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Psychosocial Correlates of Bulimic Symptoms Among NCAA Division-I Female Collegiate Gymnasts and Swimmers/Divers

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In this study, we tested Petrie and Greenleaf's (2007) model of bulimic symptoms in two independent samples of female collegiate swimmers/divers and gymnasts. Structural equation modeling revealed support for the model, although it also suggested additional pathways. Specifically, general societal pressures regarding weight and body were related to the internalization of those ideals and, subsequently, to increases in body dissatisfaction. Pressures from the sport environment regarding weight and appearance were associated with more body dissatisfaction and more restrictive eating. Body dissatisfaction was related to more feelings of sadness, anger, and fear among the athletes. Negative affect, body dissatisfaction, and dietary restraint were related directly to bulimic symptoms, accounting for 55–58% of its variance. These results suggest that general sociocultural pressures are influential, but weight and appearance pressures in the sport environment may be even more pervasive and negative for female athletes.

Keywords: health, psychology, sport psychology, gender, body image, eating disorders

Eating disorders are one of the most common psychological disorders experienced by girls and women (Stice & Shaw, 2002). Lifetime prevalence estimates using DSM-IV (American Psychiatric Association [APA], 2000) criteria are .9% (anorexia nervosa), 1.5% (bulimia nervosa), and 3.5% (binge eating disorder) for women (Hudson, Hiripi, Pope, & Kessler, 2007). Regarding subclinical or symptomatic levels of eating disturbance, prevalence rates may approach 40% in female undergraduates (Cohen & Petrie, 2005), and often cause distress and impairment at levels similar to those found with clinical disorders. For example, in a study of female undergraduates, Cohen and Petrie (2005) found that symptomatic women were similar to those who were classified as eating disordered on measures of negative affect (i.e., anxiety, shame), negative thinking (i.e., catastrophizing), body image concerns, and internalization of societal ideals (i.e., importance of being

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physically fit), and both groups had significantly higher levels of distress on these measures than did the asymptomatic group.

Among women, athletes historically have been considered a population at increased risk for disordered eating attitudes and behaviors, especially for lean-body or aesthetic sports, and prevalence research supports this contention (e.g., Sanford-Martens et al., 2005). For example, within a large sample of female collegiate athletes drawn from across the United States and representing 17 sports, 2% were classified as eating disordered, 25.5% as symptomatic, and 72.5% as asymptomatic (Greenleaf, Petrie, Carter, & Reel, 2009). In a study that included diagnostic interviews, Sundgot-Borgen and Torstveit (2004) found rates of 0–2% (anorexia nervosa), 1.1–6% (bulimia nervosa), and approximately 8% (eating disorders, not otherwise specified) among elite female athletes; all prevalences were higher than found among a matched group of nonathletes. Further, Petrie, Greenleaf, Carter, and Reel (2009) reported that (1) subclinical disorders were more prevalent for female athletes than clinical disorders; (2) subclinical and clinical groups of athletes did not differ significantly on measures of sociocultural pressures, body image concerns, internalization of the thin ideal, and negative affect; and (3) the two groups had significantly higher levels of disturbance across all psychosocial and disordered eating measures than asymptomatic female athletes.

Athletes' slightly higher prevalence than nonathletes may be due, in part, to the pressures they experience from society in general *and* the sport environment in particular. Athletes are not immune to the messages that exist for women about the centrality of appearance, beauty, and body in determining their worth, and they also experience unique pressures and demands from the sport environment to maintain a strong, lean, fit body that both looks good and performs as needed (Torstveit, Rosenvinge, & Sundgot-Borgen, 2008). In the sport environment, female athletes may experience weight classifications, teammates' body image concerns, "weigh-ins," sport physique ideals, coaches' standards about eating, revealing uniforms/attire, and judges that value body aesthetics over skills/technique, all of which can increase their vulnerability to unhealthy weight management behaviors and attitudes (Petrie & Greenleaf, 2007). Although research has documented that athletes do experience such unique sport pressures (Berry & Howe, 2000), few studies have linked these experiences directly to disordered eating attitudes and behaviors or considered how these pressures might combine with the ubiquitous general societal messages that exist for women about beauty and appearance.

To address this limitation and provide direction for future research, Petrie and Greenleaf (2007) proposed a model to better understand how psychosocial variables might interact and be related to binge eating and bulimic symptoms among athletes. Based on existing eating disorder research (e.g., Stice, 2001, 2002), this model acknowledges the potential influence of both general and sport-specific psychosocial factors. Petrie and Greenleaf hypothesized that general societal pressures to achieve a thin-ideal, sport-specific pressures regarding weight/body shape/performance, internalization of societal beauty ideals, body dissatisfaction, negative affect, dietary restraint, and modeled behaviors by peers/family/teammates all played a role in explaining the presence of bulimic symptoms.

Similar to nonathletes, athletes are exposed to messages and pressures from family, friends, and the media concerning what the ideal body looks like, what constitutes beauty, the value of being thin and attractive, and how women should

be in relationships and behave in relation to food and their bodies. Athletes also receive messages and pressures from teammates, coaches, and other sport personnel (e.g., judges) regarding their weight, eating patterns, body size/shape, and performance. These sport-specific pressures, like general sociocultural ones, can be pervasive and deleterious. Although considerably more research has been conducted regarding the effects of general sociocultural pressures (Stice, 2002), sport-specific pressures also have been associated with disordered eating attitudes and behaviors (Petrie et al., 2009; Reel & Gill, 1996). In fact, female athletes who receive disparaging and critical comments about their bodies or instructions to lose weight from coaches report having more problems with body image and disordered eating than those who have not been told such things (Kerr, Berman & De Souza, 2006; Muscat & Long, 2008). In their model, Petrie and Greenleaf (2007) linked these pressures to the internalization of ideals about appearance, beauty, and body size/shape.

When female athletes internalize societal and/or sport-specific expectations and images and make appearance central to their self-evaluation, they are hypothesized to be at increased risk for experiencing body image concerns (Petrie & Greenleaf, 2007). Appearance-conscious female athletes compare their current body size and shape and their self-determined level of attractiveness against the societal and sport-specific standards they have internalized. When they fall short of these internalized ideals, which most do, they will blame themselves for their shortcomings and experience dissatisfaction with their bodies and appearance. In a study of female collegiate athletes, Petrie (1996) found that the greater the difference between actual and ideal body weights, the more dissatisfied they were with their bodies. Among nonathletes, a strong causal link has been documented between internalization and body dissatisfaction (Stice, 2002).

Body dissatisfaction is viewed as a primary precursor of disordered eating, though its effects may be indirect, occurring through two distinct, but related pathways—affect regulation and dietary restraint (Stice, 2001). Concerning affect regulation, Stice (2001) has suggested that women experience negative emotions, such as anger, sadness, guilt, and fear, in conjunction with their body dissatisfaction. In response to these negative emotions, women may use food as a source of comfort. Yet, when women eat to cope with their emotions, they often end up feeling worse about themselves and experiencing continued negative affect. In the restraint pathway, women severely restrict their food intake to change their body's size and shape and thus more closely approximate the societal thin beauty ideal (Stice, 2001). Although dieting may be associated with initial weight loss, extreme restraint is likely to lead to such levels of caloric deficit that physiology overwhelms cognitive restraint and binge eating results. Women become so hungry that they can no longer inhibit their desire to eat and, in those instances, consume large amounts of food in a seemingly uncontrolled manner. When such binges occur, they may feel like failures, become disgusted with themselves, and cope by recommitting to restrict their food intake. Regardless of the pathway, both negative affect and dietary restraint can set up a cycle of bingeing followed by negative emotion (e.g., sadness, anger, shame); a recommitment to restrict; more bingeing; and for some, other forms of purging, such as vomiting or overexercising. Such a cycle can lead to bulimic symptoms because bingeing and purging are the immediate precursors of bulimia nervosa (Stice, 2002).

