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Bulimic Symptomatology Among Male Collegiate Athletes: A Test of an Etiological Model

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We tested Petrie and Greenleaf's psychosocial model in relation to male athletes' bulimic symptomatology. Through structural equation modeling, we cross-sectionally examined the direct and indirect effects of general and sport-specific appearance pressures, internalization, body satisfaction, drive for muscularity, negative affect, and dietary restraint on bulimic symptomatology. Participants were U.S. male collegiate athletes ($N = 698$; $M_{age} = 19.87$ years) representing 17 sports. With minor respecifications, the model had acceptable fit, and the psychosocial variables explained 48% of the bulimic symptomatology variance. Although all variable paths were significant, sport pressures, such as from coaches and teammates about weight, importance of appearance, and looking good in a uniform, were the most salient latent variable. Athletes' engagement in muscle-building behaviors added uniquely and substantively as well. Our analysis begins to clarify the complex interactions among these psychosocial variables in understanding male athletes' bulimic symptomatology and provides a base from which to develop prevention programming.

Keywords: body image, bulimia, eating disorders, drive for muscularity

A Test of an Etiological Model: Disordered Eating in Male Collegiate Athletes

Male athletes are at risk for developing eating disorders (ED) as well as disordered eating attitudes and behaviors, such as bulimic symptomatology, due to general sociocultural ideals about body and appearance, and sport environment pressures about weight and performance (Petrie & Greenleaf, 2012b). These general and sport-specific pressures are similar to those experienced by female athletes, though with an additional focus on having a physique that is defined by muscle mass, strength, and leanness. Across several studies, researchers have found that general sociocultural, and sport-specific, pressures are unique from each other and contribute independently to disordered eating outcomes, such as body image concerns and bulimic symptomatology (Galli, Petrie, Reel, Chatterton, & Baghurst, 2014; Petrie, Greenleaf, Reel, & Carter, 2008). Although body, appearance, and weight pressures are central to understanding male athletes' risk, they are conceptualized as interacting with other sociocultural factors, such as internalization of societal appearance ideals (i.e., development of cognitive schemas about what represents physical attractiveness) and dietary restraint (i.e., self-reported intentions to restrict caloric intake), to predict bulimic symptomatology (Petrie & Greenleaf, 2012b). To date, however, research conducted on male athletes has lagged far behind that of female athletes, relying on relatively small samples of male athletes (e.g., $n = 183$; Galli, Petrie, Reel, Greenleaf, & Carter, 2015) and statistical approaches that have tested only direct relations among predictors and ED outcomes (e.g., Petrie, Galli, Greenleaf, Reel, & Carter, 2014). Although researchers have examined contemporary etiological models of bulimic symptomatology using samples of female athletes (e.g., Anderson, Petrie, & Neumann, 2011), no such study has been done with male athletes. Thus, research is needed that incorporates a larger sample and statistical approaches (i.e., structural equation modeling [SEM]) to test etiological models to better understand the direct and indirect relations among hypothesized predictors and bulimic symptomatology.

Sociocultural Model of Disordered Eating

Drawing on existing ED reviews (e.g., Grieve, 2007; Ricciardelli & McCabe, 2003; Stice, 2001, 2002), Petrie and Greenleaf (2012b) proposed a socioculturally based model to explain the etiology of ED, including bulimic symptomatology, in female and male athletes. Their model identified pressures about body, appearance, weight, eating, and performance in athletes' general and sport environments as well as how these pressures may influence the extent to which athletes internalize societal

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ideals, become dissatisfied with their bodies, exercise and diet to be lean and/or muscular, experience negative emotions, and develop ED symptoms. Although the entire model has been validated in cross-sectional studies with female collegiate athletes (e.g., Anderson et al., 2011) and specific pathways confirmed via longitudinal methodologies (Anderson, Petrie, & Neumann, 2012; Voelker, Petrie, Neumann, & Anderson, 2016), only certain hypothesized risk factors from the model have been tested with male athletes. For example, in a mixed-sport sample of 203 male collegiate athletes, Petrie et al. (2014) examined the relationship of body image, dietary restraint, negative affect, and drive for muscularity to bulimic symptomatology. Although they found that engaging in muscularity behaviors (MB; e.g., lifting weights) and restricting caloric intake were related directly to the measure of bulimic symptomatology, they did not include measures of general or sport-specific pressures or internalization nor did they test for indirect effects among the variables. In the sections that follow, we introduce each construct in the Petrie and Greenleaf model and discuss the mechanisms associated with each proposed pathway with respect to the development of bulimic symptomatology among male athletes.

General societal pressures. Thompson and Sherman (2010) have argued that, through their comments and actions, the media (including social media, see Holland & Tiggemann, 2016), family, and friends highlight cultural ideals in terms of body size and shape, appearance, weight, eating, and gender roles and characteristics. These ideals may act as a psychological pressure and indirectly increase risk of developing bulimic symptoms, such as through the internalization process (Stice, 2002). Media portray the ideal male body as tall, muscular, and strong, yet lean, and suggest that attainment of such a physique is an indication of masculinity (Cafri et al., 2005; McNeill & Firman, 2014; Petrie & Greenleaf, 2012a). Over time, and repeated exposure, men may adopt these societal ideals and values as their own, that is, internalize the psychological and physical representations of what it means to be a man (Grieve, 2007). For example, men who read fitness magazines, and thus frequently exposed themselves to media images of men's bodies, were more likely to internalize male body ideals than those who were less involved and had less exposure (Morry & Staska, 2001). Studies conducted with samples of male athletes have not directly examined this connection, though Petrie, Greenleaf, Carter, and Reel (2007) found that a mixed-sport sample of male collegiate athletes who had subclinical ED symptoms reported experiencing more pressures from television, movies, and magazines regarding appearance and/or weight than did the athletes who were asymptomatic (i.e., healthy eaters).

Sport weight pressures. Athletes experience unique sport environment pressures about appearance, weight, diet, physique, and body functionality, including required team weigh-ins, coaches' comments about weight and eating, and having to wear revealing uniforms (Thompson & Sherman, 2010; Voelker, Petrie, Reel, & Gould, 2017). Like general societal pressures, these sport-specific pressures may be internalized (Galli & Reel, 2009). However, because of (a) the pervasiveness, (b) athletes' immersion in their sport environments, and (c) coaches' comments being highly influential in athletes' lives (Beckner & Record, 2016), these pressures also may affect male athletes' mood; self-perceptions (e.g., body satisfaction); and behaviors (e.g., dieting, strength training) directly. For example, Galli and Reel (2009) found that male athletes engaged in specific behaviors, such as increasing aerobic exercise, muscle-building behaviors, and caloric restriction, to meet the physique pressures of the sport environment. Findings from research with male figure skaters indicate that sport-related weight pressures, but not sport-related body dissatisfaction, are related significantly to higher levels of disordered eating symptomatology as measured by the Eating Attitudes Test (EAT-26; Voelker et al., 2017). Among male collegiate athletes, pressures from the sport environment regarding body shape and size have been associated with engaging in muscle-building behaviors and with a tendency to view muscularity as a core component of body image (Petrie et al., 2007).

Internalization of societal appearance ideals. Male athletes who have internalized societal and sport-specific ideals have, in essence, integrated them into their self-schema. That is, they personally value these ideals, experience a psychological press to attain them, and engage in comparative processes between their real physiques and the ideals they have internalized (Petrie & Greenleaf, 2012b). However, because these ideals generally are impossible to achieve, there will be a discrepancy between the reality of their current selves (e.g., physique, gender role) and what they aspire to be. When the discrepancy is perceived as large, they are hypothesized to experience decreases in body satisfaction and a lowering of self-worth and esteem (Higgins, 1987; Stice, 2001). For example, among female athletes, internalization has been associated with greater dissatisfaction with body size and shape (Greenleaf, Petrie, Reel, & Carter, 2010), whereas adolescent boys' body dissatisfaction has been explained through their endorsement of weight and body image as salient parts of their self-evaluation (Jones, Bain, & King, 2008). Research has not quantitatively established the internalization—body dissatisfaction relationship with male athletes, though comments obtained through Galli and Reel's (2009) interviews revealed that male athletes engaged in comparison processes with teammates and others and believed their body dissatisfaction results from falling short of internalized ideals.

