THE RELATIONSHIP OF SPORT TYPE TO DISORDERED EATING CORRELATES AMONG COLLEGIATE MALE ATHLETES

Kaleb W. Cusack

Thesis Prepared for the Degree of

MASTER OF SCIENCE

UNIVERSITY OF NORTH TEXAS

August 2020

APPROVED:

Trent A. Petrie, Major Professor
Clifton Edward Watkins, Committee Member
Heidemarie Blumenthal, Committee Member
Vicki Campbell, Chair of the Department of Psychology
Tamara L. Brown, Executive Dean of the College of Liberal Arts and Social Sciences
Victor Prybutok, Dean of the Toulouse Graduate School

Cusack, Kaleb W. *The Relationship of Sport Type to Disordered Eating Correlates among Collegiate Male Athletes*. Master of Science (Psychology), August 2020, 65 pp., 7 tables, 1 appendix, references, 129 titles.

Petrie and Greenleaf's sociocultural model proposes that athletes experience unique sport environment pressures regarding weight, body size/shape, eating and appearance that increases their risk of developing disordered eating (DE) attitudes and behaviors. Although research in cross-correlational studies has looked at prevalence of eating disorders (ED) and DE behaviors in different sport types, such pressures are likely to vary by sport depending on its unique environment and performance demands. For instance, female athletes in leanness sports experience more body dissatisfaction and societal appearance pressures compared to those in nonleanness sports. Because these effects have been established primarily with female athletes, I examined ED/DE correlates from Petrie and Greenleaf's model with 695 collegiate male athletes who represented five sport types (endurance, ball game, power, technical, weight-dependent) based on a well-established categorization system. Through a series of one-way MANCOVAs (BMI serving as the covariate), I found that sport types were significantly different from each other on all ED/DE correlates except for negative affect. Follow-up analysis revealed that power, endurance, and weight-dependent athletes showed the greatest number of significantly different group centroids, demonstrating distinct profiles among the sport types in their experiences of the ED/DE correlates. Discussion focuses on possible explanations for the research findings, future directions, and clinical implications.

TABLE OF CONTENTS

Page

LIST OF TABLES v

CHAPTER 1. INTRODUCTION 1

Sociocultural Model for Sport 3

General Sociocultural Pressures 3

Sport Environment Pressures 4

Internalization 4

Body Dissatisfaction 5

Negative Affect 6

Dietary Intent 6

Drive for Muscularity 7

Purpose 7

CHAPTER 2. METHOD 9

Participants 9

Instruments 9

Demographics 9

General Sociocultural Pressures 9

Sport Weight Pressures 10

Internalization 10

Body Image 11

Negative Affect 12

Eating Pathology 12

Procedure 13

Data Analysis 14

CHAPTER 3. RESULTS 16

General Sociocultural Pressures 16

Sport Weight Pressures 16

Internalization of Appearance Ideals 17

Body Satisfaction and Drive for Muscularity 18

Negative Affect 19

Eating Pathology 19

CHAPTER 4. DISCUSSION 20

APPENDIX: EXTENDED LITERATURE REVIEW 30

REFERENCES 56

LIST OF TABLES

Page

Table 1. Proposed Hypotheses 26

Table 2. Canonical Correlations and Structure Coefficients for Function of General Pressures . 26

Table 3. Descriptive Discriminate Analysis Follow-Ups 27

Table 4. Canonical Correlations and Structure Coefficients for Functions of Sport Specific Pressures 28

Table 5. Canonical Correlations and Structure Coefficients for Function of Internalization Measures 28

Table 6. Canonical Correlations and Structure Coefficients for Functions of Body Image Concerns 29

Table 7. Canonical Correlations and Structure Coefficients for Function of Eating Pathology... 29

CHAPTER 1

INTRODUCTION

Eating disorders (EDs) and body image concerns are typically more prevalent among girls and women than boys and men (e.g., Darcy et al., 2013), but recent research has suggested that, within the subpopulation of athletes, both men and women should be studied in relation to these concerns (e.g., Thompson & Sherman, 2010; Petrie et al., 2014). Research has found that rates for clinical EDs in male athletes to range from 0% to 8% (Petrie et al., 2009; Petrie et al., 2008; Martisen & Sungot-Borgen, 2013; Sungot-Borgen & Tortsviet, 2004). Given the low rates of clinical EDs in athlete samples, research in the past 10-15 years has begun exploring "subclinical" EDs in athletes.

Although the development of EDs/DE is generally recognized as multifactorial (e.g., biological, physical, personality), researchers often study them through a sociocultural perspective that focuses on the pressures and messages that exist within differing social environments about appearance, body, weight, eating, etc. (e.g., Striegel-Moore & Bulik, 2007). From this theoretical perspective, men's and boys' exposure to societal expectations and ideals about appearance are communicated by multiple sources such as friends, family and media, which is expected to result in the internalization (i.e., schema) of how they should look, eat, and behave, and what it means to be masculine (e.g., Stice, 2001). For athletes, male and female alike, the sport environment presents its own set of pressures and expectations about weight, physique, and performance that are communicated by coaches, teammates, sport judges, and even the uniforms they must wear to compete. For example, the sport environment for a cross country runner can very different as compared to the sport environment of a football offensive lineman. A cross country runner may experience pressure to maintain low body weight and a

lean body composition in order to meet the demands of an endurance sport, whereas an offensive lineman is expected to maintain greater body weight with considerably more muscle mass to be able to block similarly sized defensive linemen. These messages/pressures/ideals often vary by the sport environment and thus may have differential influence on how athletes experience, and feel about, themselves and their bodies, and contribute to what boys and men internalize about appearance, eating, weight, body, and the roles they endorse for themselves (e.g., man, athlete; Petrie & Greenleaf, 2012; Petrie, 2019).