In addition to negative affect and dietary restraint, Petrie & Greenleaf (2007) proposed that viewing significant other's (e.g., family, teammates) behaviors regarding food, eating, and weight control may increase social conformity. Athletes who see teammates restrict their food intake, exercise in addition to normal training, or disparage their bodies, may experience pressure to conform. Thus, they may adopt similar behaviors to earn the approval or respect of teammates or to attain the perceived rewards/benefits (e.g., improved performances, starting position, compliments about looks). Such modeling by peers and family members has been related directly to the development of eating disorders among nonathletes (Stice, 2002).

The Petrie and Greenleaf (2007) model provides an explanation for how general and sport-specific sociocultural pressures, together, may to increase athletes' bulimic symptoms. Yet, no study to date has tested this model in whole, or even in part, so little is known about the extent to which these variables are associated as hypothesized. Thus, the purpose of this study was to examine the Petrie and Greenleaf model in a large, diverse sample of female collegiate swimmers and gymnasts, two sports where athletes are considered highly vulnerable to disordered eating (e.g., Torstveit et al., 2008). Because this model has not been directly tested or validated previously with athletes, a cross-sectional design was deemed appropriate (Stice, 2002). Based on Petrie and Greenleaf (2007), we hypothesized that (1) sport-specific and general social pressures would be related to higher levels of internalization of beauty and body ideals; (2) internalization would be related to more body dissatisfaction; (3) body dissatisfaction would be associated with negative affect and dietary restraint; and (4) negative affect, dietary restraint, and exposure to modeled behaviors would be related to higher levels of bulimic symptoms.

Method

Participants

Participants were 414 NCAA, Division-I, female collegiate gymnasts ($n = 280$; 20 programs) and swimmers and divers ($n = 134$; 6 programs) drawn from 26 different universities that were located within all regions of the United States. Mean age was 19.14 years ($SD = 1.86$); 129 (31.2%) were freshman, 120 (29%) sophomores, 99 (23.9%) juniors, and 66 (16%) seniors. The student athletes reported having competed at the elite level ($n = 64$; 15.5%), Junior Olympic/Level 10 ($n = 290$, 70%), or Junior Olympic/Level 9 ($n = 60$, 14.5%); 269 (65%) attended school on an athletic scholarship. Regarding race/ethnicity, 341 (82.4%) were Caucasian, 20 (4.8%) Hispanic, 20 (4.8%) Asian-American, 16 (3.9%) African-American, and 1 (.2%) American Indian; 12 (2.9%) designated themselves as "Other," and 4 did not provide any information. The majority reported living with teammates either in the residence halls ($n = 125$, 30.2%) or in apartments ($n = 147$, 35.5%); 123 (29.8%) lived with someone other than teammates and 19 (4.5%) lived at home.

The athletes' mean real and ideal body mass index (BMI) were 22.54 kg/m^2 ($SD = 2.04$) and 21.7 kg/m^2 ($SD = 1.68$), respectively. According to Centers for Disease Control (CDC; n.d.) guidelines, 7 (1.6%) were underweight (BMI < 18.5), 359 (86.7%) normal weight (BMI = 18.5–24.99), and 48 (11.6%) overweight (BMI = 25–29.99). Ninety-nine percent ($n = 410$) had menstruated at least once in the past year, and over 80% ($n = 336$) indicated that they experienced regular periods

(8–12 times per year). Ten (2.4%) reported having been diagnosed previously with an eating disorder; 16 (3.8%) thought that they *might* have one.

Instruments

Demographics. Participants provided information regarding their age, race/ethnicity, year in school, height, weight, ideal weight, menstrual history, living arrangements, athletic history, and past and current eating disorder diagnoses.

Sport Weight Pressures. Modified from Reel and Gill (1996), the 20-item Weight Pressures Scale (WPS) assesses the pressures female athletes experience in their sport environment to diet, change their body size/shape, and/or achieve a certain physical look for their performances. Participants rate how often they experience each pressure on a 6-point Likert scale, ranging from 1, *never,* to 6, *always.* Based on exploratory factor analysis with principle factors extraction and squared multiple correlations as the communality estimates, a two-factor solution that explained 48% of the variance was obtained using the full sample from this study. The two factors were Appearance (five items; pressure by teammates, peers, and spectators to have a thin appearance) and Weight (six items; pressure by coaches/sport to lose weight). Total scores for each factor were the average of the items; higher scores indicate more pressure. Cronbach's alphas were .86 (Appearance) and .90 (Weight) across samples A and B.

General Sociocultural Pressures. Based on the work of Stice and his colleagues (e.g., Stice & Agras, 1998), the 35-item perceived Sociocultural Pressures Scale (PSPS) assesses the amount of pressure women experience in seven different areas, including (1) have a thin body, (2) lose weight, (3) exercise, (4) be more attractive, (5) have the perfect body, (6) diet, and (7) change one's appearance. Within each area, individuals rate the pressure they experience from five different sources—family, female friends, teammates, romantic/dating partners, and the media—using a 5-point Likert scale, that ranges from 1, *never,* to 5, *always*. Total scores were calculated for each area (e.g., lose weight) by averaging the ratings across the sources; higher scores indicate more perceived pressure. Cronbach's alphas were .81 (Thin Body), .78 (Lose Weight), .81 (Exercise), .84 to .88 (Attractive), .85 to .86 (Perfect Body), .82 to .86 (Diet), and .85 (Appearance) across Samples A and B. Two-week test–retest reliability coefficients have ranged from .75 to .96 in a sample of female undergraduates (Stice & Agras, 1998). Stice and colleagues (Stice, 2001; Stice, Shaw, & Nemeroff, 1998) have provided extensive information regarding the validity of the original scale.

Internalization. The 9-item Internalization-General factor from the Sociocultural Attitudes Toward Appearance Questionnaire-3 (SATAQ-3; Thompson, Van den Berg, Roehrig, Guarda, & Heinberg, 2004) assesses the extent to which individuals have internalized general societal messages about beauty, attractiveness, and body size/shape. For each item, individuals rate their agreement using a 5-point Likert scale that ranges from 1, *completely disagree,* to 5, *completely agree*. The scale was parceled into two indicators whose total scores were their respective mean; higher scores indicate greater internalization. Cronbach's alphas were .88 to .90 (Parcel 1) and .91 to .92 (Parcel 2) across Samples A and B. Extensive data concerning the scale's validity has been provided (Thompson et al.).

Body Satisfaction. The seven-item Body Factor from the Body Parts Satisfaction Scale—Revised (BPSS-R; Petrie, Tripp, & Harvey, 2002) assesses satisfaction with one's body size and shape by focusing on specific body parts that are typically associated with dissatisfaction in women (e.g., hips, thighs). For each item, women rate their level of satisfaction using a 6-point Likert scale, ranging from 1, *extremely dissatisfied,* to 6, *extremely satisfied*. Total score is the mean; higher scores indicate more satisfaction. Petrie et al. reported internal consistency (Cronbach's alpha) of .90 in a sample of female undergraduates; alphas were 88 to .89 across Samples A and B. Petrie et al. also provided extensive information concerning the scale's validity. Athletes also responded to a single item on their satisfaction with "overall body size and shape."