Body dissatisfaction. Body dissatisfaction, which reflects the attitudinal component of body image concerns, is hypothesized to have direct effects on the development of bulimic symptomatology (Stice, 2002) as well as indirect effects through increases in dietary restraint and

negative affect (Stice, 2001). Body-dissatisfied male athletes are likely to experience negative emotions (e.g., anger, shame), see their bodies as the cause of these feelings, and be motivated to reshape their bodies to reduce perceived real-ideal discrepancies (Higgins, 1987). To do so, they may adopt the belief (and subsequently feel pressure to act) that dieting and/or increasing exercise is necessary to bring them nearer to their goal—a body more closely aligned with their ideal. Unfortunately, dieting may result in unhealthy (and nonintuitive) eating and a disconnection from hunger and satiety cues (Moy, Petrie, Dockendorff, Greenleaf, & Martin, 2013). Furthermore, feeling a psychological press to exercise may lead to more dysfunctional thoughts about food and eating, particularly for individuals who have high levels of disordered eating symptoms (LePage, Price, O'Neil, & Crowther, 2012). Both of these responses may increase risk of overeating and ultimately the cycle of bingeing and purging that is the foundational symptom of bulimia nervosa.

Research findings have supported a direct connection between body dissatisfaction and bulimic symptomatology in a sample of female athletes (Anderson et al., 2011) and the association of a fear of becoming fat with subclinical ED symptoms in male athletes (Petrie et al., 2007). In terms of the indirect effects (Stice, 2001), higher levels of body dissatisfaction have been associated with different indices of negative affect (e.g., guilt, sadness) and greater intentions to restrict caloric intake in samples of male nonathletes (McFarland & Petrie, 2012), female exercisers (LePage et al., 2012), and male athletes (Petrie et al., 2014). Given the male ideal of strength and leanness, Petrie and Greenleaf (2012b) proposed that body dissatisfaction also would predict drive for muscularity. Male athletes may believe that becoming stronger and more muscular would not only align them more closely with appearance expectations but also help them improve their sport performances (Thompson & Sherman, 2010). Within a mixed-sport sample of 183 male collegiate athletes, Galli et al. (2015) found that body dissatisfaction was related significantly to athletes' endorsement of a muscular-oriented body image (MBI) but not to their engagement in actual behaviors designed to increase their muscularity.

Drive for muscularity. This psychological drive is manifested in men's identification with, and desire to have, a more muscular physique and their engagement in muscle-building behaviors, such as excessive weightlifting and protein supplementation (McCreary & Sasse, 2002). In many sports, muscularity is valued for aesthetic and performance reasons, which may elevate male athletes' drive to increase their strength. This desire, coupled with the reality that excessive exercise and other weight control behaviors are considered normative in sport, may be the precursor to the development of bulimic symptomatology. As men change the way they eat (e.g., restricting) and relate to their bodies (e.g., actively pursuing a more muscular physique), they increase their chances of developing bulimic symptomatology (McFarland & Petrie, 2012). For example, among 203 male, mixed-sport, athletes, Petrie et al. (2014) found that the active behavioral pursuit of a muscular body, but not the desire to have one, was related to higher levels of bulimic symptomatology, suggesting that it is MB, but not the related body image, that may increase risk.

Negative affect and dietary restraint. Dieting is a mechanism for losing weight, yet it is also associated with a disconnection to normal physiological responses to eating (e.g., satiety; Moy et al., 2013), and severe restriction can result in a caloric deficit where individuals' physiology overwhelms their cognitive restraint and binge eating results (Ruderman & Besbeas, 1992). Negative feelings about body and self, in conjunction with poor emotion regulation skills, may also result in eating disordered behaviors, such as binge eating, which allows for momentary escape from the aversive emotional arousal (Haynos & Fruzzetti, 2011). Whether driven by caloric deficit, emotion dysregulation, or a combination of the two, such overeating may be followed by feelings of shame and/or anxiety and the use of compensatory behaviors, such as self-induced vomiting or further restriction. This emotional eating also may disrupt intuitive responses to food, such as eating only when hungry and stopping when physically full (Moy et al., 2013), which can contribute to the cycle of bingeing and purging. Research with male and female athletes supports the connections among these variables (Anderson et al., 2011; Petrie et al., 2007). For example, among female athletes from weight-sensitive sports (e.g., gymnastics), body dissatisfaction, dietary restraint, and negative affect each were related directly to bulimic symptomatology, explaining 55–58% of its variance (Anderson et al., 2011). In a mixed-sport sample of male collegiate athletes, after controlling for body mass index (BMI) and social desirability, Petrie et al. (2014) found that dietary restraint, but not negative affect, predicted increases in their scores on a measure of bulimic symptomatology.

Purpose

Research with male athletes has been less frequent than what has occurred with their female counterparts, so the need exists for studies that consider male athletes' experiences and perspectives to determine similarities and/or differences. Based on their review of ED risk factors for athletes, Bratland-Sanda and Sundgot-Borgen (2013) recommended that such studies examine multifactorial, etiological models that included variables related to the drive to be more muscular. Consistent with this recommendation and the Petrie and Greenleaf (2012b) model, we hypothesized that weight pressures in sport would be related directly to internalization, body dissatisfaction, dietary restraint, and drive for muscularity. We expected general societal pressures to be related

to internalization, which would contribute to athletes' body dissatisfaction; body dissatisfaction, in turn, would be associated with dietary restraint, drive for muscularity, negative affect, and bulimic symptomatology. Finally, we hypothesized that negative affect, dietary restraint, and drive for muscularity would be related directly to increased levels of bulimic symptomatology.

Methods

Participants

Male collegiate athletes ($N = 698$; $M_{age} = 19.87$ years, standard deviation [SD] = 1.41) drawn from 35 states in the United States participated in this study. Athletes competed at the National Collegiate Athletic Association (NCAA) Division I (27.8%; $n = 194$), II (16.9%; $n = 118$), III (55.0%; $n = 384$), and National Association of Intercollegiate Athletes (0.3%, $n = 2$) levels; they participated in the following sports: baseball ($n = 131$), football ($n = 120$), track and field ($n = 114$), swimming/diving ($n = 74$), soccer ($n = 64$), basketball ($n = 41$), cross-country ($n = 36$), tennis ($n = 31$), wrestling ($n = 31$), lacrosse ($n = 18$), golf ($n = 16$), ice hockey ($n = 8$), crew ($n = 7$), fencing ($n = 3$), volleyball ($n = 2$), skiing ($n = 1$), and squash ($n = 1$). Most were White, non-Hispanic (84.2%; $n = 592$); 22.1% ($n = 154$) received an athletic scholarship. In terms of year in school, 224 (32.1%) were freshmen, 174 (24.9%) were sophomores, 178 (25.5%) were juniors, and 122 (17.5%) were seniors. Mean BMI was 24.26 kg/m^2 ($SD = 3.92$).

Instruments

Demographics. Participants provided their age, race/ethnicity, NCAA competitive level, year in school, scholarship status, height, weight, and varsity sport.

Sport weight pressures. The 12-item Weight Pressure in Sport Scale for Men (Galli et al., 2014) assesses coach/teammate pressures about weight (six items; influence coaches and teammates have on body image and disordered eating), importance of body weight and appearance (three items; value of attaining an ideal body), and uniform pressures (three items; extent to which athletic apparel draws undesired attention to the body). Athletes rated how often they experienced each pressure from 1 (*never*) to 6 (*always*). Total score for each factor is the mean of those items; higher scores indicate more perceived pressure. Galli et al. (2014) reported internal consistency reliabilities that ranged from .73 to .84. Cronbach's alphas for the current study were .84 (coach/teammate), .72 (weight and appearance), and .69 (uniform pressures). Using a sample of male athletes, Galli et al. (2014) provided statistical support for the scale's factor structure, which included exploratory and confirmatory procedures, as well as established the scales' convergent, concurrent, and incremental validity.

General sociocultural pressures. The 32-item Perceived Sociocultural Pressure Scale assesses pressures about losing weight, being lean, exercising, being attractive, looking more muscular, having a perfect body, being more muscular, and changing one's appearance as communicated through different general societal sources (Anderson et al., 2011). Each pressure was assessed across four different sources: male friends, family, romantic partners, teammates/coaches, and the media. (Although assessed, we purposefully excluded teammate/coach pressures from the total scores because they represented a sport environment pressure, and we wanted to minimize overlap with the Weight Pressure in Sport Scale for Men.) Athletes responded to each item from 1 (*never*) to 5 (*always*). Total score for each area (e.g., losing weight) is the mean of the four items representing the four sources; higher scores indicate more perceived pressure. Cronbach's alphas in the current study ranged from .82 to .86. Although not yet used with male athletes, Anderson et al. (2011) reported alphas that ranged from .78 to .88 for the subscales and that the pressures correlated significantly with measures of body dissatisfaction, internalization, and dietary restraint using a sample of female collegiate athletes.