Research suggests that athletes' experiences in different sport environments are related to their rates of ED/DE. Athletes are exposed to pressures, in and out of the sport environment, that can increase body dissatisfaction and, ultimately, their risk of developing ED/DEs. Although researchers have found differences in prevalence rates of ED/DEs between sport types among male athletes (e.g., Stoutjesdyk and Jevne,1993; Sundgot-Borgen & Torstviet, 2004; Rosendahl et al., 2009), these studies have been few and primarily have focused on specific ED symptoms and diagnoses and not on the broader set of sociocultural factors that are related to increased risk.

With female athletes, however, researchers have expanded their focus, examining the relationship of sport type to the understood sociocultural factors in the development of ED/DE, such as body dissatisfaction and dietary intent (e.g., Kong & Harris, 2015; Galante et al., 2017). In such studies, researchers have identified these sociocultural factors based on existing theoretical models (e.g., Petrie & Greenleaf, 2007; 2012), providing a framework for interpreting their findings. Thus, future research in male athletes would be best advanced by being based in current theoretical models of ED/DE development and selecting psychosocial variables related to the etiology of ED/DE. In the following sections I will provide an overview of the sociocultural model for sport, but for a more in-depth review of the literature see Appendix B.

Sociocultural Model for Sport

Based upon established sociocultural models (e.g., Moradi, 2010; Stice et al., 2012), a similar sociocultural perspective has been proposed for athletes (e.g., Petrie & Greenleaf, 2007; 2012) that suggests there are pressures and expectations about weight, physique, and performances within the sport environment that are unique from those present within general society and may be particularly important in understanding the development of athletes' ED/DEs (Galli et al., 2011). Similar to general sociocultural models, these pressures are suggested to lead to internalization, which in turn increases body dissatisfaction. Body dissatisfaction is suggested to increase disordered eating directly, as well as indirectly through increases in negative affect and intentions to engage in dietary behavior. Anderson et al. (2011) reported that sport pressures also had direct effects on body dissatisfaction and dietary restraint in a sample of collegiate female athletes. Petrie and Greenleaf (2012) also noted that athletes' drive for muscularity may contribute to the development of disordered eating behaviors and included it in their model. The following sections define and relate the constructs from the Petrie and Greenleaf (2012) model to the development of ED/DEs in male athletes.

General Sociocultural Pressures

Through multiple sources, such as peers, family, and media, male athletes, as well as men in general, can be exposed to societal pressures and expectations about their weight, appearance, and body size/shape (Stirling et al., 2012). Continued exposure to societal pressures and expectations can lead male athletes to internalize these ideals and increase dissatisfaction with their appearance (Petrie & Greenleaf, 2012; Cafri et al., 2005). Leit, Gray, and Pope Jr. (2002) found that exposure to muscular men representing a masculine appearance ideal can negatively impact attitudes about how men view their bodies. General sociocultural pressures were related

to body dissatisfaction, negative affect, and drive for muscularity in a sample of male collegiate athletes representing multiple sports (Galli, Petrie, Reel, Greenleaf, & Carter, 2014).

Sport Environment Pressures

Beyond the pressures and expectations that men face from society, male athletes are also exposed to messages from their teammates, coaches, and sport-specific expectations regarding weight, body size, appearance, physique, muscularity, eating behaviors, and what it means to be a male athlete (Galli & Reel, 2009; Voelker et al., 2018). Within the male sport environment, weight, body and appearance pressures were found to be related to comments made by coaches and teammates, the uniforms worn by the athletes, and the importance of appearance and weight to the sport (Galli et al., 2011; Galli, Petrie, Reel, Chatterton, & Baghurst, 2014). These sport pressures significantly predict higher levels of drive for muscularity in a mixed sport sample of male athletes (Galli et al., 2015) and more disordered eating symptomology in male figure skaters (Voelker et al., 2018).

Internalization

Despite the paucity of research directly examining the relationship between internalization and ED/DEs (Petrie, 2019), evidence suggests an indirect relationship through other correlates in the Petrie and Greenleaf (2012) model. Chatterton et al. (2017) found that internalization explained 9% of the variance in body dissatisfaction, specifically that higher levels of internalization were related to increased levels of body dissatisfaction. Certain behaviors can also serve as a proxy for internalization, such as body surveillance (viewing oneself from the perspective of others), body monitoring (engaging in behaviors to examine one's body size/shape/appearance). One example of body monitoring is frequent self-weighing outside of weigh-ins (Petrie, 2019). Galli, Petrie, and Chatterton (2017) found that male

collegiate athletes self-weighed at least seven times a week reported that highest levels of dietary restraint, bulimic symptomatology, and drive for muscularity.