The 10-item Body Shape Questionnaire—Revised (BSQ-10-R; Mazzeo, 1999) assesses preoccupation with body size and shape. Each item is rated on a 6-point Likert scale ranging from 1, *never*, to 6, *always*. Total score is the mean; higher scores indicate increased preoccupation. Internal consistency (Cronbach's alpha) was .96 in a sample of female undergraduates (Mazzeo). Cronbach's alphas were .96 to .97 across Samples A and B. Mazzeo found that the BSQ-10-R correlated significantly with the Eating Attitudes Test ($r = .74$) and the Bulimia Test—Revised ($r = .77$) and provided other data concerning the scale's validity.

Dietary Restraint. The 9-item Dietary Intent Scale (DIS; Stice, 1998) measures restrained eating patterns and dieting behaviors. Participants rate each dietary behavior using a 5-point Likert scale ranging from 1, *never,* to 5, *always*. Total score is the mean; higher scores indicate more restraint. The DIS is internally consistent (Cronbach's $\alpha = .94$) and has been shown to be reliable over time (1-month test–retest $\alpha = .92$) in a sample of female undergraduates (Stice, 1998). Cronbach's alphas were .90 to .91 across Samples A and B. Regarding validity, Stice and Shaw (1994) reported that the DIS correlated with the Dutch Retrained Eating Scale ($r = .92$; Van Strien, Frijters, Van Staveren, Defares, & Deurenberg, 1986), a behavioral measure of fat consumption ($r = –.32$), and body dissatisfaction ($r = .48$).

The 10-item Dutch Restrained Eating Scale (DRES; Van Strien et al., 1986) assesses behavioral restraint around food intake. For each dieting behavior, participants rate their frequency of use on a 5-point Likert scale ranging from 1, *never*, to 5, *always*. Total score is the mean; higher scores indicated more restraint in eating behaviors. The DRES is internally consistent (Cronbach's $\alpha = .94$) and reliable over a 1-month period (.92); Cronbach's alphas were .94 across Samples A and B. It also correlates negatively with self-reported caloric intake (Stice, 1998).

Negative Affect. Twenty-three items from the Positive and Negative Affect Schedule—Expanded Form (PANAS-X; Watson & Clark, 1992) assess levels of Fear (six items), Sadness (five items), Anger (six items), and Guilt (six items). For each mood state, participants rate their level of agreement using a 5-point scale that ranges from 1, *very slightly or not at all*, to 5, *extremely*. A mean total score is derived for each negative mood; higher scores indicate stronger negative affect. Cronbach's alphas have ranged between .54 and .98, and 2-month test–retest reliabilities ranged between .64 and .71 in samples of male and female undergraduates (Bagozzi, 1993). Cronbach's alphas were .88 (Fear), .92 to .93 (Sadness), .87 (Anger), and .92 (Guilt) across Samples A and B. Watson and Clark (1992) have provided extensive validity information.

Modeled Behaviors. A 20-item measure was designed for this study to assess the extent to which individuals have seen others engaging in known behavioral indicators of disordered eating, including, dieting behaviors / controlling food, using purging / weight control behaviors, expressing or exhibiting body image concerns, binge eating, and excessively exercising after eating. For each behavior, participants rate the extent to which they have seen family members, coaches, teammates, and friends (romantic, school) engaging in that behavior on 5-point Likert scales that range from 1, *never,* to 5, *always*. Total scores are determined for each behavior by summing across and averaging the ratings of family, coaches, teammates, and friends; higher scores indicate greater presence of that behavior. Cronbach's alpha were .75 to .76 (Dieting), .72 (Purge/Weight Control), .76 to .79 (Body Image Concerns), .80 to .81 (Binge Eating), and .73 to .74 (Excessive Exercise) across Samples A and B.

Bulimic Symptoms. The 36-item Bulimia Test Revised (BULIT-R; Thelen, Mintz, & Vander Wal, 1996) assesses bulimic symptoms based on DSM-IV criteria (APA, 2000). Using a 5-point scale ranging from 1, *absence of a disturbance,* to 5, *extreme disturbance*, individuals rate all 36 items, though only 28 are scored. The BULIT-R was parceled into four indicators of seven items each. A total score was computed for each parcel and ranged from 7, *low*, to 35, *high*. Thelen et al. (1996) reported Cronbach's alpha (.98) and 2-month test–retest reliability (.95) in samples of female undergraduates, and provided extensive data concerning the scale's validity. Cronbach's alphas were .77 to .83 (Parcel 1), .72 to .83 (Parcel 2), .77 to .79 (Parcel 3), and .70 to .74 (Parcel 4) across Samples A and B.

Social Desirability. The 12-item Marlowe-Crowne Social Desirability Scale (MCSD; Form B, Reynolds, 1982) assesses whether an individual is responding in a socially desirable way or presenting themselves in a positive light. For each item, individuals respond *true* or *false*. Total score is the sum and can range from 0, *low*, to 12, *high*. Reynolds (1982) reported a Kuder-Richardson (KR)-20 of .76 and adequate validity 12-item version of the MCSD-Form B in samples of men and women. The KR-20 was .57 to .62 across Samples A and B.

Procedure

Following institutional review board approval to conduct the study, NCAA Division-I gymnastic and swimming/diving head coaches were contacted to solicit their participation. The coaches were notified initially by e-mail regarding the study; follow-up contact was made via phone and e-mail. The coaches were told that the study was funded by an NCAA grant and its purpose was to examine the physical and psychological well-being of collegiate female student athletes. To participate, coaches had to provide permission for their teams to complete our questionnaires during the fall season and to identify a contact person (e.g., athletic trainer) who would administer the surveys. Of the 26 schools, surveys were distributed by athletic trainers ($n = 9$), team managers ($n = 1$), assistant coaches ($n = 3$), and head coaches ($n = 13$). For their assistance, each team contact was paid $150.00 after the completion of the data collection.

A few weeks before the data collection, which occurred during the last 2 weeks of September 2008, team contacts were e-mailed to schedule their administration dates. Contacts were then mailed (1) specific number of surveys needed for that team, (2) standardized instructions, and (3) researcher's contact information. The first author called contacts before data collection to answer any questions they might have.

At the data collection, each athlete received an unsealed envelope that contained the consent form and questionnaires. Athletes did not put their names or any other identifying information on the questionnaires, which were counterbalanced (see Instruments section for a description). Team contacts read instructions and then had the athletes sign the consent form. Participation was voluntary, though no athlete refused to complete the questionnaires. Team contacts left the area so the athletes could complete the questionnaires in private.

When done, athletes sealed the questionnaires and consent forms in the envelope, and then wrote an X across the flap for privacy. The team contact collected the sealed envelopes, and returned them to the first author in the provided postage-paid mailing carton. Inspection of the envelopes revealed that none had been tampered with before being returned to the first author.

Data Analysis

For the 26 teams, team contacts identified 503 athletes who were active and on the team rosters. Of the 503 surveys that were sent, 454 were returned. Of these, 24 were blank and 16 had significant missing data (e.g., entire questionnaires were left blank) and were discarded, giving a participation rate of 91%. Because the purpose of the study was to test Petrie and Greenleaf's (2007) proposed model and then confirm it in a separate sample, the 414 athletes were matched on BMI and then grouped into Sample A (n = 207; exploratory sample) and Sample B (n = 207; confirmatory sample). To ensure that the two samples were similar to each other, they were compared using MANOVAs for each construct's set of measured variables. For all variables, no significant differences were found between the two groups (ps > .05).