Internalization. The nine-item Internalization General subscale of the Sociocultural Attitudes Toward Appearance Questionnaire-3 (Thompson, van de Berg, Roehrig, Guarda, & Heinberg, 2004) assesses social comparison (four items; extent to which individuals compare themselves to body ideals) and internalization (five items; extent to which individuals value body ideals). Athletes rated each item from 1 (*completely disagree*) to 5 (*completely agree*). Total score of each dimension is the mean of those items; higher scores indicate more comparisons or internalization. Among male undergraduates, Cronbach's alpha was .94 (Karazsia & Crowther, 2008); alphas for the current study were .96 (comparison) and .95 (internalization). Karazsia and Crowther (2008) provided detailed information about the scale's validity, including significant correlations with measures of drive for muscularity, physical appearance comparisons, and negative affect.

Body satisfaction. Eighteen items from the Body Parts Satisfaction Scale for Men (McFarland & Petrie, 2012) were used to measure men's satisfaction with their upper bodies (14 items) and legs (four items). Items are specific body parts, such as chest and arms, on which men rate their satisfaction with leanness and muscularity, as well as questions about overall body size and shape (e.g., "overall level of body's muscularity"). Athletes rated each item from 1 (*extremely dissatisfied*) to 6 (*extremely satisfied*). Total score for each factor is the mean of those items; higher scores indicate more satisfaction. With male undergraduates (McFarland & Petrie, 2012), Cronbach's alphas ranged from .94 to .97; alphas in the current study were .95 (upper body) and .90 (legs). Furthermore, McFarland and Petrie (2012) reported that body dissatisfaction added incrementally to the prediction of disordered eating (i.e., EAT-26); dietary restraint; guilt; and lower self-esteem beyond what was explained by social desirability and drive for muscularity.

Dietary restraint. The nine-item Dietary Intent Scale (DIS; Stice, 1998) assesses behaviors related to restricting caloric intake. Athletes responded to each item from 1 (*never*) to 5 (*always*). Total score is the mean of the items; higher scores indicate greater restraint. Cronbach's alpha was .95 for male undergraduates (McFarland & Petrie, 2012); alphas for the parcels used in the study were .88 and .90. The DIS has correlated ($r = .92$) with the Dutch Restrained Eating Scale and a measure of bulimic symptomatology (r's from .45 to .64) among female collegiate athletes (Anderson et al., 2011).

Negative affect. Twenty-three items from the Positive and Negative Affect Schedule-Expanded (Watson & Clark, 1992) were used to assess fear, hostility, guilt, and sadness as has been done in previous studies with athletes (Anderson et al., 2011). From 1 (*very slightly/not at all*) to 5 (*extremely*), athletes rated their experience of each mood over the last 3 months. Total score for each mood is the mean of those items; higher scores indicate stronger negative affect. With female athletes, Cronbach's alphas have ranged from .87 to .93 (Anderson et al., 2011); alphas in the current study were .88 (fear), .89 (hostility), .92 (guilt), and .94 (sadness). The fear, hostility, and sadness scales have correlated significantly with measures of general and sport-specific pressures, dietary restraint, body dissatisfaction, and bulimic symptomatology, supporting the scale's validity among athletes (Anderson et al., 2011).

Drive for muscularity. The 14-item Drive for Muscularity Scale (McCreary & Sasse, 2000) assesses MBI (seven items; preoccupation with becoming more muscular) and MB (seven items; behaviors dedicated to increasing muscle mass). Athletes rated each item from 1 (*never*) to 6 (*always*). Total score for each subscale is the mean of those items; higher scores indicate a stronger drive for muscularity. For male athletes, Galli et al. (2015) reported Cronbach's alphas of .92 (MBI) and .84 (MB) and significant correlations with sport and general pressures and negative affect, demonstrating the subscales' concurrent validity. McCreary and Sasse (2000) also have provided extensive information about the scale's validity. In the current study, alphas were .85 (MB) and .93 (MBI) for the two factors, and .72 and .77 for the two MB parcels.

Bulimic symptomatology. The 36-item Bulimia Test—Revised (BULIT-R; Thelen, Mintz, & Vander Wal, 1996) assesses behaviors and attitudes that comprise symptoms of bulimia nervosa based on the *Diagnostic and Statistical Manual-IV-TR* (American Psychiatric Association, 2000). Although athletes completed all 36 items, only 28 are scored. On each item, athletes responded from 1 (*absence of disturbance*) to 5 (*extreme disturbance*). A total score is the sum of the items; higher scores indicate endorsement of more symptomatology. Cronbach's alpha was .87 among collegiate male athletes (Petrie et al., 2007). In the current study, alpha for the entire scale was .90; alphas for the parcels ranged from .64 to .74. In a mixed-sport sample of male athletes, Petrie et al. (2014) reported significant correlations with measures of body dissatisfaction, dietary restraint, and negative affect, providing support for its concurrent validity. Pritchard (2014) also provided information supporting the scale's use and validity with men.

Procedure

Following institutional review board approval from the University of North Texas, head athletic trainers from NCAA Division I, II, and III and National Association of Intercollegiate Athletes institutions were contacted via e-mail to solicit the participation of their athletes. The e-mail explained the general purpose of the study (to examine the psychological health and well-being of male collegiate athletes) and asked that information on the study be forwarded to the athletes and/or coaches at their universities; the researchers provided the athletic trainers with an e-mail and a flier, both of which described the study, which they could send to their athletes. In the e-mail and/or flier, athletes were directed to a secure website where they could anonymously participate in a larger study on the psychological health and well-being of male collegiate athletes that was funded by a grant from the NCAA. Data collection occurred throughout the 2010–2011 academic year and has resulted in publications regarding their prevalence of ED (Chatterton & Petrie, 2013) and the relationship of their team and self-weighing behaviors to body image perceptions and disordered eating (Galli, Petrie, & Chatterton, 2017).

On the website, athletes provided consent for their participation and then completed the survey questionnaire, which took approximately 20 min. Athletes did not provide any identifying information in the survey. When done, through a separate website page (and thus database), the athletes could sign up for a random drawing to win one of fifty $50.00 cash prizes. Because of the manner in which we solicited the participation of the student athletes and that we did not follow up with the athletic trainers as to whether or not they forwarded our request to their athletes, there is no way to determine the number of student athletes who may have been made aware of the study and thus had a chance to participate.

Data Analysis

Initially, 1,048 eligible male athletes entered the website and started the survey. However, 317 were removed due to not progressing past the initial third of the survey and leaving multiple questionnaires completely blank or not meeting the eligibility criteria (e.g., were not collegiate athletes on a varsity team). Thus, we had usable data from 66.6% of the male athletes who started the survey. For the 698 participants in our final sample, we examined their data and found no individual missing items. Because we limited the number of measured variables included, we chose to parcel the DIS and the BULIT-R to have an adequate number of indicators for those latent

variables (LVs), which is an accepted analytic approach (see Little, Rhemtulla, Gibson, & Schoemann, 2013). We used the "item-to-construct balance" technique (Little, Cunningham, Shahar, & Widaman, 2002), in which items are parceled to distribute equal values of factor loadings. For each measure, the factor loadings from a single-construct solution were used, and the items were allocated to parcels based on the magnitude of the factor loadings. The DIS was represented by two parcels, one of which consisted of five items and the other consisted of four items. The BULIT-R was represented by four parcels, each consisting of seven items.[1] Although some debate has surrounded the use of parcels (e.g., Marsh, Lüdtke, Nagengast, Morin, & Von Davier, 2013), they are an appropriate and reliable tool for estimating latent models when the items/scales that make up a parcel reflect a unidimensional LV (Bandalos, 2002). Recent research has affirmed the use of parcels for this purpose (Gordts, Uzieblo, Neumann, Van den Bussche, & Rossi, 2017). We calculated total scores for each measure, and the subsequent DIS and BULIT-R parcels, and then examined the scales' distributional characteristics (i.e., kurtosis, skewness, outliers); all variables fell within acceptable limits. We also determined the means, SDs, and bivariate correlations among all the full scale scores of the measured variables.

