q-EDD diagnosed 7 BN; Q-EDD diagnosed 125 nonBN &amp; BULIT-R diagnosed 120 nonBN; Q-EDD misdiagnosed 2 nonBN &amp; BULIT-R misdiagnosed 6 BN</td>
<td>False (-): 3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ED &amp; nonED: 98%</td>
<td></td>
<td>False (+): 2%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ED, Sx, Asx: 90%</td>
<td></td>
<td>Sensitivity: 97%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Specificity: 98%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(+) Predictive Power: 94%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(-) Predictive Power: 99%</td>
</tr>
<tr>
<td>Study 2</td>
<td>100% agreement</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Study 3</td>
<td>*</td>
<td>False (-): 22%</td>
<td>*</td>
<td>No misses between AN and BN:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensitivity: 78%</td>
<td></td>
<td>Sensitivity: 100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accuracy: 78%</td>
<td></td>
<td>Accuracy: 100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>False (-): 0%</td>
</tr>
</tbody>
</table>

Note: ED = Eating Disorder; *DSM-IV* = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; WMQ = Weight Management Questionnaire; PWCM = Pathogenic Weight Control Methods; Sx = Symptomatic; Asx = Asymptomatic

Note: This information is consolidated from the following sources: (Mintz, et al., 1997)
Table 8

Eating Disorder Screening Techniques for Female College Athletes

- Survey of Eating Disorders Among Athletes (SEDA)\(^1,2,3\)
- The Athletic Milieu Direct Questionnaire (AMDQ)\(^5\)
- The Female Athlete Screening Tool (FAST)\(^4,6\)
- The Health, Weight, Dieting and Menstrual History Questionnaire (HWDM)\(^7,11\)
- The College Health Related Information Survey (CHRIS)\(^8\)
- The Physiologic Screening Test\(^9\)
- ATHLETE Questionnaire\(^10\)

Note: This information is consolidated from the following sources:
<table>
<thead>
<tr>
<th>Name of Instrument</th>
<th># of Female Athletes</th>
<th>Mean Age</th>
<th>School(s)</th>
<th>Sport &amp; Pathologic Eating Percentage</th>
</tr>
</thead>
</table>
| SEDA               | 158                  | *        | 5 universities & colleges in Ohio with > 10,000 enrolled to simulate DI & DII schools in 1984-1985 | CC: BN: 23.1%  
Diving: BN: 16.7%  
Gymnastics: BN: 27.3%  
Swimming: BN: 18.5%  
Synchronized swimming: BN: 23.5%  
Tennis: BN: 9.1%  
Track (field): BN: 5.6%  
Track (running): BN: 3.0%  
AN restricting: 7.4%  
AN bulimic: 11.1%  
Bulimia: 18.5%  
Binge eating: 63.0%  
-EDs not specified besides BN |

Note: * = was not provided in study; CC = Cross Country; DE = Disordered Eating; ED = Eating Disordered

Note: This information is consolidated from the following sources: (Black, 1991b, 1991e; Guthrie, 1985)
Table 10

Number of Athletes, Mean Age, School and Percent of Pathologic Eating in Sport for AMDQ

<table>
<thead>
<tr>
<th>Name of Instrument</th>
<th># of Female Athletes</th>
<th>Mean Age</th>
<th>School(s)</th>
<th>Sport &amp; Pathologic Eating Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMDQ</td>
<td>149</td>
<td>20.0</td>
<td>*</td>
<td>Total: 65% DE; 25% BN; 8% EDNOS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Basketball: 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cheerleading: 3 BN; 1 NOS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Dance company: 3 BN; 1 AN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Modern dance: 1 BN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Golf: 1 BN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gymnastics: 1 NOS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Softball: 0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Swimming: 4 BN; 1 NOS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tennis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Track &amp; CC: 1 BN; 1 NOS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Volleyball</td>
</tr>
</tbody>
</table>

Note:
* = was not provided in the study
CC = Cross Country
DE = Disordered eating
ED = Eating disordered

Note: This information is consolidated from the following sources:
(Nagel, et al., 2000)
### Table 11