Structural equation modeling was used to test the proposed model (Kline, 2005). Confirmatory factor analysis was used to establish the measurement model, which is the relationship of the measured variables to the hypothesized constructs. Once the measurement model was established, the structural model was tested to determine the strength and significance of the proposed pathways among the latent constructs. Given that the data in both Samples A and B demonstrated adequate univariate and multivariate normality and the continuous nature of the latent variable indicators, all models were tested using the robust maximum likelihood estimation procedure provided by version 6.1 of Mplus (Muthén & Muthén, 2010). Both direct and indirect effects were obtained for the pathways in the model. An indirect effect implies a causal relation in which an independent variable (A) generates a mediating variable (B), which in turn generates a dependent variable (C) (Sobel, 1990). In modeling research, the indirect effect is the product of regression estimates, $(A \times B) + (B \times C)$, within this sequence of variable effects (Hanushek & Jackson, 1977).

Two measures, the SATAQ-I and the BULIT-R, were parceled because they were the only indicator of each construct. We followed the approach of previous

structural equation modeling studies (e.g., Little, Cunningham, Shahar, & Widaman, 2002; Wupperman & Neumann, 2006) that have employed item or scale composites (i.e., parcels) as indicators for latent variables. The use of parcels instead of items is beneficial because parcels are more reliable and valid indicators, provide more efficient parameter estimates, have higher communalities, and reduce the number of parameters to be estimated, thus improving the ratio of subjects to estimated parameters (Little et al., 2002). Use of parcels has been shown to be appropriate to the degree that items/scales that make up a parcel reflect a unidimensional latent variable (Bandalos, 2002). Our preliminary analyses provided support for treating the relevant variable scales as unidimensional latent variables, and parcels were computed by averaging subsets of items within each scale or using scale composites as indicators for their respective latent variables.

Results

Data Overview

Correlations, means, and standard deviations among the variables that were part of the final measurement models are presented in Table 1. Although a few of the variables had significant correlations with the MCSD, none of the correlations exceeded .30.

Measurement Model—Sample A

As described in the instrument section, all the measured variables initially were loaded on to their respective factors. Due to poor fit, four measured variables were dropped: BSQ-R (from Body Satisfaction), PANAS-Guilt (from Negative Affect), and purging and binge eating (from Modeled Behaviors). All latent factors were allowed to correlate and all factor correlations were significant ($p < .001$), ranging from –.35 to –.60 and .28 to .83. See Table 2 for the standardized factor loadings and standard errors of each measured variable associated with its latent factor. The overall fit of the final measurement model was good (see Table 3).

Structural Model—Sample A

The hypothesized model (see Figure 1) had a poor fit with the data (see Table 3), including nonsignificant pathways among some of the constructs. Thus, a model respecification was undertaken following the guidelines outlined by MacCallum (1995). Initially, the nonsignificant pathways—between Modeled Behaviors and Disordered Eating, and Sport Pressures to Internalization—were dropped. All remaining pathways in the model were significant and in the expected direction. Next, based on the Lagrange multiplier test statistic and consideration of existing theory and research (e.g., Reel & Gill, 1996, Stice, 2002), three pathways were added to the model: (1) sport pressures to dietary restraint, (2) sport pressures to body satisfaction, and (3) body satisfaction to bulimic symptoms. The resulting respecified model provided a good overall fit to the data (Kline, 2005; see Table 3).

Table 1 Correlation Matrix of Measured Variables in Sample A (n = 207) and Sample B (n = 207)

	Variable	1	2	3	4	5	6	7	8	9	10	11	12
1	WPS1short	1	.60	.63	.60	.50	.46	.56	.64	.51	.35	.35	-.46
2	WPS2short	.52	1	.49	.50	.33	.30	.47	.51	.38	.20	.19	-.30
3	PSPS-lwt	.61	.50	1	.89	.74	.71	.81	.87	.77	.47	.52	-.40
4	PSPS-thbod	.55	.44	.87	1	.74	.71	.81	.87	.76	.41	.44	-.35
5	PSPS-ex	.53	.28	.71	.73	1	.69	.74	.74	.70	.36	.38	-.33
6	PSPS-attract	.47	.33	.64	.73	.67	1	.80	.73	.81	.39	.42	-.35
7	PSPS-perf-bod	.51	.35	.70	.78	.65	.76	1	.86	.83	.46	.48	-.35
8	PSPS-diet	.58	.50	.84	.83	.74	.71	.76	1	.83	.40	.42	-.35
9	PSPS-appear	.51	.40	.76	.75	.63	.77	.77	.81	1	.38	.40	-.35
10	SATpar1	.43	.30	.53	.55	.48	.54	.59	.55	.52	1	.87	-.29
11	SATpar2	.44	.33	.52	.53	.43	.52	.53	.52	.49	.86	1	-.29
12	BPSS-overall	-.56	-.32	-.55	-.51	-.42	-.44	-.47	-.51	-.50	-.53	-.48	1
13	BPSS-body	-.63	-.37	-.63	-.54	-.51	-.43	-.49	-.58	-.53	-.52	-.51	.80
14	PANAS-fear	.16	.17	.22	.19	.23	.18	.23	.25	.20	.17	.14	-.14
15	PANAS-anger	.27	.24	.26	.25	.25	.33	.27	.26	.25	.26	.20	-.19
16	PANAS-sad	.21	.17	.28	.27	.28	.35	.26	.29	.24	.27	.21	-.28
17	DIS	.61	.49	.65	.58	.52	.45	.49	.62	.53	.44	.44	-.51
18	DRES	.68	.51	.62	.57	.53	.45	.53	.58	.51	.44	.43	-.50
19	BULpar1	.60	.34	.54	.54	..45	.49	.51	.55	.49	.50	.44	-.67
20	BULpar2	.54	..35	.54	.51	.40	.42	.50	.51	.46	.42	.40	-.51
21	BULpar3	.57	.25	.55	.54	.41	.44	.52	.51	.47	.46	.42	-.58
22	BULpar4	.40	.18	.48	.46	.36	.38	.44	.41	.39	.36	.34	-.47
23	SDS	-.23	-.20	-.17	-.20	-.20	-.19	-.17	-.22	-.19	-.24	-.18	.12
	M	2.83	3.47	1.82	1.94	2.11	2.09	2.44	2.10	1.98	2.81	2.88	4.18
	SD	1.33	1.38	0.90	0.91	1.01	0.95	0.98	0.92	0.85	0.98	1.05	1.01

Note. Sample A correlations are shown above the diagonal and Sample B below the diagonal. WPS = Weight Pressures Scale Factor 1 (social appearance) Factor 2 (sport/coach); PSPS = Perceived Sociocultural Pressures Scale (lose weight, thin body, exercise, attractiveness, perfect body, diet, change appearance); SATAQ-3 = Sociocultural Attitudes Toward Appearance Scale-3 Parcels 1 and 2; BPSS-R = Body Parts Satisfaction Scale—Revised Body Factor and Overall Body Factor; PANAS-X = Positive Affect Negative Affect Schedule-Expanded; DIS = Dietary Intent Scale; DRES = Dietary Restrained Eating Scale; Q-EDD = Questionnaire for Eating Disorder Diagnoses; BULIT-R = Bulimia Test—Revised; SDS = Social Desirability Scale. Correlations ≤ .13 were not significant; correlations between .14 and .17 were significant at $p < .05$; correlations between .18 and .20 were significant at $p < .005$; correlations > .21 were significant at $p < .0001$.