Prior to beginning the SEM analyses, we tested the measurement model to establish the relationships of the measured variables to the LV. We tested the proposed model (measurement and structural) using MPlus version 7.1 (Los Angeles, CA; Muthén & Muthén, 2013). We determined model fit using the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR); each fit index provided a different evaluation of the model (Hu & Bentler, 1999). Based on our sample size and recommendations by Hu and Bentler, cutoff values were set at CFI ≥ .90, RMSEA ≤ .08, and SRMR ≤ .08 as indications of adequate fit. We used maximum likelihood to estimate all parameters with the exception of the indirect effects and related confidence intervals (CIs), which were obtained using the recommended method of bias-corrected bootstrapping (Preacher & Kelley, 2011; Preacher, 2015). Thus, significant direct and indirect effects were tested, and the variance explained is based upon the bootstrapped values; 95% CI are presented for each indirect effect. Alpha was set at .05 to determine the statistical significance of all analyses.

Results

Correlations

In Table 1, we present the means, SDs, and bivariate correlations of all the measures described in the Method section.[2] With respect to bulimic symptomatology, three athletes (0.3%) scored above the clinical cutoff of 104. (Using a broader measure of ED symptoms, Chatterton and Petrie (2013) reported that eight of the male athletes met the criteria for a clinical classification, including subthreshold bulimia [$n = 4$], binge ED [$n = 3$], or nonbinge bulimia [$n = 1$].) Furthermore, the mean score of the BULIT-R for our male athletes ($M = 46.17$, $SD = 13.83$) was comparable with that reported by Petrie et al. (2014) in an independent mixed-sport sample of male collegiate athletes, $M = 47.39$, $SD = 15.67$; $t(899) = 1.073$, $p = .28$.

Testing the Etiological Model

Measurement model. All LVs were allowed to correlate; correlations ranged from –.33 to –.13 and .15 to .57. The original measurement model with the MB and MBI factors representing the Drive for Muscularity LV did not demonstrate adequate model fit (CFI = .910; SRMR = .058; RMSEA = .071; $\chi^2 = 1{,}341.23$, $df = 297$), due in part to the high residuals for the MBI factor. Therefore, we dropped MBI and parceled the MB factor to create two indicators of three and four items each. With this change, the Drive for Muscularity LV represented the actual behaviors male athletes engaged in to increase their strength and musculature, such as lifting weights and ingesting protein supplements. This change was consistent with recent research findings that have shown MB, but not MBI, to be related to bulimic symptomatology among male athletes (Petrie et al., 2014) and nonathletes (McFarland & Petrie, 2012). This respecified measurement model demonstrated a better fit compared with the original measurement model (CFI = .920; SRMR = .049; RMSEA = .067, 90% CI [.063, .071]; $\chi^2 = 12{,}028.42$, $df = 351$). See Table 2 for standardized factor loadings and standard errors.

Structural model. For all the SEM models, we entered BMI as a covariate to control for effects due to physical size. Support for using BMI as a covariate is based on (a) significant relationships between it and measures of disordered eating attitudes and behaviors in mixed-sport samples of male athletes (Petrie et al., 2014) and (b) significant correlations with over half of the predictors and outcomes in the current sample. The hypothesized model (CFI = .906; SRMR = .129; RMSEA = .078; $\chi^2 = 1{,}722.29$, $df = 330$) fit the data poorly. This model was respecified following guidelines suggested by MacCallum (1995). First, we dropped the nonsignificant pathway from body satisfaction to drive for muscularity. Second, based on modification indices and existing theory (e.g., Cafri et al., 2005; Grieve, 2007), we added two pathways: (a) sport weight pressures to negative affect and (2) general societal pressures to negative affect. This respecified model adequately fit with the data (CFI = .916; SRMR = .078; RMSEA = .074, 90% CI [.070, .077]; $\chi^2 = 1{,}580.07$, $df = 329$); furthermore, all pathways were significant ($ps < .05$). See Figure 1 for detailed information about the significant direct paths and the variance explained in each LV.

The indirect effect, which was obtained through bias-corrected bootstrapping procedures, from sport weight pressures to bulimic symptomatology was

Table 1 Correlations, Means, and SDs Among Measured Variables ($N = 698$)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1. WPS-C	–																							
2. WPS-A	.35	–																						
3. WPS-UP	.35	.34	–																					
4. PS-LW	.25	.35	.30	–																				
5. PS-LB	.26	.43	.30	.76	–																			
6. PS-EX	.21	.38	.24	.65	.75	–																		
7. PS-LM	.22	.39	.23	.59	.72	.79	–																	
8. PS-AT	.17	.34	.26	.59	.66	.67	.72	–																
9. PS-PB	.19	.37	.28	.61	.71	.70	.75	.81	–															
10. PS-BM	.23	.38	.24	.59	.73	.76	.89	.78	.78	–														
11. PS-CA	.21	.35	.29	.69	.70	.70	.71	.77	.77	.78	–													
12. SATAQ-I	.19	.35	.20	.31	.33	.33	.38	.35	.37	.40	.36	–												
13. SATAQ-C	.18	.34	.22	.30	.34	.34	.39	.38	.40	.39	.37	.84	–											
14. SatLegs	−.07	−.15	−.09	−.19	−.18	−.17	−.22	−.19	−.19	−.20	−.21	−.22	−.21	–										
15. SatBody	−.12	−.16	−.08	−.31	−.27	−.26	−.32	−.26	−.25	−.30	−.29	−.24	−.18	.74	–									
16. Fear	.05	.13	.18	.27	.27	.29	.30	.34	.31	.34	.36	.19	.19	−.15	−.17	–								
17. Hostile	.14	.23	.24	.32	.33	.35	.34	.33	.35	.38	.40	.19	.24	−.19	−.24	.63	–							
18. Guilt	.12	.25	.22	.33	.36	.36	.38	.40	.38	.41	.43	.22	.24	−.24	−.28	.66	.71	–						
19. Sad	.09	.21	.24	.26	.29	.28	.33	.35	.33	.35	.35	.19	.24	−.14	−.21	.61	.64	.68	–					
20. MBeh	.38	.31	.10	.22	.30	.27	.35	.28	.32	.35	.30	.27	.29	−.10	−.11	.11	.21	.20	.18	–				
21. MBody	.26	.35	.15	.27	.37	.39	.52	.41	.40	.54	.40	.40	.35	−.32	−.39	.22	.32	33	.28	.65	–			
22. DIS	.33	.26	.28	.64	.50	.40	.35	.41	.44	.37	.45	.32	.28	−.20	−.27	.21	.24	.28	.20	.15	.17	–		
23. BULIT-R	.32	.36	.39	.49	.41	.35	.35	.40	.42	.37	.43	.24	.27	−.22	−.32	.31	.40	.48	.37	.27	.29	.53	–	
24. BMI	.37	.17	.12	.34	.26	.23	.15	.11	.14	.16	.20	.07	.06	−.05	−.22	−.03	.14	.07	.06	.20	.09	.26	.28	–
Mean	2.67	2.88	2.33	1.42	1.65	1.79	1.91	1.65	1.58	1.85	1.56	2.72	2.62	4.38	4.12	1.74	1.88	1.86	1.93	2.81	3.19	1.65	46.17	24.26
SD	1.13	1.14	1.15	0.72	0.82	0.87	0.93	0.86	0.82	0.90	0.78	1.05	1.11	1.12	0.98	0.66	0.75	0.86	0.96	1.14	1.38	0.82	13.83	3.92
Range	1–6	1–6	1–6	1–5	1–5	1–5	1–5	1–5	1–5	1–5	1–5	1–5	1–5	1–6	1–6	1–5	1–5	1–5	1–5	1–6	1–6	1–5	28–122	16.1–44.9