Body Dissatisfaction

Body dissatisfaction refers to how individuals feel about their weight, body size, body shape, and outward physical appearance, comprising the attitudinal component of body image concerns. Initially thought to be indirectly related to ED/DE through negative affect and dieting (Stice, 2001), current models (Petrie & Greenleaf, 2012) also propose direct effects (Petrie, 2019). Although male athletes generally report significantly higher satisfaction with their bodies than male nonathletes (Hausenblas & Symons Downs, 2001), male athletes still experience concerns about their bodies, such as not being sufficiently lean or muscular (e.g., Galli & Reel, 2009). These concerns can bring rise to affective and behavioral responses (Petrie & Greenleaf, 2012). Due to physical appearance's role as a central component of self-concept in athletes, male athletes may experience negative affect (e.g., sadness, shame, anger) in response to their body dissatisfaction. Behaviorally, male athletes may address body dissatisfaction by restricting caloric intake to lose weight or increase caloric intake and take muscle enhancing products (e.g., dietary supplements, anabolic-androgenic steroids). to increase muscle mass and strength. In a sample of collegiate male athletes, there were significant correlations between body and face dissatisfaction and feelings of depression and sadness alongside stress (Petrie et al., 2007). Chatterton et al. (2017) found that body dissatisfaction was significantly related to dietary restraint (32% variance explained), negative affect (30% variance explained), and bulimic symptomology (48% variance explained), supporting the direct and indirect effects of body satisfaction proposed by Petrie and Greenleaf (2012).

Negative Affect

Negative emotions can be the catalyst for self-nurturing behaviors. The experience of negative affect, such as shame, anger, fear or guilt, and sadness, can motivate individuals to engage coping to comfort and/or distract themselves from typically aversive and unsettling feelings. Although hunger represents a physical/psychological need, individuals may also eat for emotional reasons and rely on food to cope with psychological distress (Kerin et al., 2019). This "comfort eating" can dysregulate food intake and increase binge eating. In response to binge eating, individuals may experience guilt or shame, which may lead compensatory over-exercising, dieting, or other unhealthy behaviors, such as vomiting. This binge/purge cycle may lead to the development of bulimia nervosa and related symptomatology (Fairburn et al., 2005).

Dietary Intent

Dietary intent refers to goal-direct behavior to engage in caloric restriction with the intent of changing weight. Dieting often includes set rules of what should be eaten and requires individuals to ignore the normal physiological signs of hunger and satiety in order to reach their weight goals. When dieting, individuals selectively deny physiological cues (e.g., convincing themselves that they are not actually hungry; Petrie et al., 2014) or only eating certain foods, regardless of nutritional value, if they do acknowledge the hunger. Disrupting these intuitive eating processes, such as eating when hungry or stopping when satiated, can lead to dysregulated eating (Neumark-Sztainer et al., 2011; Tylka, 2006). Tylka and Kroon van Diest (2013) found that intuitive eating was negatively correlated with DE/ED symptomatology. Dietary intent is a significant predictor of eating disorder risk and compensatory behaviors (e.g., laxative use, vomiting, excessive exercise; Schaumberg & Anderson, 2016). In male collegiate athletes,

dietary intent and muscularity behaviors were significantly related to higher levels of bulimic symptomatology (Petrie et al., 2014).

Drive for Muscularity

Drive for muscularity refers to the preoccupation to attain a muscular or mesomorphic body and the behaviors that individuals will engage in to achieve that physique (e.g., lifting weights, using protein supplements; McCreary & Sasse, 2000; McCreary et al., 2004). For male college students, this body type is characterized by definition (leanness), large size, athletic appearance, and an ambiguous balance of being "big… but not too big," and a primary focus on body areas from the waist up (e.g., abdomen, arms, chest; Ridgeway & Tylka, 2005). Male collegiate athletes are not excluded from these concerns, as their body dissatisfaction was related to higher levels of muscularity oriented body image (Chatterton et al., 2017; Galli et al., 2015; Petrie et al., 2014). Muscle building behaviors were also found to be significantly related to higher levels of bulimic symptomatology in a male collegiate athletes (Chatterton et al., 2017; Petrie et al., 2014).

Purpose

In this study, we sought to extend and improve upon past research (e.g., Karr et al., 2013; Kong & Harris, 2015) by (a) using a more sophisticated system to conceptualize sport type (Sundgot-Borgen & Torstveit, 2004; Thompson & Sherman, 2014), (b) incorporating a more extensive set of psychosocial correlates to represent the ED/DE outcomes (e.g., internalization, body satisfaction, drive for muscularity), and (c) examining the experiences of male collegiate athletes, an understudied group. Based on our sport type groups, which we describe in detail in the method, we hypothesized that the sport types would all differ on the psychosocial variables, although many of the comparisons in this study are exploratory (See Table A.1). Specifically, we

expected that the endurance athletes and weight-dependent athletes could experience significantly higher levels of sport environment pressures and eating pathology than the other sport types in our sample (ball game, power, & technical). Additionally, it was expected ball-sport and power athletes would experience higher body image concerns (body dissatisfaction and drive for muscularity) as compared to other sports.

CHAPTER 2

METHOD

Participants

Male collegiate athletes (N = 698) who ranged in age from 18 to 26 years (M_{age}= 19.87 years, SD= 1.41) and represented 17 sports from U.S. colleges and universities participated. The athletes competed at the National Collegiate Athletic Association (NCAA) Division I (27.8%; n = 194), Division II (16.9%; n = 118), and Division III (55%; n = 384) levels; two athletes (0.3%) competed at the National Association of Intercollegiate Athletic (NAIA) level. The majority were White, Non-Hispanic (84.8%; n = 591); 4.3% (n = 30) were African-American, 4.2% were Latino/x (n = 2.9), and 2.6% were Asian-American/Pacific Islander (n = 18). In terms of class rank, 224 (32.1%) were freshman, 174 (24.9%) sophomores, 178 (25.5%) juniors, and 122 (17.5%) seniors; 154 (22.1%) reported receiving athletic scholarships.