	Variable	13	14	15	16	17	18	19	20	21	22	23	*M*	*SD*
1	WPS1short	-.53	.29	.31	.27	.64	.67	.59	.53	.54	.41	-.21	2.95	1.36
2	WPS2short	-.33	.23	.24	.20	.54	.55	.47	.44	.34	.28	-.02	3.44	1.40
3	PSPS-lwt	-.45	.35	.43	.37	.54	.51	.55	.51	.53	.50	-.21	1.72	0.90
4	PSPS-thbod	-.40	.31	.36	.33	.49	.48	.48	.45	.48	.46	-.20	1.87	0.92
5	PSPS-ex	-.35	.19	.34	.26	.35	.35	.33	.30	.37	.35	-.22	1.92	0.96
6	PSPS-attract	-.36	.31	.37	.35	.39	.36	.42	.42	.45	.41	-.17	1.94	0.93
7	PSPS-perf-bod	-.39	.24	.40	.31	.46	.47	.49	.49	.49	.45	-.16	2.26	0.92
8	PSPS-diet	-.42	.27	.38	.29	.53	.52	.51	.52	.53	.49	-.16	1.97	0.90
9	PSPS-appear	-.38	.27	.37	.29	.39	.39	.47	.44	.46	.41	-.21	1.92	0.85
10	SATpar1	-.31	.22	.27	.14	.33	.39	.40	.37	.40	.32	-.23	2.68	0.95
11	SATpar2	-.31	.22	.26	.14	.34	.37	.39	.37	.39	.30	-.25	2.72	0.99
12	BPSS-overall	.83	-.26	-.26	-.28	-.45	-.38	-.49	-.44	-.51	-.37	.11	4.17	1.04
13	BPSS-body	1	-.31	-.28	-.25	-.46	-.42	-.50	-.45	-.49	-.37	.11	3.90	1.00
14	PANAS-fear	-.14	1	.59	.60	.33	.27	.38	.36	.33	.33	-.15	2.19	1.10
15	PANAS-anger	-.27	.20	1	.65	.22	.19	.38	.35	.38	.36	-.30	1.88	0.80
16	PANAS-sad	-.28	.50	.57	1	.26	.23	.35	.35	.31	.36	-.06	2.20	0.84
17	DIS	-.57	.19	.28	.25	1	.85	.61	.58	.52	.39	-.08	2.23	0.80
18	DRES	-.59	.15	.23	.23	.88	1	.57	.53	.45	.33	-.10	2.68	0.90
19	BULpar1	-.65	.19	.33	.38	.64	.64	1	.82	.77	.71	-.20	11.87	4.48
20	BULpar2	-.54	.25	.27	.30	.58	.63	.82	1	.79	.74	-.19	13.35	4.30
21	BULpar3	-.60	.20	.25	.29	.51	.54	.79	.85	1	.78	-.21	13.94	5.02
22	BULpar4	-.47	.15	.20	.30	.44	.45	.79	.81	.79	1	-.25	12.28	4.21
23	SDS	.17	-.16	-.23	-.01	-.18	-.21	-.20	-.13	-.17	-.06	1	6.22	2.69
	M	3.91	2.19	1.91	2.19	2.20	2.62	12.17	13.84	14.74	13.06	6.04		
	SD	0.99	1.03	0.77	0.81	0.93	0.96	5.26	5.23	5.36	4.79	2.41		

Table 2 Standardized Parameter Estimates for the Measurement Model (*n* = 207 per Sample)

		Sample A		Sample B	
Latent Variable	Observed Variable	Standardized Factor Loadings	Standard Error	Standardized Factor Loadings	Standard Error
Sport pressures	WPS1short	.884	.024	.832	.029
	WPS2short	.689	.045	.606	.043
Sociocultural pressures	PSPS-change appear.	.870	.021	.858	.021
	PSPS-diet	.942	.010	.917	.024
	PSPS-perfect body	.910	.020	.842	.032
	PSPS-attractiveness	.811	.029	.800	.025
	PSPS-exercise	.800	.027	.789	.025
	PSPS-thin body	.917	.014	.917	.012
	PSPS-lose weight	.922	.015	.903	.013
Internalization	SATAQpar1	.908	.032	.899	.024
	SATAQpar2	.963	.031	.958	.025
Body satisfaction	BPSS-overall	.888	.026	.862	.027
	BPSS-body	.935	.026	.915	.020
Negative affect	PANAS-sad	.800	.043	.761	.045
	PANAS-anger	.810	.046	.767	.053
	PANAS-fear	.736	.042	.665	.052
Restrained eating	DIS	.914	.021	.914	.018
	DRES	.924	.021	.961	.014
Disordered eating	BULIT-Rpar1	.897	.016	.897	.014
	BULIT-Rpar2	.905	.018	.929	.014
	BULIT-Rpar3	.878	.019	.901	.019
	BULIT-Rpar4	.809	.026	.863	.022

Note. WPS = Weight Pressures Scale Factor 1 (pressures from teammates, peers regarding appearance) Factor 2 (pressures from sport/coach regarding weight); PSPS = Perceived Sociocultural Pressures Scale (lose weight, thin body, exercise, attractiveness, perfect body, diet, change appearance); SATAQ-3 = Sociocultural Attitudes Toward Appearance Scale-3 Parcels 1 and 2; BPSS-R = Body Parts Satisfaction Scale–Revised Body Factor and Overall Body Factor; PANAS-X = Positive Affect Negative Affect Schedule–Expanded; DIS = Dietary Intent Scale; DRES = Dietary Restrained Eating Scale; BULIT-R = Bulimia Test-Revised Parcels 1–4.

Within the respecified model, Internalization was associated with the direct effects of Sociocultural Pressures (standardized parameter estimate, $\beta = .51$), which accounted for 26% of this factor's variance. Body Satisfaction was associated with lower levels of Internalization ($\beta = -.14$) and Sport Pressures ($\beta = -.55$); these variables accounted for 38% of the Body Satisfaction variance. Negative Affect

Table 3 Model Fit (*n* = 207 per Sample)

Model	*df*	Satorra–Bentler χ^2	NNFI	CFI	SRMR	RMSEA (90% CI)
Sample A						
Measurement	247	342.64	.95	.96	.04	.04 (.032–.054)
Initial Structural	264	447.61	.92	.90	.19	.06 (.049–.067)
Respecified Structural	199	306.88	.94	.95	.08	.05 (.040–.062)
Sample B						
Measurement	188	308.57	.92	.94	.04	.06 (.044–.067)
Structural	199	319.60	.93	.94	.05	.05 (.043–.065)

Note. NNFI = non-normed fit index (> .95 indicates good fit); CFI = comparative fit index (> .95 indicates good fit); SRMR = standardized root mean squared residual (< .08 indicates good fit); RMSEA = root mean square error of approximation (90% confidence interval; < .06 indicates good fit).

was related to Body Satisfaction (β = –.39), which explained 16% of the variance. Dietary Restraint was associated with the direct effect of Sport Pressure (β = .79), but not Body Satisfaction (β = –.04, *ns*); Sport Pressures accounted for 66% of the variance. Finally, Bulimic Symptoms was explained by the direct effects of Negative Affect (β = .26), Body Satisfaction (β = –.25), and Dietary Restraint (β = .44); these variables accounted for 55% of the variance in Bulimic Symptoms. See Figure 2.