Note. WPS-C, -A, and -UP = Weight Pressure in Sport Scale for coach/teammate, appearance, and uniform pressures (scores can range from 1 = *low pressure* to 6 = *high pressure*); PS-LW, -LB, -EX, -LM, -AT, -PB, -BM, -CA = Perceived Sociocultural Pressure Scale for subscales lose weight, lean body, exercise more, look more muscular, be attractive, have a perfect body, be more muscular, and change appearance (scores can range from 1 = *low pressure* to 5 = *high pressure*); SATAQ-I and -C = Sociocultural Attitudes Toward Appearance Questionnaire-3 for subscales internalization and comparison (scores can range from 1 = *low* to 5 = *high*); SatLegs and SatBody = Body Parts Satisfaction Scale for Men for legs and body factors (scores can range from 1 = *low satisfaction* to 6 = *high satisfaction*); Fear, Hostile, Guilt, and Sad = negative mood states from the Positive and Negative Affective States Questionnaire (scores can range from 1 = *low* to 5 = *high*); MBeh and MBody = Drive for Muscularity Scale for muscle-building behaviors and muscularity-oriented body image subscales (scores can range from 1 = *low* to 6 = *high*); DIS = Dietary Intent Scale (scores can range from 1 = *low* to 5 = *high*); BULIT-R = Bulimia Test—Revised (scores can range from 28 = *low symptoms* to 140 = *high symptoms*); BMI = body mass index (kg/m^2). Correlations < −.08 or >.08 are significant at $p < .05$. Correlations < −.13 or >.13 are significant at $p < .001$.

significant (β = 0.37, 95% CI [0.29, 0.45]) and mediated through drive for muscularity (β = 0.05, 95% CI [0.02, 0.09]), dietary restraint (β = 0.21, 95% CI [0.15, 0.26]), and negative affect (β = 0.07, 95% CI [0.01, 0.13]). The total indirect effect from general societal pressures to bulimic symptomatology was also significant (β = 0.13, 95% CI [0.06, 0.19]), though mediated solely by negative affect (β = 0.12, 95% CI [0.06, 0.19]). There were no other significant indirect effects in the model.

Discussion

Although the initial test of the Petrie and Greenleaf (2012b) model resulted in an inadequate fit with the data, the respecified model was acceptable. In the respecified model, we dropped one pathway and added two new ones that were consistent with recent research (e.g., Galli, Reel, Petrie, Greenleaf, & Carter, 2011; Mulgrew & Volcevski-Kostas, 2012); this model explained 48% of the BULIT-R variance. Overall, we found that the sport environment, specifically experiencing pressures from coaches and teammates about weight, body, and performance, was the key LV for understanding the male athletes' BULIT-R scores. Not only did sport weight pressures have direct effects on internalization, negative affect, body satisfaction, dietary restraint, and drive for muscularity but also consistent with past research with female athletes and nonathletes (e.g., Anderson et al., 2011; Petrie et al., 2014; Stice, 2002), it was related significantly to bulimic symptomatology through the extent to which it increased the male athletes' likelihood of restricting their caloric intake, engaging in muscle-building behaviors, and feeling negative emotions, such as guilt and sadness.

General, and sport-specific, pressures explained 34% of the internalization variance, though the effects were stronger for sport pressures. Although the internalization of general societal pressures had been verified for female athletes (Anderson et al., 2011), female

Table 2 Measurement Model Factor Loadings and Standard Errors (*N* = 698)

Latent Variable	Observed Variable	Standardized Factor Loadings	Standard Error
Sport pressures	WPS-M coach/teammate	.580	.035
	WPS-M appearance importance	.645	.033
	WPS-M uniform pressures	.536	.034
General societal pressures	PSPS lose weight	.731	.025
	PSPS lean body	.829	.016
	PSPS exercise more	.838	.014
	PSPS look more muscular	.891	.011
	PSPS be more attractive	.845	.016
	PSPS perfect body	.869	.017
	PSPS be more muscular	.917	.008
	PSPS change appearance	.857	.014
Internalization	SATAQ internalization	.927	.018
	SATAQ social comparison	.910	.020
Body satisfaction	BPSS-M upper body	.985	.042
	BPSS-M legs	.748	.037
Negative affect	PANAS fear	.761	.025
	PANAS hostility	.815	.020
	PANAS guilt	.879	.015
	PANAS sadness	.778	.020
Drive for muscularity	DMS MB 1	.961	.011
	DMS MB 2	.823	.010
Dietary restraint	DIS parcel 1	.955	.010
	DIS parcel 2	.974	.010
Bulimic symptomatology	BULIT-R parcel 1	.781	.020
	BULIT-R parcel 2	.886	.012
	BULIT-R parcel 3	.824	.016
	BULIT-R parcel 4	.815	.018

Note. WPS-M = Weight Pressure in Sport Scale for Men; PSPS = Perceived Sociocultural Pressure Scale; SATAQ = Sociocultural Attitudes Toward Appearance Questionnaire; BPSS-M = Body Parts Satisfaction Scale for Men; PANAS = Positive and Negative Affect Schedule; DMS MB = Drive for Muscularity Scale Muscularity Behaviors; DIS = Dietary Intent Scale; BULIT-R = Bulimia Test—Revised.

nonathletes (Stice, 2002), and male nonathletes (Edwards, Tod, Molnar, & Markland, 2016), until this study, it had not been established with male athletes. The relationship of sport weight pressures to internalization, however, has been equivocal in studies of athletes. For example, among female collegiate athletes, sport weight pressures were unrelated to internalization scores (Anderson et al., 2011), though the sport-related weight pressures that male figure skaters experienced were the only predictor of their disordered eating scores (Voelker et al., 2017). Furthermore, male athletes representing seven different sports (e.g., football, swimming, baseball) reported through qualitative interviews that the pressures they experienced in their sport environments had negative effects on how they thought they should look (Galli & Reel, 2009).

Male athletes compete in environments that emphasize leanness and muscularity, and the importance of having such a physique often is endorsed and communicated by teammates, coaches, and even fans and sport officials (Thompson & Sherman, 2010). Coaches may make comments about body composition and its presumed relation to athletic performance, and teammates may model expected behaviors (e.g., dieting, additional physical training, muscle-building behaviors; Galli & Reel, 2009; Voelker et al., 2017). Being exposed to such messages and ideals on a daily basis may lead male athletes to believe that looking a certain way is important for their performances, defines their masculinity, and establishes their personal worth. For male athletes, being immersed in environments, particularly sport specific, which emphasize weight, appearance, and body appear to be more influential in determining their adoption of these values than the messages they receive from the general sociocultural environment.

Consistent with past research with men (Morry & Staska, 2001), women (Fingeret & Gleaves, 2004), and female athletes (Anderson et al., 2011), internalization was related to lower levels of body satisfaction. Sport weight pressures also contributed and together these LVs explained 9% of the variance in the male athletes' body satisfaction. Male athletes experience pressure to manage their weight, look good in their uniforms, and perform at a high level (Galli & Reel, 2009). They are in constant contact with other athletes (immediate comparison group) who may possess the ideal body, and coaches, teammates, and trainers may make comparative statements that highlight where athletes' bodies fall short of the ideal (Voelker et al., 2017). Thus, male athletes' immersion in environments with constant body monitoring, comparing and evaluating, as well as the extent to which body ideals are internalized, may increase their risk of becoming dissatisfied with the leanness and muscularity of their bodies.

Sport weight pressures, but not body satisfaction, were related to athletes' use of muscle-building behaviors ($R^2 = .21$). Petrie et al. (2007) found that pressures from teammates and coaches regarding body size and weight were associated with athletes' drive for muscularity. The nonsignificant path from body satisfaction likely was due to our defining Drive for Muscularity