Instruments

Demographics

Participants reported their age, race/ethnicity, NCAA level, academic standing, scholarship status, height, weight, varsity sport played, and location (i.e., state) of their school.

General Sociocultural Pressures

The 24-item Perceived Sociocultural Pressures Scale (PSPS; Stice & Agras, 1998) assesses the pressures athletes experienced from four sources (family, male friends, romantic/dating partners, and the media) in six different areas (lose weight, have a lean body, exercise more, look more muscular, look more attractive, change appearance); athletes also provided the pressures they felt from coaches/teammates though we did not include them into total scores to ensure separation between sport and general pressures. Athletes rated each

pressure (e.g., lose weight) from each source from 1, *never*, to 5, *always*. Total score for each pressure is the mean of the four sources; higher scores indicate more perceived pressure. Cronbach's alphas in the current sample were .86 (Lose Weight), .83 (Lean Body), .81 (Exercise More), .82 (Look More Muscular), .84 (Look More Attractive), and .84 (Change Appearance). In terms of validity, Anderson, Petrie and Neumann (2011) found that the pressures were significantly correlated with measures of body satisfaction (*rs* = -.43 to -.58), internalization (*rs* = .43 to .59), and dietary intent (*rs* = .45 to .65).

Sport Weight Pressures

The 12-item Weight Pressures Scale for Male Athletes (WPS-M; Galli, Petrie, Reel, Chatterton, & Baghurst, 2014) assesses sport pressures from (a) coach and teammates (6 items; from coaches and/or teammates to attain a certain weight, shape, or size of body), (b) uniform (3 items; from the team uniform worn), and (c) weight and appearance (3 items; perceived importance of weight and appearance in sport). The athletes rated each item from 1, *never*, to 6, *always*. Total score for each factor is the mean of those items; higher scores indicate more pressure. Cronbach's alphas in the current sample were .84 (Coach and Teammate), .69 (Uniform), and .71 (Weight and Appearance). Galli et al. (2014) found that the pressures were significantly correlated with internalization (*rs* = .19 to .36), dietary intent (*rs* = .22 to .33), bulimic symptomology (*rs* = .31 to .40), and drive for muscularity (*rs* = .15 to .49).

Internalization

The 9-item Internalization-General and the 5-item Internalization-Athlete factors from the Sociocultural Attitudes Towards Appearance Questionnaire-3 (SATAQ-3; Thompson, Van den Berg, Roehrig, Guarda, & Heinberg, 2004), respectively, assess the extent to which individuals have internalized general societal, and athletic, ideals about weight, appearance, and

body size/shape. Athletes rated each item from 1, *completely disagree*, to 5, *completely agree*. Total score for each factor is the mean of those items; higher scores indicate greater internalization. Cronbach alphas in the current sample were .95 (General) and .96 (Athlete). Regarding validity, Thompson et al. reported significant relationships between the General and Athlete factors and body satisfaction (*r*s = .32 to .57) and perceived appearance/weight pressures (*r*s = .17 to .38).

Body Image

We used 18 items from the Body Parts Satisfaction Scale for Men (BPSS-M; McFarland & Petrie, 2012) to assess the athletes' satisfaction with the muscularity and leanness of their upper body (12 items; e.g., "muscularity of chest") and their legs (6 items; e.g., "leanness of upper legs"). Athletes rated each body part from 1, *extremely dissatisfied*, to 6, *extremely satisfied*. Each factor score is the mean of those items; higher scores indicate greater satisfaction. Cronbach alphas in the current sample were .92 (Legs) and .94 (Upper Body). McFarland and Petrie also provided extensive information regarding the scale's development, factor structure, and criterion-related and incremental validity.

The Drive for Muscularity scale (DMS; McCreary, Sasse, Saucier, & Dorsch, 2004) assesses Muscularity-Oriented Body Image (MBI; 7 items; importance of being, and desire to be, more muscular) and Muscularity Behaviors (MB; 7 items; engagement in behaviors designed to increase muscularity). Athletes rated each item from 1, *never*, to 6, *always*. Total score for each factor is the mean of those items; higher scores indicate greater endorsement of those attitudes or behaviors. Cronbach alphas from the current sample were .93 (MBI) and .85 (MB). McFarland and Petrie (2012) found that MBI was negatively correlated with self-reported satisfaction with

legs (r = -.32) and satisfaction with upper body (r = -.29), and MB significantly related to higher levels of dietary intent (β = .28) and bulimic symptomatology (β = .29).

Negative Affect

We used 23 items from the Positive and Negative Affect Schedule-Expanded Form (PANAS-X; Watson & Clark, 1994) to assess fear (6 items), hostility (6 items), guilt (6 items), and sadness (5 items). For each specified mood state, athletes rated the extent to which they had experienced it during the past three months from 1, *very slightly or not at all*, to 5, *extremely*. Total score for each mood state is the mean of the items; higher scores indicate higher levels of that mood. Cronbach alphas in the current sample were .87 (Fear), .89 (Hostility), .91 (Guilt), and .93 (Sadness). Petrie et al. (2014) reported that each of the mood states was correlated with bulimic symptomology (rs = .24 to .32), body satisfaction (rs = -.34 to -.24), dietary intent (rs = .16 to .21), and muscularity-oriented body image (rs = .16 to .23).