Measurement Model—Sample B

The final measurement model from Sample A was tested in Sample B. All latent factors were allowed to correlate and all factor correlations were significant ($p <$ .001), ranging from –.34 to –.76 and .31 to .82. See Table 2 for the standardized factor loadings and standard errors of each measured variable associated with its latent factor. The overall fit of the model was good (see Table 3).

Structural Model—Sample B

Sociocultural Pressures (β = .64) were related directly to Internalization and accounted for 41% of its variance. Body Satisfaction was based on the direct effects of Internalization (β = –.28) and Sport Pressures (β = –.62), and these variables accounted for 65% of the variance. Negative Affect was explained by the direct effect of Body Satisfaction (β = –.37), which accounted for 14% of its variance. Sport Pressures (β = .84), but not Body Satisfaction (β = –.01, *ns*), were associated directly with Dietary Restraint, accounting for 71% of the variance. Finally, Bulimic Symptoms was explained by the direct effects of Negative Affect (β = .14), Body Satisfaction (β = –.42), and Dietary Restraint (β = .35); these variables accounted for 58% of the variance in Bulimic Symptoms. See Figure 2.

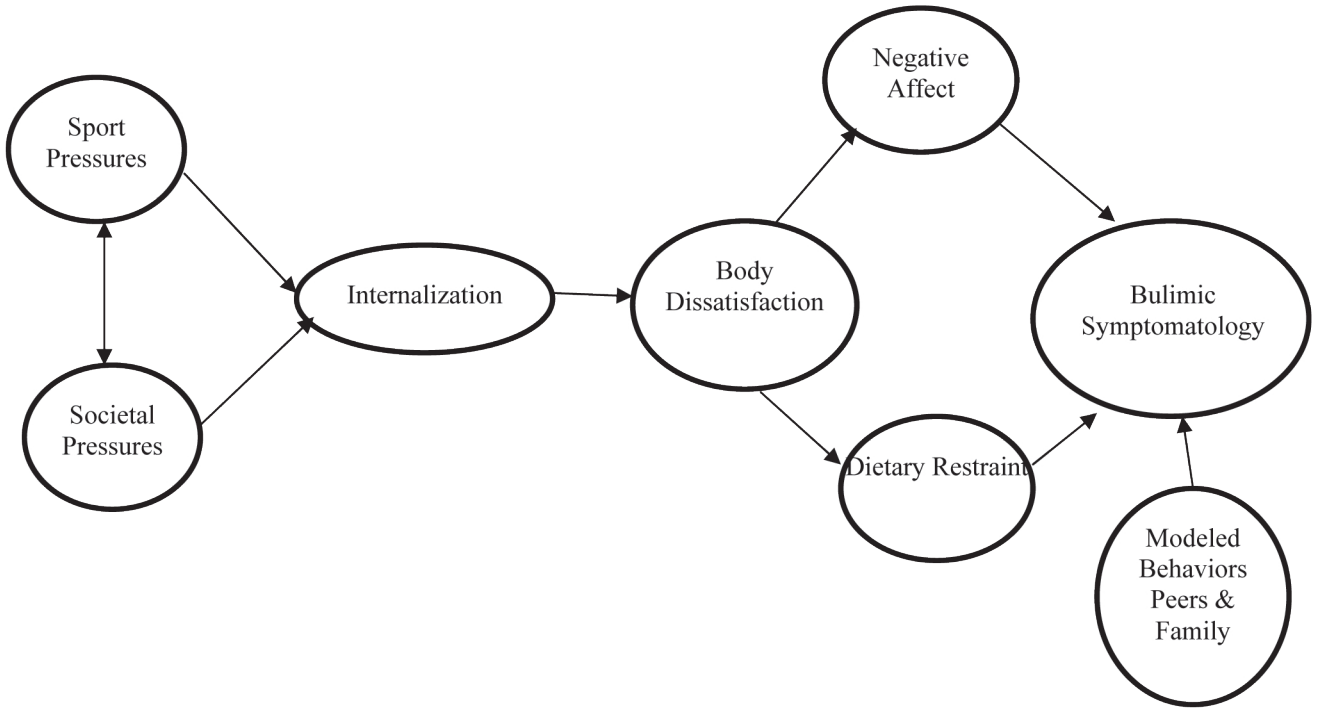

Figure 1 — The Petrie and Greenleaf (2007) model of disordered eating among female athletes.

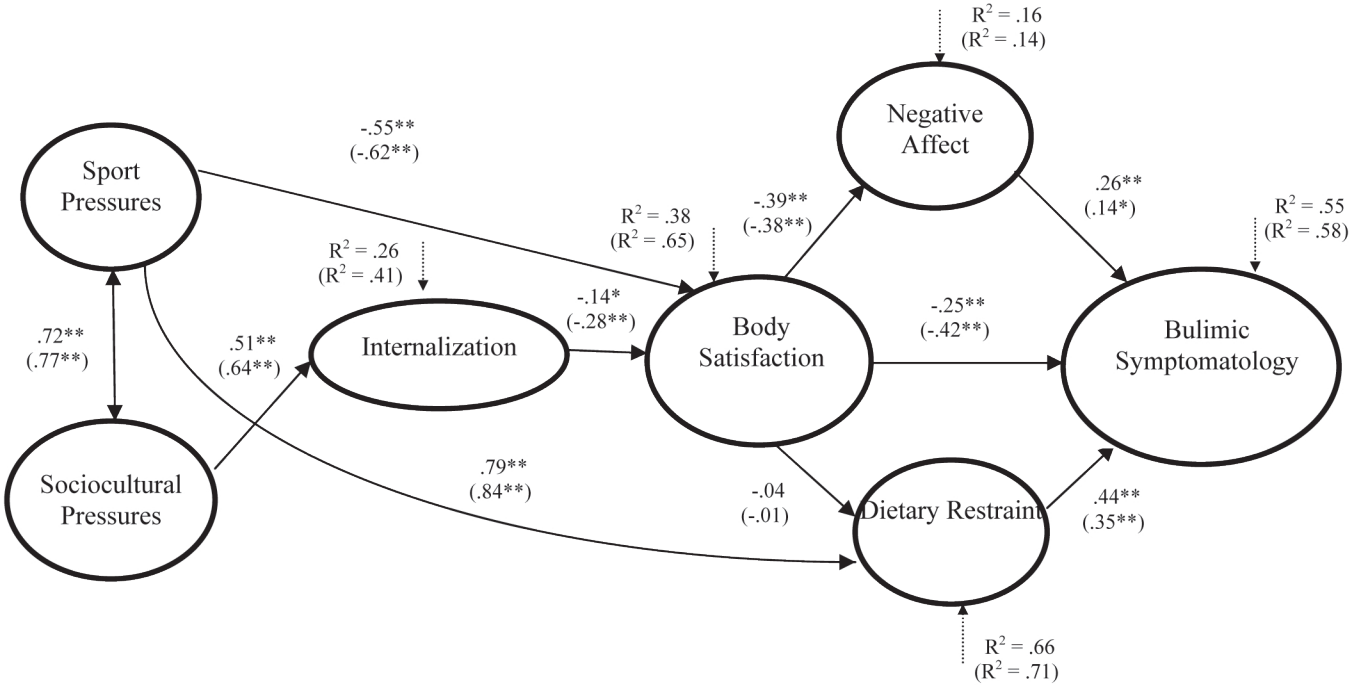

Figure 2 — Respecified model with standardized parameter estimates and R^2 values for Samples A and B. Sample B values are provided in parentheses. *$p < .05$, **$p < .01$.