**Number of Athletes, Mean Age, School and Percent of Pathologic Eating in Sport for FAST**

<table>
<thead>
<tr>
<th>Name of Instrument</th>
<th># of Female Athletes</th>
<th>Mean Age</th>
<th>School(s)</th>
<th>Sport &amp; Pathological Eating Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAST</td>
<td>41</td>
<td>20.5</td>
<td>University of Connecticut &amp; St. Joseph College</td>
<td>Crew: 2.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Track &amp; CC: 1.6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lacrosse: 0.8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Soccer: 1.6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Softball: 1.6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-EDs not specified</td>
</tr>
</tbody>
</table>

Note: * = was not provided in the study; CC = Cross Country; DE = Disordered eating; ED = Eating disordered

Note: This information is consolidated from the following sources:
(Affenito, et al., 1998; McNulty, et al., 2001)
Table 12

Number of Athletes, Mean Age, School and Percent of Pathologic Eating in Sport for HDWM

<table>
<thead>
<tr>
<th>Name of Instrument</th>
<th># of Female Athletes</th>
<th>Mean Age</th>
<th>School(s)</th>
<th>Sport &amp; Pathologic Eating Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDWM</td>
<td>BH: 112, BM: 425</td>
<td>BH: 19.5, BM: 19</td>
<td>BH: Division II, BM: 7 universities</td>
<td>BH: Lean, Diving, CC, Swimming, Track (sprinting), Non-Lean, Field hockey, Softball, Tennis, Track (field) Self Reported ED: 3.5%, DE: 20% -EDs not specified per sport</td>
</tr>
</tbody>
</table>

Note: * = was not provided in study; CC = Cross Country; DE = Disordered Eating; ED = Eating Disordered; BH = Beals & Hill; BM = Beals & Manore; Aesthetic = Cheerleading, Diving, Gymnastics; Endurance = Basketball, CC, Track (running), Field Hockey, Crew, Soccer, Swimming, Water Polo; Team/Aerobic = Track (field), Golf, Softball, Tennis, Volleyball

Note: This information is consolidated from the following sources:
(Beals & Hill, 2006; Beals & Manore, 2002)
## Table 13

**Number of Athletes, Mean Age, School and Percent of Pathologic Eating in Sport for CHRIS**

<table>
<thead>
<tr>
<th>Name of Instrument</th>
<th># of Female Athletes</th>
<th>Mean Age</th>
<th>School(s)</th>
<th>Sport &amp; Pathologic Eating Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHRIS</td>
<td>408</td>
<td>19.3</td>
<td>Stanford University</td>
<td>*</td>
</tr>
</tbody>
</table>

*Note: * = was not provided in the study; CC = Cross Country; DE = Disordered eating; ED = Eating disordered

*Note: This information is consolidated from the following sources: (Steiner, et al., 2003)*
<table>
<thead>
<tr>
<th>Name of Instrument</th>
<th># of Female Athletes</th>
<th>Mean Age</th>
<th>School(s)</th>
<th>Sport &amp; Pathologic Eating Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiologic Screening Test</td>
<td>148</td>
<td>20.1</td>
<td>Division I Midwest university</td>
<td>Basketball: 0% ED; 0% DE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Softball: 0% ED; 0% DE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Swimming: 25% ED; 15% DE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tennis: 0% ED; 25% DE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Track &amp; Field: 13% ED; 25% DE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Volleyball: 0% ED; 13% DE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CC: 0% ED; 45% DE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Golf: 10% ED; 30% DE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gymnastics: 17% ED; 50% DE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cheerleading: 33% ED; 11% DE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Dance Company: 13% ED; 20% DE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Modern Dance: 9% ED; 45% DE</td>
</tr>
</tbody>
</table>

Note: * = was not provided in study; CC = Cross Country; DE = Disordered Eating; ED = Eating Disordered
Note: This information is consolidated from the following sources: (Black, et al., 2003)
Table 15

Number of Athletes, Mean Age, School and Percent of Pathologic Eating in Sport for ATHLETE

<table>
<thead>
<tr>
<th>Name of Instrument</th>
<th># of Female Athletes</th>
<th>Mean Age</th>
<th>School(s)</th>
<th>Sport &amp; Pathologic Eating Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATHLETE</td>
<td>167</td>
<td>20.0</td>
<td>*</td>
<td>Volleyball, Swimming, Basketball, CC, Soccer, Gymnastics, Lacrosse, Track &amp; Field, -EDs not specified</td>
</tr>
</tbody>
</table>