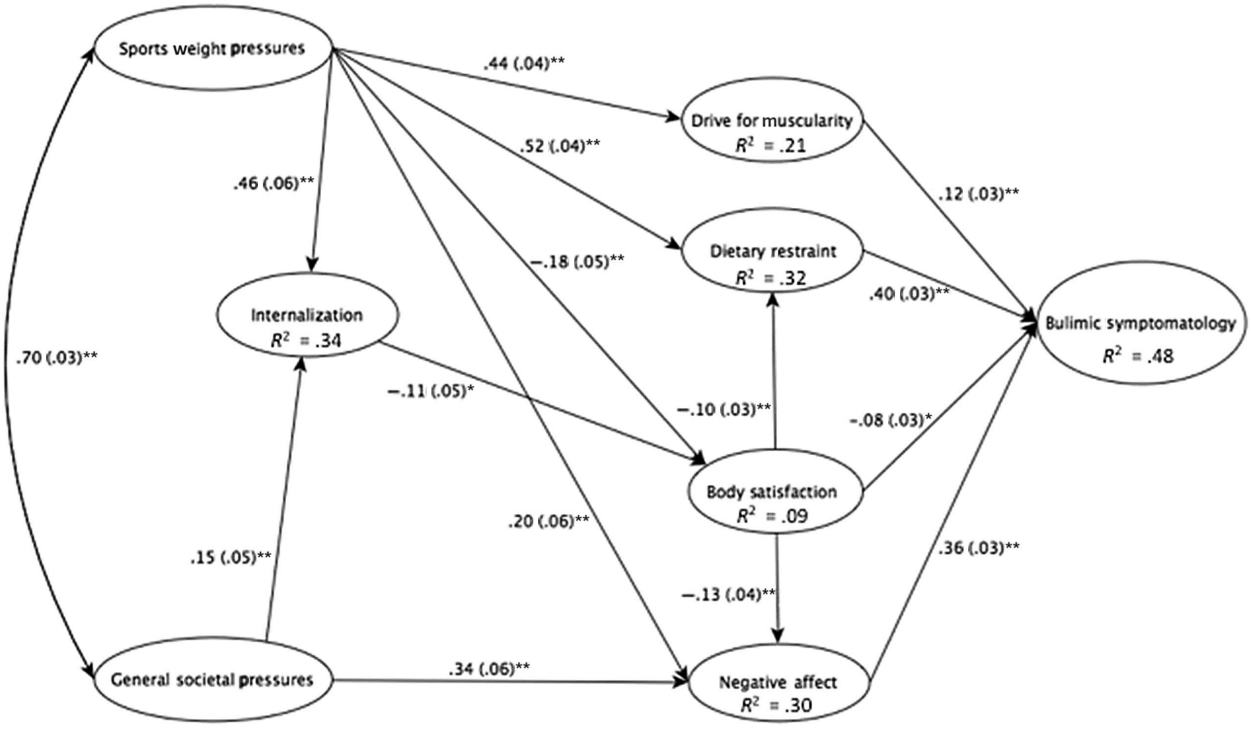

Figure 1 — Final model with standardized parameter estimates and R^2 values. Estimates of standard errors are displayed parenthetically. $*p < .05$. $**p < .01$.

solely by the MB items from the scale (and thus not including any items related to their desire to have a muscular body). Similarly, McFarland and Petrie (2012) and Petrie et al. (2014) found that among male undergraduates and collegiate athletes, respectively, body satisfaction was unrelated to men engaging in muscularity-focused behaviors. Thus, pressures within the sport environment about appearance, body, and weight are associated with the likelihood that male athletes will engage in muscle-building behaviors, such as supplement use and excessive weight-lifting, which most athletes consider necessary for, and beneficial to, their athletic performances (Galli & Reel, 2009).

Although sport weight pressures and body satisfaction were associated with the athletes' dietary restraint ($R^2 = .32$), sport pressures were the stronger predictor. Among male undergraduates and male athletes, being satisfied with body size and shape has been associated with lower levels of caloric restraint (McFarland & Petrie, 2012; Petrie et al., 2014; Voelker et al., 2017). For example, Petrie et al. (2014) found that, in a mixed-sport sample, the male collegiate athletes who were more satisfied with their bodies and appearance were most likely to report lower scores on a measure of dietary intent. Thus, being dissatisfied with body size and shape, which generally occurs when male athletes believe that their current levels of muscularity and/or leanness do not match ideals (Higgins, 1987), combined with time spent in training environments that emphasize the connection between weight loss and performance (Thompson & Sherman, 2010), may lead male athletes to purposefully try to reduce their food intake to achieve a leaner physique that may more fully reveal their muscularity and be consistent with sport and appearance expectations.

Sport weight pressures, general societal pressures, and body satisfaction predicted higher levels of negative affect ($R^2 = .30$). Among male athletes from power, endurance, and ball game sports, Galli et al. (2011) reported an association between sport weight pressures and negative affect; however, this relationship was nonsignificant among female collegiate gymnasts and swimmers (Anderson et al., 2011). Regarding general societal pressures, men who viewed media images of attractive and muscular men experienced an immediate decline in mood, including feelings of anger (Mulgrew & Volcevski-Kostas, 2012). The body dissatisfaction–negative affect relationship has been supported among female athletes (Anderson et al., 2011), male undergraduates (McFarland & Petrie, 2012), and male collegiate athletes (Petrie et al., 2014). Male athletes reside in general and sport-specific environments that communicate to them about how they should look, think, and feel about their bodies and behave in relation to food. In the presence of such messages, male athletes may engage in an ongoing comparative process that contributes not only to body dissatisfaction but also to general feelings of sadness, shame, and/or anger as they realize they do not measure up to societal expectations.

Consistent with past research (e.g., Anderson et al., 2011; Greenleaf et al., 2010; Petrie et al., 2007), being body dissatisfied, experiencing negative affect, intending to restrict caloric intake, and engaging in muscle-building behaviors explained 48% of the variance in the male athletes' bulimic symptomatology. Athletes with low levels of body satisfaction may engage in behaviors (e.g., excessive exercising, purging) designed to change their physique to more closely align with appearance ideals. The combination of a high physical training load with decreases in food intake may create such large caloric deficits that male athletes' bodies are physiologically primed to binge eat (Ruderman & Besbeas, 1992). Binge eating often results from disruptions in adaptive eating processes, such as eating to satisfy physical, as opposed to emotional, needs and being attuned to hunger and satiety cues. Dieting may disrupt these adaptive eating processes because it requires individuals to ignore physical cues (e.g., hunger) and classify foods as "good" or "bad," thus placing restrictions on what should and should not be eaten (e.g., Moy et al., 2013). Such disruptions may lead directly to overeating, which often is associated with feelings of guilt and shame, and subsequently followed by behaviors designed to rid oneself of excess food, such as vomiting, laxatives, or increasing levels of exercise, all of which are precursors to bulimia.

The male athletes' drive for muscularity was represented solely by their engagement in muscle-gain behaviors and was related to the extent to which the athletes' reported bulimic symptoms. In interviews with male undergraduates, Ridgeway and Tylka (2005) found that all of the men described the ideal male body as being muscular and half said it included being lean and tall; more than 13% endorsed using diet pills and muscle-enhancing supplements to achieve that physique. Furthermore, male athletes have reported dissatisfaction with different aspects of their physique and acknowledged that weight lifting and modifying their eating patterns are key strategies for enhancing their bodies (Galli & Reel, 2009). For male athletes, how they approach (and how much they engage in) muscle-building behaviors is salient and needs to be considered to fully understand their potential for developing bulimic symptomatology.

Overall, our study verifies the Petrie and Greenleaf (2012b) model among male collegiate athletes, suggesting that all of the proposed psychosocial variables are important for understanding their level of bulimic symptomatology. Like Anderson et al. (2011), who tested the model in female collegiate athletes, pressures within the sport environment about weight, body, performance, and appearance were most influential, being indirectly related to bulimic symptomatology through the extent to which the athletes' engaged in muscle-building behaviors, restrained their eating, and experienced negative feelings (e.g., sadness). Our findings underscore the importance of considering drive for muscularity with this group. Finally, like Anderson et al. (2011), these

psychosocial variables explained about 50% of the BULIT-R variance, suggesting a strong effect that may only be improved by examining the potential influences of personality variables that may moderate their effects (see Brannan, Petrie, Greenleaf, Reel, & Carter, 2009).

The current study has limitations that warrant discussion. First, due to lack of fit, we defined drive for muscularity solely by the MB items. Doing so, however, was consistent with recent research that has suggested it is MB, rather than a MBI, which increases risk of bulimic symptomatology (Petrie et al., 2014). Second, the current study used a cross-sectional design that did not allow for a causal, or temporal, interpretation of the data. This approach, however, was appropriate given that this study represented the first test of the Petrie and Greenleaf (2012b) model in a sample of male athletes. In future studies, researchers might examine the supported relationships longitudinally, such as between sport weight pressures and dietary restraint or drive for muscularity, to determine how they change over time and which variables temporally influence others. Third, although the current study used a large sample of male collegiate athletes in the United States, athletes self-selected into the study and certain sports were underrepresented. Therefore, the findings may not generalize to all sports, and additional research is needed to verify the relations found in the current study. Future research might test this model within single sports (e.g., all football players or all soccer players) or among younger athletes to determine if the influence of the sport environment remains, is heightened, or is diminished. Finally, our measure of general societal appearance ideals was broad and did not include specific references to the body, weight, and appearance pressures individuals might experience through their involvement in social media. A recent review of research on social media and body image and disordered eating (Holland & Tiggemann, 2016) suggests that this outlet may play a powerful role in shaping individuals' expectations about appearance and how they feel about their bodies. Future research with athletes might examine how social media use (e.g., viewing photos) might relate to their disordered eating attitudes and behaviors.