Indirect Effects—Samples A and B

Across the two samples, similar indirect effects emerged within the respecified model. Sociocultural Pressures (βs = –.07 to –.18) were indirectly related to Body Satisfaction. Sport Pressures (βs = .21 to .23) and Internalization (βs = .05 to .10) had indirect effects on Negative Affect. There were no indirect effects on Dietary Restraint. For Bulimic Symptoms, indirect effects were found with Sport Pressures through Dietary Restraint (βs = .29 to .35) and through Body Satisfaction (βs = .14 to .26); Internalization also was indirectly related to Bulimic Symptoms through Body Satisfaction (β = .10) within Sample A only.

Discussion

The initial test of the Petrie and Greenleaf (2007) model revealed a poor fit with the data. Based on nonsignificant parameter estimates, pathways from Sport Pressures to Internalization and from Modeled Behaviors to Bulimic Symptoms were dropped. We then added pathways from Sport Pressures to Body Satisfaction, from Sport Pressures to Dietary Restraint, and from Body Satisfaction to Bulimic Symptoms, which greatly improved the model's fit, though made the Body Satisfaction to Dietary Restraint pathway nonsignificant (see Figure 2). This respecified model was tested in the second sample and again found to fit the data well; all pathways were significant and in the hypothesized directions (see also Figure 2). The fact that the respecified model fit was confirmed in a second, matched sample suggests that it is valid and may generalize to other comparable samples of female collegiate athletes.

In the respecified model, sociocultural pressures to be thin and attractive were associated with internalization of those beauty and body ideals. The more that female athletes experience social pressures to achieve a certain appearance and body shape, the more likely they are to take on as their own and integrate into their belief systems these images and ideals and view them as central to their self-evaluation. Previous research has demonstrated the powerful influence of sociocultural ideals on young women's beliefs about themselves and their bodies (Stice, 2002; Thompson et al., 2004). Among female collegiate athletes, Petrie et al. (2009) found that those classified as eating disordered and symptomatic reported significantly more pressures regarding their weight from the media, family, and friends than did those who were asymptomatic. These findings support a direct association between general sociocultural pressures and internalization of societal ideals regarding appearance and body in female athlete and nonathlete populations.

Pressures from teammates and coaches regarding appearance and weight were not related to internalization as hypothesized, though it was associated strongly with Body Satisfaction and Dietary Restraint. In addition, Sport Pressures were indirectly related to bulimic symptoms through their effects on athletes' satisfaction with their bodies and the extent to which they restrict their food intake. These direct and indirect effects extend the work of de Bruin, Oudejans, and Bakker (2007) who found a simple relationship between elite gymnasts' frequency of dieting and the pressure they reported feeling from coaches to lose weight. The mediated effects also suggest that pressures in the sport environment are not limited to worsening body dissatisfaction and dietary restraint, but may contribute to female athletes developing an actual eating disorder, which is consistent with other

studies that have shown sport pressures to be associated with increases in eating pathology among female athletes (e.g., Berry & Howe, 2000; Byrne & McLean, 2002). Further, Petrie et al. (2009) found that female collegiate athletes who were classified as eating disordered or symptomatic reported experiencing significantly more pressures about their weight from sport judges and teammates than did the asymptomatic athletes. In their study of current and retired gymnasts, Kerr et al. (2006) reported a strong association between negative comments made by coaches about body size and shape and the gymnasts' belief that they needed to lose weight. For female athletes, particularly those in lean, physique-dependent, or aesthetic sports (e.g., gymnastics), pressures from coaches (and potentially teammates) to have a certain body type and lose weight appears to be associated strongly with body dissatisfaction and pathogenic weight control behaviors, such as restricting food intake. In future studies, researchers may want to determine if the effects of such weight pressures would be as strong among athletes in sports that are not as focused on body and weight (e.g., softball, basketball). Researchers also might test whether certain psychological factors, such as self-esteem, goal orientation, or social support, may moderate its effects, and whether, over the course of a season, such pressures worsen dietary restriction and body dissatisfaction.

The more the female athletes internalized society's ideals concerning beauty, appearance, and body size/shape, the less satisfied they were with their body size and shape, which is consistent with research conducted with nonathletes (e.g., Stice, 2002). Sociocultural Pressures also contributed to lower Body Satisfaction, but indirectly through its effects on Internalization. Because most women fall short of the societal beauty ideal, when physical appearance is central to their self-evaluation they are likely to be disappointed in themselves and their bodies. These women will view their bodies as unacceptable when compared with the internalized ideal and subsequently experience feelings of discomfort and dissatisfaction with how they look and the size and shape of their bodies. Even though athletes generally report greater satisfaction with their bodies and more closely approximate the societal ideal than do nonathletes (Hausenblas & Downs, 2001), internalization of general social appearance ideals appears to still play a role in determining their body satisfaction. This finding raises the question regarding what factors, psychological or physical, reduce the strength of the relationship between these two constructs and if athletes would benefit as much as nonathletes from intervention programs aimed at reducing the internalization of the societal ideal (Stice, Presnell, Gau, & Shaw, 2007).

Body dissatisfaction has been found to be a causal risk factor (Stice, 2002) and is central to all models of disordered eating (e.g., Stice, 2001), though its effects may not be just direct. Stice and colleagues (Stice & Agras, 1998; Stice et al., 1998) have suggested that body dissatisfaction leads women to either (1) restrict their food intake in hopes of shrinking their body size to more closely approximate the thin ideal and/or (2) blame themselves for how they look; view themselves as inadequate in terms of their body size and shape; and experience feelings of guilt, anger, sadness, disappointment, and anxiety. In the current study, the influence of body satisfaction on bulimic symptoms was both direct and indirect. As has been found in samples of female nonathletes (Stice, 2002), the more dissatisfied the swimmers and gymnasts were with their bodies, the more bulimic symptoms they reported. In addition, body dissatisfaction was related to negative affect, such that

female athletes who were less satisfied with their bodies reported more feelings of anger, sadness, and fear. However, the relationship between Body Satisfaction and Dietary Restraint became nonsignificant when the pathway from Sport Pressures to Dietary Restraint was added to the model.

Across the two samples, the extent to which the athletes felt pressures from coaches and teammates about weight and appearance was related to higher levels of dissatisfaction with their bodies and more use of restrictive eating behaviors; body dissatisfaction, though, was unrelated to dietary restraint. This finding is inconsistent with past research conducted with nonathletes and suggests that different mechanisms may be operating in the sport environment. For example, among female adolescents, Stice et al. (1998) found that initial body dissatisfaction predicted negative affect and dietary restraint 6 months later. Considered with the results from this study, body dissatisfaction is a predictor of negative emotions for both athletes and nonathletes, but its effects on dietary restraint may be most salient for nonathletes. With the intense pressures that exist in the sport environment regarding weight, having a thin body, and appearance, female athletes, particularly those in weight-conscious sports, may choose to restrict their eating (to achieve a leaner body) as a result of these pressures even when they generally may be satisfied with their bodies, particularly in comparison with their nonathlete peers. Because female athletes' restrictive eating may be influenced primarily by the situation (i.e., the weight-focused sport environment), it may dissipate when they leave the sport environment. Longitudinal research is needed to examine this question and address the extent to which sport pressures and body satisfaction predict future dietary restraint, particularly after leaving the sport environment.