Eating Pathology

The 36-item Bulimia Test Revised (BULIT-R; Thelen, Mintz, & Vander Wal, 1996) assesses bulimic symptoms based on DSM-IV criteria (APA, 2000). Athletes rated each item from 1, *no or lowest level or frequency of disturbance*, to 5, *highest level or frequency of disturbance*. Total score is the sum of the 28 included items, and can range from 28, *no symptoms*, to 140, *high level of symptoms*. Cronbach's alpha in the current sample was .90. Petrie, Greenleaf, Carter, and Reel (2007) found that the BULIT-R could successfully differentiate between male collegiate athletes who were symptomatic or were asymptomatic of an ED. Further, the BULIT-R correlated significantly with measures of body satisfaction (r = -.23), dietary intent (r = .44), negative affect (rs = .24 to .32), and drive for muscularity (rs = .18 to .24; Petrie et al., 2014).

The nine-item Dietary Intent Scale (DIS; Stice, 1998b) assesses behavioral intentions to restrict eating. Athletes rated each item from 1, *never*, to 5, *always*. Total score is the mean of the items; higher scores indicate a stronger intention to restrain. Cronbach's alpha from the current sample was .95. The DIS has been found to correlate significantly with total caloric intake (r = -.24) and fat-gram intake (r = -.34; Stice, Fisher, & Lowe, 2004), and with body satisfaction (r = -.26; McFarland & Petrie, 2012).

Procedure

After obtaining IRB approval, we emailed head athletic trainers from NCAA (Division I, II, and III) and NAIA institutions to solicit their assistance in making the study available to male athletes at their schools. There were no exclusion criteria. The email described the study, including its purpose (i.e., examine the physical and psychological health of male collegiate athletes), the website link to the survey, information on being enrolled for the random drawings for $50 cash prizes, and that it was funded by a grant from the National Collegiate Athletic Association. We sent three email reminders to the athletic trainers during the fall semester and again during the subsequent spring semester to maximize athlete participation. Because we did not request confirmation from athletic trainers that they forwarded information about the study, we cannot determine a specific response rate. However, the participants came from colleges/universities located in 34 of the 50 states in the U.S.

Athletes who chose to participate anonymously completed the survey via a secure website. They provided consent and then completed the questionnaires; the survey took 15-20 minutes and the athletes provided no identifying information. Upon completion, athletes were given the option of entering the random drawing.

Data Analysis

First, we determined that no items were missing across all data collected. Second, we calculated total scores and Cronbach's alphas for each measure, and then examined each score's distributional properties (e.g., skewness, kurtosis); all were within normal limits. Third, to improve upon the Kong and Harris (2015) study, we categorized the male athletes into six different sport types based on current best practices (e.g., Martinsen & Sundgot-Borgen, 2013), including: (a) ball game (n = 257; e.g., baseball, basketball, soccer, lacrosse, and volleyball), (b) power (n = 185; e.g., football, field events, and hockey), (c) endurance (n = 169; e.g., cross country/track, swimming, rowing, and skiing), (d) technical (n = 51; e.g., tennis, golf, fencing, and squash), (e) weight-dependent (n = 33; e.g., wrestling and crew), and (f) aesthetic (n = 3; all diving). Due to the small size of the aesthetic sport type group, they were dropped from all subsequent analyses.

To address our research question, we used multivariate analysis of covariance (MANCOVA). Sport type served as the independent variable, body mass index (BMI) as the covariate due to its relationship to the outcomes included in this study, and the sociocultural, body image, and disordered eating measures as the dependent variables. For our post-hoc comparisons, we used descriptive discriminant analysis (DDA; Barton, Yeatts, Henson, & Martin, 2016). For our DDA post-hoc analyses, we examined the strength of the observed measured variables on each linear composite dependent variable (i.e., structure coefficients), interpreting the coefficients in excess of |.33| (Tabachnick & Fidell, 2013). By examining the group centroids, we determined the levels within each IV that differed significantly on each identified linear composite dependent variable while controlling for BMI. We set alpha at .05 for

all analyses. Based on a power analysis using G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009), small effect size (f^2 = .10), and our sample size of 698, power exceeded .90.

CHAPTER 3

RESULTS

Based on the Box's M test, and comparison of log determinants if Box's M test was significant, the homogeneity of covariances assumption was met across all analyses.

General Sociocultural Pressures

The MANCOVA reached significance, Wilk's $\Lambda = .917$, F (24, 2387.40) = 2.49, $p < .001$, partial $\eta^2 = .08$. The DDA revealed a single function, Wilk's $\Lambda = .93$, χ^2 (24) = 46.90, $p = .003$, $R^2_c = .07$, which indicated that the general sociocultural pressures linear composite discriminated between sport types. The structure coefficients revealed that pressures to lose weight, have a lean body, exercise more, look more muscular, and change appearance significantly contributed to the group differences on this composite dependent variable (See Table A.2). The pressure to look more attractive did not significantly contribute to group differences on this composite dependent variable.