Note: * = was not provided in the study; CC = Cross Country; DE = Disordered eating; ED = Eating disordered

Note: This information is consolidated from the following sources:
(Hinton & Kubas, 2005)
Table 16

Athlete Screening Techniques’ Items, Internal Consistency and Validity

<table>
<thead>
<tr>
<th>Name of Instrument</th>
<th>Number of Questions/ Items</th>
<th>Internal Consistency (Cronbach’s α)</th>
<th>Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEDA(^1,2,3)</td>
<td>33</td>
<td>Factors related to ED onset: 0.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Athletic factors that contribute: 0.90</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preventative measures to decrease ED: 0.73</td>
<td></td>
</tr>
<tr>
<td>AMDQ(^2)</td>
<td>19</td>
<td>0.87</td>
<td>58.0%</td>
</tr>
<tr>
<td>FAST(^4,6)</td>
<td>33</td>
<td>0.88 and 0.87</td>
<td></td>
</tr>
<tr>
<td>HDWM(^7,11)</td>
<td>54</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>CHRIS(^8)</td>
<td>32</td>
<td>Mental Health: 0.80</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eating Problems: 0.77</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Risk Behaviors: 0.87</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Performance Pressure: 0.71</td>
<td></td>
</tr>
<tr>
<td>Physiologic Screening Test(^9)</td>
<td>18</td>
<td>0.60</td>
<td>63.9%</td>
</tr>
<tr>
<td>ATHLETE(^10)</td>
<td>39</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

Note: * = was not provided in the study

Note: This information is consolidated from the following sources:
<table>
<thead>
<tr>
<th>Name of Instrument</th>
<th>Specificity</th>
<th>Sensitivity</th>
<th>False Positives</th>
<th>False Negatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEDA&lt;sup&gt;1,2,3&lt;/sup&gt;</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>AMDQ&lt;sup&gt;5&lt;/sup&gt;</td>
<td>77.2%</td>
<td>79.6%</td>
<td>20.4%</td>
<td>18.0%</td>
</tr>
<tr>
<td>FAST&lt;sup&gt;4,6&lt;/sup&gt;</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>HDWM&lt;sup&gt;7,11&lt;/sup&gt;</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>CHRIS&lt;sup&gt;8&lt;/sup&gt;</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Physiologic Screening Test&lt;sup&gt;9&lt;/sup&gt;</td>
<td>77.7%</td>
<td>86.5%</td>
<td>22.3%</td>
<td>15.4%</td>
</tr>
<tr>
<td>ATHLETE&lt;sup&gt;10&lt;/sup&gt;</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

Note: * = was not provided in the study
Note: This information is consolidated from the following sources:
<sup>1</sup>(Guthrie, 1985), <sup>2</sup>(Black, 1991b), <sup>3</sup>(Black, 1991e), <sup>4</sup>(Affenito, et al., 1998), <sup>5</sup>(Nagel, et al., 2000), <sup>6</sup>(McNulty, et al., 2001), <sup>7</sup>(Beals & Manore, 2002), <sup>8</sup>(Steiner, et al., 2003), <sup>9</sup>(Black, et al., 2003), <sup>10</sup>(Hinton & Kubas, 2005), <sup>11</sup>(Beals & Hill, 2006)
Abstract

Objective:
Pathological eating behaviors (PEBs) are prevalent in female collegiate athletes. This literature review analyzed seven screening tools for PEBs in this population.

Methods:
A search was performed using PubMED, CINAHL, SPORTDiscus, PSYCHinfo and Science Citation Index. Fifty-seven articles met study criteria and were reviewed.

Results:
Problems within the seven questionnaires included: only one or two research articles were available, small sample sizes were assessed, the most current DSM criteria was not always utilized, sports assessed were different between studies, few studies provided epidemiologic analyses and not all studies specified percentage of PEBs for sports.

Conclusion:
Evidence-based practice does not definitively support the use of a screening technique for this population. An interdisciplinary team should perform a preseason examination to identify female college athletes with PEBs. Since the PST has the most promising findings it may be used in this setting. Further research is necessary on this topic.