Given that athletes' ED may negatively affect their performances, either directly or indirectly, sport personnel, such as coaches and sport psychologists, who work with athletes need to understand that they can play a role in identification, referrals, and treatment (Thompson & Sherman, 2010). For example, sport psychologists could target the social agents (e.g., coaches, teammates) who comprise the sport environment itself, helping them become more aware of the effects of their comments and their expectations about body, weight, and appearance, and then educating them on how to create a "body-healthy" training environment (Petrie & Greenleaf, 2012a). Programs designed to educate coaches about the impact of their remarks and that highlight self-awareness regarding such comments could be implemented to help shift the focus of the athletic environment away from weight and appearance. Sport psychologists also might work directly with athletes, providing them with resources and strategies for countering the ubiquitous messages about physical and appearance ideals. Interventions of this kind have had success with female athletes (e.g., Becker, McDaniel, Bull, Powell, & McIntyre, 2012) but have yet to be modified and tested with male athletes. Furthermore, athletic departments might develop annual screening for their athletes that could be carried out by sports medicine personnel, such as athletic trainers. This screening could be done to identify athletes who report high levels of body dissatisfaction, a high drive to restrict their eating, and a strong focus on muscle-building behaviors (beyond what may be required for their sport). Once identified, athletes could be sensitively referred to counselors and psychologists on campus for further evaluation and potential treatment. Such an approach is consistent with National Athletic Trainers' Association recommendations (Bonci et al., 2008) and allows for early identification and treatment of at-risk athletes.

This study provided information about the relationships of hypothesized risk factors and bulimic symptomatology in male collegiate athletes. Sport-specific pressures played the most important role in understanding the athletes' symptomatology, having effects through negative affect, dietary restraint, and drive for muscularity. As the direct precursors of the athletes' bulimic symptomatology, body dissatisfaction, negative affect, dietary restraint, and drive for muscularity also were salient. The findings from this study provide a foundation on which professionals working with athletes can develop interventions to target and reduce risk factors for disordered eating.

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Notes

1. Exploratory factor analyses that were used to determine parcels are available from the second author (T.A. Petrie) upon request.

2. Although we parceled three scales for the SEM analysis, we chose to report the correlations for the total or factors scores of each measure, so comparisons could be made with previously published research. In addition, correlations of the parcels with the other variables included in the study were similar to those obtained from the total/factor scores. Correlations of parcels with the other measured variables are available from the second author (T.A. Petrie) upon request.

References

American Psychiatric Association. (2000). *Diagnostic and statistic manual of mental disorders-Text revision* (4th ed.). Washington, DC: Author.

Anderson, C.M., Petrie, T.A., & Neumann, C.S. (2011). Psychosocial correlates of bulimic symptoms among NCAA Division-I female collegiate gymnasts and swimmers/ divers. *Journal of Sport & Exercise Psychology, 33*, 483–505. PubMed doi:10.1123/jsep.33.4.483

Anderson, C.M., Petrie, T.A., & Neumann, C.A. (2012). Effects of sport pressures on female collegiate athletes: A preliminary longitudinal investigation. *Sport, Exercise, and Performance Psychology, 1*, 120–134. doi:10.1037/a0026587

Bandalos, D.L. (2002). The effects of item parceling on goodness-of-fit and parameter estimate bias in structural equation modeling. *Structural Equation Modeling, 9*, 78–102. doi:10.1207/S15328007SEM0901_5

Becker, C., McDaniel, L., Bull, S., Powell, M., & McIntyre, K. (2012). Can we reduce eating disorder risk factors in female college athletes? A randomized exploratory investigation of two peer-led interventions. *Body Image, 9*, 31–42. PubMed doi:10.1016/j.bodyim.2011.09.005

Beckner, B., & Record, R. (2016). Navigating the thin-ideal in an athletic world: Influence of coach communication on female athletes' body image and health choices. *Health Communication, 31*, 364–373. PubMed doi:10.1080/10410236.2014.957998

Bonci, L.J., Granger, L.R., Johnson, C.L., Malina, R.M., Milne, L.W., & Vanderbunt, E.M. (2008). National Athletic Trainers' Association position statement: Preventing, detecting, and managing disordered eating in athletes. *Journal of Athletic Training, 43*(1), 80–108. Retrieved from http://www.nata.org/journal-of-athletic-training

Brannan, M., Petrie, T., Greenleaf, C., Reel, J., & Carter, J. (2009). The relationship between body dissatisfaction and bulimic symptoms in female collegiate athletes. *Journal of Clinical Sport Psychology, 3*, 103–126. doi:10.1123/jcsp.3.2.103

Bratland-Sanda, S., & Sundgot-Borgen, J. (2013). Eating disorders in athletes: Overview of prevalence, risk factors and recommendations for prevention and treatment. *European Journal of Sport Science, 13*, 499–508. PubMed doi:10.1080/17461391.2012.740504

Cafri, G., Thompson, J.K., Ricciardelli, L., McCabe, M., Smolak, L., & Yesalis, C. (2005). Pursuit of the muscular ideal: Physical and psychological consequences and putative risk factors. *Clinical Psychology Review, 25*, 215–239. PubMed doi:10.1016/j.cpr.2004.09.003

Chatterton, J., & Petrie, T. (2013). Prevalence of eating disorders and pathogenic weight control behaviors among male collegiate athletes. *Eating Disorders, 21*, 328–341. doi:10.1080/10640266.2013.797822

Edwards, C., Tod, D., Molnar, G., & Markland, D. (2016). Perceived social pressures and the internalization of the mesomorphic ideal: The role of drive for muscularity and autonomy in physically active men. *Body Image, 16*, 63–69. PubMed doi:10.1016/j.bodyim.2015.11.003

Fingeret, M., & Gleaves, D.H. (2004). Sociocultural, feminist, and psychological influences on women's body satisfaction: A structural modeling analysis. *Psychology of Women Quarterly, 28*(4), 370–380. doi:10.1111/j.1471-6402.2004.00154.x

Galli, N., Petrie, T.A., & Chatterton, J. (2017). Team weigh-ins and self-weighing: Relations to body-related perceptions and disordered eating in collegiate male athletes. *Psychology of Sport and Exercise, 29*, 51–55. doi:10.1016/j.psychsport.2016.12.004

Galli, N., Petrie, T.A., Reel, J., Chatterton, J., & Baghurst, T. (2014). Assessing the validity of the Weight Pressures in Sport Scale for male athletes. *Psychology of Men & Masculinity, 15*, 170–180. doi:10.1037/a0031762

Galli, N., Petrie, T.A., Reel, J., Greenleaf, C., & Carter, J. (2015). Psychosocial predictors of drive for muscularity in male collegiate athletes. *Body Image, 14*, 62–66. PubMed doi:10.1016/j.bodyim.2015.03.009

Galli, N., & Reel, J.J. (2009). Adonia or Hephaestus? Exploring body image in male athletes. *Psychology of Men & Masculinity, 10*, 95–108. doi:10.1037/a0014005

Galli, N., Reel, J.J., Petrie, T., Greenleaf, C., & Carter, J. (2011). The pressure to be perfect: The implications of body expectations for men in sport. *Journal of Sport & Exercise Psychology, 35*(5), 746–747.