Based on the group centroids, the one-way ANCOVA was significant $F(4, 689) = 2.46$, $p = .044$, partial $\eta^2 = .01$ (see Table A.3 for centroid means and confidence intervals). Specifically, there was a significant difference on the group centroids between power and endurance athletes ($d = .30$). Power sport athletes reported more pressure to lose weight, have a lean body, look more muscular, and change appearance, but less pressure to exercise, than the endurance athletes.

Sport Weight Pressures

The MANCOVA was significant, Wilk's $\Lambda = .576$, F (12, 1817.923) = 35.15, $p<.001$, partial $\eta^2 = .168$. The DDA revealed two significant functions: Function 1, Wilk's $\Lambda = .545$, $\chi 2$ (12) = 418.48, $p < .001$, $R^2_c = .31$, and Function 2, Wilk's $\Lambda = .792$, $\chi 2$ (6) = 160.72, $p < .001$, R^2_c

= .21. Examination of the structure coefficients revealed that coach and teammate pressures contributed significantly to the group differences for Function 1. For Function 2, coach and teammate pressures, and uniform pressures contributed significantly (see Table A.4). Weight and appearance pressures did not contribute significantly to either function.

Based on the Function 1 group centroids, the one-way ANCOVA was significant, F (4, 689) = 57.61, $p < .001$, partial $\eta^2 = .25$ (see Table A.3 for centroid means and confidence intervals). The group centroid for weight-dependent athletes was significantly higher than endurance ($d = 2.45$), ball game ($d = 1.39$), power ($d = 1.17$), and technical athletes ($d = 2.05$). The group centroids for ball game and power athletes, respectively, were significantly higher than endurance ($d = 1.05$; 1.08), and technical athletes ($d = .67$; .81). Athletes from the sports with the larger centroids experienced more pressures from coaches and teammates regarding weight and body.

Based on the Function 2 group centroids, the one-way ANCOVA was significant, F (4,689) = 50.21, $p < .001$, partial $\eta^2 = .23$ (see Table A.3 for centroid means and confidence intervals). The group centroid for weight-dependent athletes was significantly higher than endurance ($d = .87$), ball game ($d = 1.93$), power ($d = 1.58$), and technical athletes ($d = 2.07$). The group centroid for endurance athletes was significantly higher than ball game ($d = 1.03$), power ($d = .63$), and technical athletes ($d = 1.19$). The group centroid for power athletes was significantly higher than ball game athletes ($d = .30$). Athletes who scored higher on this function experienced more pressures due to their uniforms and from coaches and teammates about their weight and appearance in sport.

Internalization of Appearance Ideals

The MANCOVA reached significance, Wilk's $\Lambda = .966$, $F(8, 1376) = 2.98$, $p = .003$,

partial η^2 = .017. The DDA revealed a single significant function, Wilk's Λ = .934, χ^2 (24) = 46.90, p = .003, R^2_c = .07. The structure coefficients revealed that the internalization of both general societal, and athletic, appearance ideals contributed significantly, though athletic ideals were more salient (see Table A.5).

Based on the group centroids, the one-way ANCOVA was significant, F (4, 689) = 5.55, p < .001, partial η^2 = .03 (see Table A.3 for centroid means and confidence intervals). The group centroids for the ball game (d = .40) and technical athletes (d = .49) were significantly higher than endurance athletes. Thus, ball game and technical sport athletes experienced more internalization of athletic ideals, but less in regards to general societal appearance ideals, then did athletes from endurance sports.

Body Satisfaction and Drive for Muscularity

The MANCOVA reached significance, Wilk's Λ = .847, F (16, 2096.402) = 7.31, p< .001, partial η^2 = .041. Although the DDA revealed three significant functions -- Function 1, Wilk's Λ = .791, χ^2 (16) = 161.938, p < .001, R^2_c = .17, Function 2, Wilk's Λ = .958, χ^2 (9) = 29.625, p = .001, R^2_c = .03, and Function 3 Wilk's Λ = .983, χ^2 (4) = 11.565, p = .021, R^2_c = .02 -- due to the low amount variance explained by Function 2 (R^2=.04)and Function 3 (R^2=.02), we did not interpret them. For Function 1, however, examination of the structure coefficients revealed that dissatisfaction with upper body, engagement in muscularity behaviors, and having a muscularity oriented body image contributed significantly to the group differences (see Table A.6).

Based on the Function 1 group centroids, the one-way ANCOVA was significant, F (4, 689) = 21.46, p< .001, partial η^2 = .111 (see Table A.3 for centroid means and confidence intervals). The group centroids for ball game (d = .82), power (d = .86), and technical athletes (d

= 55) were significantly higher than endurance athletes. The group centroid for power athletes was significantly higher than weight-dependent athletes (d = .59). Thus, athletes who scored higher on this function experienced more dissatisfaction with upper body, were more oriented to a having a muscular body, and were more engaged in behaviors designed to increase muscularity than those who scored lower.

Negative Affect

The sport type MANCOVA was not significant, Wilk's Λ = .989, F (16, 2096.402) = .471, p = .961, indicating that the sport groups did not differ significantly in their reported levels of negative affect.

Eating Pathology

The MANCOVA reached significance, Wilk's Λ = .891, F(8, 1376) = 10.21, p<.001, partial η^2 = .056. The DDA revealed a single significant function, Wilk's Λ = .909, χ^2 (8) = 66.07, p < .001, R^2_c = .08; both dietary intention and bulimic symptomology significantly contributed (see Table A.7).