Consistent with research with nonathletes (e.g., Stice, 2002), Negative Affect, Dietary Restraint, and Body Satisfaction were associated directly with Bulimic Symptoms, accounting for 55–58% of the variance. Female athletes who were feeling angry, sad, and fearful; who were dissatisfied with the size and shape of their bodies; and who were restricting their food intake reported increased levels of bulimic symptoms. Women who feel unhappy, sad, discouraged, or angry may try to cope with and distract themselves from their negative emotions (and thus comfort themselves) by binge eating (Stice, 1998, 2001). Among athletes, higher levels of sport anxiety have been related to more bulimic symptoms (Holm-Denoma, Scaringi, Gordon, Van Orden, & Joiner, 2009), and feelings of inadequacy associated with disordered eating patterns (Wichstrøm, 2000). Women who are restricting their food intake and experiencing severe caloric deficits may be overwhelmed by their physiology and experience disinhibited eating. Whether caused by negative affect or dietary restraint, binge eating may be followed by additional negative emotions (e.g., guilt, shame, anger) and a recommitment to restrict food intake. When this response occurs, women increase the likelihood that they will binge eat again, which may then lead to other forms of purging (e.g., vomiting, overexercising) as they attempt to rid themselves of the calories they have consumed. This cycle is the direct precursor to the development of bulimia nervosa.

Modeled Behaviors were unrelated to Bulimic Symptoms. Social learning theory (Bandura, 2004) and social conformity support the concept that behaviors are influenced by significant others, which might be particularly salient among members of cohesive units, such as sport teams or sororities (Crandall, 1988). In the current study, athletes reported that observing what their teammates, family

members, coaches, and friends were doing was not associated with their own disordered eating attitudes and behaviors. Because this study is the first to examine this construct in relation to disordered eating in athletes and because we created the measure, it may be worth further testing in future studies with more rigorously developed measures.

Overall, the constructs within the Petrie and Greenleaf (2007) model were supported, explaining over half of the variance in bulimic symptoms, although some of the initially hypothesized pathways were not. The experience of general sociocultural pressures regarding beauty, appearance, and self were related to greater internalization of those ideals. Internalization, in turn, was associated with less body satisfaction, which then was related to the experience of more negative emotions. Pressures from significant people in the sport environment (e.g., teammates, coaches) played a stronger and more central role than originally hypothesized. Although not associated with internalization, sport pressures were related directly to the athletes' body satisfaction and dietary restraint, and indirectly to bulimic symptoms. The female athletes who felt sad, angry, and fearful; who were dissatisfied with the size and shape of their bodies; and who reported restricting how much they ate reported increased levels of bulimic symptoms. Although this model was tested and then confirmed in a matched sample, additional research is needed to further test and validate the pathways supported in this study.

Implications for Consulting

Because sport pressures are related significantly to body dissatisfaction and dietary restraint, athletes may benefit from changes in the sport environment to lessen weight and appearance pressures. Coaches' self-awareness about their behaviors toward and influence with their female athletes, however, appears limited. Kerr et al. (2006) found that gymnastic coaches attributed the use of unhealthy weight control practices to other coaches, but not to themselves, even though the gymnasts identified their own coaches as the primary source of body and weight pressures. Thus, it will be helpful for athletes if coaches (a) become aware of their behaviors and attitudes regarding weight, body, and performance expectations; (b) understand how their behaviors and comments influence female athletes' beliefs about themselves and their use of pathogenic weight control behaviors; and (c) then refrain from behaviors (e.g., weighing athletes) and comments (e.g., "you're carrying some extra weight") that have been linked to body dissatisfaction and restrictive eating. Sport consultants can work directly with coaches to increase their awareness and implement these changes or with sport organizations to develop eating disorder prevention and treatment policies that encourage a healthy approach to weight, eating, body shape, exercise, and performance. Without changing the sport environment, female athletes are likely to continue to experience problems with disordered eating.

Given the connections between sociocultural pressures, internalization, and body image concerns and the development of bulimic symptoms, body-dissatisfied athletes can be targeted for intervention to reduce their risk. These interventions, which can include education about nutrition, self-esteem, and the influence of the media messages concerning societal beauty ideals, can be implemented in a time-limited manner and do not have to address disordered eating. For example, Smith

and Petrie (2008) tested a 3-hr cognitive dissonance–based intervention for eating disorders with a sample of female collegiate athletes and found that the intervention led to decreases in depression/sadness and internalization and increases in body satisfaction. Such programming is a potentially efficient and effective way to reduce the risk of disordered eating among female athletes, and could easily be implemented by sport consultants.

Limitations and Directions for Future Research

There were several limitations in the current study that warrant discussion. First, all data were collected via self-report. However, a standardized data collection process was used in which athletes completed the questionnaires anonymously, no other athletic personnel were present, and the athletes sealed their questionnaires in an envelope before returning them. Further, relationships with a measure of social desirability were quite small, suggesting that the athletes' responses to the questionnaires were not overly biased in this manner.

Second, even though the model was confirmed in a second sample, the reality is that both samples represented only female swimmers/divers and gymnasts from NCAA Division-I universities, so generalizability is limited to similar groups of athletes. To further confirm the model, data from samples that represent truly independent populations, such as NCAA Division-III female swimmers/gymnasts, high school female athletes, NCAA Division-I female athletes from different sports, or even male athletes, will need to be collected and tested. In doing so, researchers can determine if the respecified model holds equally well in the new samples and if sport pressures have the same strong effects.

Third, the data collected were cross-sectional so conclusions about causality cannot be determined. However, the relationships in the model were determined a priori, were consistent with longitudinal and experimental research conducted with female nonathletes (Stice, 2002), and were confirmed in a second sample. Future research, when practical, might incorporate longitudinal designs to test the directionality of the pathways in the Petrie and Greenleaf (2007) model as well as the pathways that were supported in this study.

Fourth, longitudinal studies also might follow athletes during their college careers and then into their postcollege years to determine what changes occur when athletes stop training and competing at a high level. It would be important to determine the duration and extent to which college sport experiences influence later behaviors. For example, does the experience of extensive weight pressures in the sport environment have a carryover effect after retirement from athletics? If so, future research may want to examine interventions that can address the long-term eating attitudes/behaviors in retired student athletes.

Conclusion

This study provided information about the relationships between a variety of psychosocial variables and bulimic symptoms in female collegiate swimmers/divers and gymnasts. For these female athletes, general and sport-specific pressures may play an important role in the development of body image concerns, dieting, and ultimately bulimic symptoms, though their influences appear to occur through dif-

ferent mechanisms. Sport pressures were related directly to body dissatisfaction and dietary restraint, which suggests that receiving negative comments about one's body and weight from important people in the sport environment (e.g., coaches) may lead athletes to become more unhappy with how they look and more likely to restrict their eating to obtain a leaner physique. In the end, negative affect, body dissatisfaction, and restrained eating explained 55–58% of the variance in the athletes' bulimic symptoms. The findings from this study provide a foundation on which sport consultants can develop interventions to target and reduce the psychosocial correlates of disordered eating among female collegiate athletes.

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