Gordts, S., Uzieblo, K., Neumann, C., Van den Bussche, E., & Rossi, G. (2017). Validity of the Self-Report Psychopathy Scales (SRP-III Full and Short Versions) in a community sample. *Assessment, 24*(3), 308–325. PubMed doi:10.1177/1073191115606205

Greenleaf, C., Petrie, T.A., Reel, J., & Carter, J. (2010). Psychosocial risk factors of bulimic symptomatology among female athletes. *Journal of Clinical Sport Psychology, 4*, 177–190. doi:10.1123/jcsp.4.3.177

Grieve, F.G. (2007). A conceptual model of factors contributing to the development of muscle dysmorphia. *Eating Disorders, 15*, 63–80. PubMed doi:10.1080/10640260601044535

Haynos, A., & Fruzzetti, A. (2011). Anorexia nervosa as a disorder of emotion dysregulation: Evidence and treatment implications. *Clinical Psychology: Science and Practice, 28*, 183–202. doi:10.1111/j.1468-2850.2011.01250.x

Higgins, E.T. (1987). Self-discrepancy: A theory relating self and affect. *Psychological Review, 94*, 319–340. PubMed doi:10.1037/0033-295X.94.3.319

Holland, G., & Tiggemann, M. (2016). A systematic review of the impact of the use of social networking sites on body image and disordered eating outcomes. *Body Image, 17*, 100–110. PubMed doi:10.1016/j.bodyim.2016.02.008

Hu, L., & Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*, 1–55. doi:10.1080/10705519909540118

Jones, D.C., Bain, N., & King, S. (2008). Weight and muscularity concerns as longitudinal predictors of body image among early adolescent boys: A test of the dual pathway model. *Body Image, 5*, 195–204. PubMed doi:10.1016/j.bodyim.2007.12.001

Karazsia, B., & Crowther, J.H. (2008). Psychological and behavioral correlates of the SATAQ-3 with males. *Body Image, 5*, 109–115. PubMed doi:10.1016/j.bodyim.2007.08.004

LePage, M., Price, M., O'Neil, P., & Crowther, J. (2012). The effect of exercise absence on affect and body dissatisfaction as moderated by obligatory exercise beliefs and eating disordered beliefs and behaviors. *Psychology of Sport and Exercise, 13*, 500–508. PubMed doi:10.1016/j.psychsport.2012.02.008

Little, T., Cunningham, W., Shahar, G., & Widaman, K. (2002). To parcel or not to parcel: Weighing the merits. *Structural Equation Modeling, 9*, 151–173. doi:10.1207/S15328007SEM0902_1

Little, T., Rhemtulla, M., Gibson, K., & Schoemann, A. (2013). Why the items versus parcels controversy needn't be one. *Psychological Methods, 18*, 285–300. PubMed doi:10.1037/a0033266

Marsh, H.W., Lüdtke, O., Nagengast, B., Morin, A.J., & Von Davier, M. (2013). Why item parcels are (almost) never appropriate: Two wrongs do not make a right—Camouflaging misspecification with item parcels in CFA models. *Psychological Methods, 18*, 257–284. doi:10.1037/a0032773

MacCallum, R.C. (1995). Model specification: Procedures, strategies, and related issues. In R.H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 16–36). Thousand Oaks, CA: Sage.

McCreary, D., & Sasse, D. (2000). An exploration of the drive for muscularity in adolescent boys and girls. *Journal of American College Health, 48*, 297–304. PubMed doi:10.1080/07448480009596271

McFarland, M.B., & Petrie, T.A. (2012). Male body satisfaction: Factorial and construct validity of the Body Parts Satisfaction Scale for Men. *Journal of Counseling Psychology, 59*, 329–337. PubMed doi:10.1037/a0026777

McNeill, L.S., & Firman, J.L. (2014). Ideal body image: A male perspective on self. *Australasian Marketing Journal, 22*, 136–143. doi:10.1016/j.ausmj.2014.04.001

Morry, M.M., & Staska, S.L. (2001). Magazine exposure: Internalization, self-objectification, eating attitudes, and body satisfaction in male and female university students. *Canadian Journal of Behavioural Science, 33*, 269–279. doi:10.1037/h0087148

Moy, J., Petrie, T.A., Dockendorff, S., Greenleaf, C., & Martin, S. (2013). Dieting, exercise, and intuitive eating among early adolescents. *Eating Behaviors, 14*, 529–532. PubMed doi:10.1016/j.eatbeh.2013.06.014

Mulgrew, K.E., & Volcevski-Kostas, D.D. (2012). Short term exposure to attractive and muscular singers in music video clips negatively affects men's body image and mood. *Body Image, 9*, 543–546. PubMed doi:10.1016/j.bodyim.2012.05.001

Muthén, L.K., & Muthén, B.O. (2013). *Mplus user's guide* (7th ed.). Los Angeles, CA: Muthén & Muthén.

Petrie, T.A., Galli, N., Greenleaf, C., Reel, J., & Carter, J. (2014). Psychosocial correlates of bulimic symptomatology among male athletes. *Psychology of Sport and Exercise, 15*, 680–687. doi:10.1016/j.psychsport.2013.09.002

Petrie, T.A., & Greenleaf, C. (2012a). Body image in sports/athletics. In T.F. Cash (Ed.), *Encyclopedia of body image and human appearance* (Vol. 1, pp. 160–165). San Diego, CA: Academic Press.

Petrie, T.A., & Greenleaf, C. (2012b). Eating disorders in sport. In S. Murphy (Ed.), *Oxford handbook of sport and performance psychology*. New York, NY: Oxford University Press.

Petrie, T.A., Greenleaf, C., Carter, J.E., & Reel, J.J. (2007). Psychosocial correlates of disordered eating among male collegiate athletes. *Journal of Clinical Sport Psychology, 1*, 340–357. doi:10.1123/jcsp.1.4.340

Petrie, T.A., Greenleaf, C., Reel, J., & Carter, J. (2008). Prevalence of eating disorders and disordered eating behavior in male collegiate athlete. *Psychology of Men & Masculinity, 9*, 267–277. doi:10.1037/a0013178

Preacher, K.J. (2015). Advances in mediation analysis: A survey and synthesis of new developments. *Annual Review of Psychology, 66*, 825–852. PubMed doi:10.1146/annurev-psych-010814-015258

Preacher, K.J., & Kelley, K. (2011). Effect size measures for mediation models: Quantitative strategies for communicating indirect effects. *Psychological Methods, 16*, 93–115. PubMed doi:10.1037/a0022658

Pritchard, M.E. (2014). Do body image investment and evaluation relate to bulimic symptoms in US collegiate men and women in the same way? *Psychology of Men & Masculinity, 15*, 163–169. doi:10.1037/a0032835

Ricciardelli, L.A., & McCabe, M.P. (2003). A longitudinal analysis of the role of biopsychosocial factors in predicting body change strategies among adolescent boys. *Sex Roles, 48*, 349–359. doi:10.1023/A:1022942614727

Ridgeway, R.T., & Tylka, T.L. (2011). College men's perceptions of ideal body composition and shape. *Psychology of Men & Masculinity, 6*, 209–220. doi:10.1037/1524-9220.6.3.209

Ruderman, A.J., & Besbeas, M. (1992). Psychological characteristics of dieters and bulimics. *Journal of Abnormal Psychology, 101*, 383–390. PubMed doi:10.1037/0021-843X.101.3.383

Stice, E. (1998). Relations of restraint and negative affect to bulimic pathology: A longitudinal test of three competing models. *International Journal of Eating Disorders, 23*, 243–260. doi:10.1002/(SICI)1098-108X(199804)23:3<243::AID-EAT2>3.0.CO;2-J

Stice, E. (2001). A prospective test of the dual-pathway model of bulimic pathology: Mediating effects of dieting and negative affect. *Journal of Abnormal Psychology, 110*, 124–135. PubMed doi:10.1037/0021-843X.110.1.124

Stice, E. (2002). Risk and maintenance factors for eating pathology: A meta-analytic review. *Psychological Bulletin, 128*, 825–848. PubMed doi:10.1037/0033-2909.128.5.825

Thelen, M.H., Mintz, L.B., & Vander Wal, J.S. (1996). The Bulimia Test—Revised: Validation with DSM-IV criteria for bulimia nervosa. *Psychological Assessment, 8*, 219–221. doi:1040-3590/96

Thompson, A.M., van de Berg, P., Roehrig, M., Guarda, A.S., & Heinber, L. (2004). The Sociocultural Attitudes Towards Appearance Scale-3 (SATAQ-3): Development and validation. *International Journal of Eating Disorders, 35*, 293–304. PubMed doi:10.1002/eat.10257

Thompson, R.A., & Sherman, R. (2010). *Eating disorders in sport*. New York, NY: Routledge/Taylor & Francis Group.

Voelker, D.K., Petrie, T.A., Neumann, C.S., & Anderson, C.M. (2016). Psychosocial factors as longitudinal predictors of bulimic symptomatology among female collegiate athletes. *Psychology of Sport and Exercise, 26*, 123–129. doi:10.1016/j.psychsport.2016.06.009

Voelker, D.K., Petrie, T.A., Reel, J.J., & Gould, D. (2017). Frequency and psychosocial correlates of eating disorder symptomatology in male figure skaters. *Journal of Applied Sport Psychology*. doi:10.1080/10413200.2017.1325416

Watson, D., & Clark, L.A. (1992). Affects separable and inseparable: On the hierarchical arrangement of the negative affects. *Journal of Personality and Social Psychology, 62*, 489–505. doi:10.1037/0022-3514.62.3.489