Based on the group centroids, the one-way ANCOVA was significant, F (4, 689) = 18.77, p <.001, partial η^2 = .10 (see Table A.3 for centroid means and confidence intervals). The group centroid for weight-dependent athletes was significantly higher than endurance (d = 1.32), ball game (d = 1.32), power (d = 1.54), and technical athletes (d = .89). The group centroid for technical athletes was significantly higher than power athletes (d = .65). Athletes with higher scores on this function reported more disordered eating pathology in terms of higher intentions to diet and more bulimic symptomology than those with lower group centroids.

CHAPTER 4

DISCUSSION

In this study, I examined the relationship of sport type, which was used as a proxy for the type of pressures athletes are likely to experience within a sport environment, to the psychosocial variables identified with the Petrie and Greenleaf (2012) model. I extended past research (e.g., Kong & Harris, 2015) by using a more robust and detailed method for determining my sport type groupings. As hypothesized, after controlling for the athletes' BMI, there were significant differences among sport types on every composite dependent variable with the exception of negative affect. Consistent with past research, athletes who competed within certain types of sports were able to be delineated from others on basis of their scores on the composite dependent variables (e.g., Galante et al., 2017; Karr et al., 2013; Kong & Harris, 2015; Perelman et al., 2019). In particular, weight-dependent, power, and technical sport athletes had the greatest number of significantly different scores, demonstrating distinct profiles across the composite dependent variables.

In regards to general sociocultural pressures, particularly the general masculine ideal to be lean and muscular, power sport athletes scored higher than athletes who participated in endurance sports. Although the literature suggests that men experience societal pressures related to their appearance (e.g., Cafri et al., 2005; Petrie et al., 2014), the lack of any other significant differences on this composite dependent variable suggests that these pressures are not particularly exacerbated by male athletes' participation in different types of sport environments. However, when pressures related specifically to the sport environment were considered, there was greater differentiation among the sport type groups on those composite dependent variables. Although the athletes who participated in weight-dependent sports scored highest on both

functions, which is consistent with past research (e.g., Chapman & Woodman, 2016), power and ball game athletes reported experiencing higher levels of pressures from teammates and coaches (compared to endurance and technical athletes) and endurance sport athletes appeared to be particularly conscious of how they felt about their bodies and weight in relation to their uniforms. Although comments by coaches and teammates about weight, eating and body have been noted as prominent, powerful and ubiquitous pressures in the sport environment (e.g., Galli & Reel, 2009; Jones et al., 2005), athletes experience unique pressures related to their uniforms, particularly the presence of bodily flaws and an increased scrutiny of their physique (Galli et al., 2014). My study adds supports to the contention that athletes from different sport environments will experience varying levels and types of pressure from within those environments.

Ball game and technical sport athletes scored significantly higher than athletes who participated in endurance sports on dependent variable composites related to internalization and body image. Specifically, the ball game and technical sport athletes more strongly internalized the ideals of an athletic body (e.g., being muscular) and were more dissatisfied with their upper bodies, more oriented to having a muscular body, and more engaged in behaviors to increase muscularity. Not surprisingly, power sport athletes reported similar levels of body image dysfunction to the ball game and technical sport athletes. These results are similar to previous research suggesting that ball game, technical and power sport athletes would have more desire for a larger, muscular physique than athletes from other sports and be more dissatisfied with the leanness and muscularity of their current bodies (e.g., Raudenbush & Meyer, 2003; Stewart et al., 2003). As compared to sports that may emphasize leanness to improve performance (e.g., swimming), demands within sport environments such as golf, football, and baseball (technical, power, and ball sports included in the sample, respectively) require explosive, powerful

movements. The athletes from these sport types may internalize pressures to conform to a more muscular body image due to a possible belief that muscular prowess directly relates to higher performance. Professionals will need to take note of the pressures that these athletes are inundated with on a daily basis, as they can be more likely to direct their efforts to address their size concerns (Raudenbush & Meyer, 2003).

Given their increased sport environment pressures, it is not surprising that weight-dependent athletes reported significantly higher intentions to diet and more bulimic symptomology than all other groups. This finding supports the notion that some athletes may develop DE/ED in response to the demands of their environment rather than to address body dissatisfaction. Research examining the etiology of ED/DE supports the relationship between sport pressures and bulimic symptomology (Chatterton et al., 2017). In the case for weight-dependent athletes, there are ubiquitous messages within their environment about weight and body, which may result in them being more likely to engage in weight loss behaviors. The literature has found support for this result, finding that athletes from weight-dependent sports typically report higher levels of ED/DE as compared to other sport types. (e.g., Lentillon-Kaestner, 2014; Stoutjesdyk and Jevne, 1993; Thompson & Sherman, 2010; Thompson & Sherman, 2014).

Although the study had many strengths, including a large, diverse sample of male collegiate athletes, there were limitations that require discussion. First, although the men represented 17 different sports, there were not a sufficient number of athletes who participated in the sport type groupings of aesthetic (e.g., figure skating, gymnastics) or antigravitation (e.g., pole vaulting, ski jumping) to be included. Thus, my findings are limited to the comparisons among the five included sport type groups and cannot be generalized beyond those athletes'

experiences. Second, despite using one of the more supported taxonomies for sport type (Sundgot-Borgen & Torstviet, 2004) there is a possibility for losing nuance and variance in our findings when placing individuals into groups. Even though our sport types attempt to capture the environment through the demands it could place on the athlete, it would be fallacious to say that sports like swimming and diving were the same experience as cross-country. Third, all scores were obtained through self-report, which introduces the potential for self-presentational bias. Thus, my findings actually may underestimate the extent to which the sport type groups differ from each other. Finally, the cross-sectional design of the study limits how I can interpret my findings, focusing only on the associations among the sport type groups and the outcomes. In the future, researchers could engage in more purposeful sampling so as to enroll athletes from sports representing an even broader set of sport types, with more athletes representing each sport, and could implement longitudinal designs to test the temporal relationships among the pathways that are hypothesized within the Petrie and Greenleaf (2012) model.

The findings offer considerations for how sport psychologists and other sport medicine professionals, such as sport dietitians, may understand and assist male athletes who are from different sport environments. For professionals working in weight-dependent sport environments, such as wrestling and rowing, our results suggest they experience considerable pressures from coaches and teammates about body and weight and are likely to report behaviors and intentions related to their eating that are restrictive and dysfunctional. Professionals can directly target the sources of pressures within a sport environment (i.e., coaches and teammates) by helping them become more aware of the impact of their comments and expectations of body size, shape, and appearance, and direct them on creating a training environment that is focused on healthy behaviors and expectations. Ball game, power, and technical sport athletes, on the

other hand, reported being the most oriented to having a muscular body, being the most dissatisfied with their current bodies' leanness and muscularity, and being most likely to engage in behaviors designed to increase their muscle mass and strength. The misuse of anabolic-androgenic steroids and dietary supplements to build muscle can lead to issues with kidney health (Bordin et al., 2017). More commonly associated with weight-dependent athletes, overtraining can possibly lead to nonfunctional overreaching or even overtraining syndrome that are associated with decreased performance, reduced recovery, physical exhaustion, and psychological distress (Birrer, 2019; Miskulin & Milanovic, 2018). Professionals can provide athletes with resources and strategies to counter the pressures they experience. Finally, endurance sport athletes (i.e., swimming, cross-country, long-distance track events), appear to experience considerable pressure from their teammates and coaches about body and weight, and uniquely, from their uniforms. That is, these athletes, likely due to the fact that their uniforms are swimsuits and expose more of the body than other sports, may become overly sensitized to their bodies and perceived flaws in their physiques. Similarly to weight-dependent athletes, addressing the atmosphere surrounding endurance athletes can be beneficial. Prevention programming for ED/DE risk factors has been suggested for female athletes (Bar et al., 2016). Although there is a paucity of intervention and programming research for male athletes, Petrie (2019) recommends that successful prevention programs are interactive, target supported risk factors, and be based in a theoretical-established approach.

In this study, I examined the relationship of sport types to various psychosocial variables related to ED/DE development. In improving on past research (e.g., Kong & Harris, 2015) I used a more robust system for grouping the athletes across their sports and incorporated a more sophisticated way to examine multivariate outcomes. Overall, I found that sport type groups

differed from each other, in ways consistent with theory and research (Kong & Harris, 2015; Perelman et al., 2018), across the composite dependent variables. In summary, weight-dependent sport athletes reported higher scores in their experience of sport related pressures, higher intentions to diet, and more bulimic symptomology. Although not significantly different, they also indicated high scores on the internalization of sport-related messages regarding their weight, appearance, and body. Power sport athletes indicated higher scores on general sociocultural pressures, more dissatisfaction with their upper bodies, higher endorsement of wanting a more muscular body, and engaging in more behaviors to increase their muscularity. Endurance athletes reported higher scores in their experience of sport pressures, particularly when involving pressures from coaches and teammates and pressures due to their uniforms. Ball and technical sport athletes indicated higher scores on internalization of sport-related messages regarding their appearance. Although this study did elucidate differences in correlates between sport environments, additional research is needed to further understand the impact sport environments have on ED/DE development over time.

Table 1

Proposed Hypotheses

	Endurance	Ball Game	Power	Technical	Weight-Dep.
General pressures	A	*	*	*	*
Sport pressures	A	*	A	*	A
Internalization	*	*	*	*	*
Body image concerns	*	B	A	*	*
Negative Affect	*	*	*	*	*
Eating pathology	A	B	*	B	A

Note. Letters denote no significant difference between sport types with same letter. Sport types with different letters are significantly different from each other. *Exploratory; No literature to support a hypothesis.

Table 2

Canonical Correlations and Structure Coefficients for Function of General Pressures

Variables	Sport Type		
	Function 1		
	R^2_c	Std. Coeff.	r_s
	.07		
Lose Weight		.04	.43*
Lean body		.40	.58*
Exercise more		-.12	.53*
Look more muscular		1.18	.73*
More attractive		-1.08	.10
Change appearance		.15	.38*

Note: R^2_c = squared canonical correlation; Std. Coeff. = standardized coefficients; r_s = structure coefficients. *Significant contribution to function per Tabachnick & Fidell's (2013) guidelines.

Table 3

Descriptive Discriminate Analysis Follow-Ups

Discriminate Functions within ED/DE correlates	Adjusted Group Centroids (Controlling for BMI) by Sport Type				
	Endurance (*n*=169) (95% C.I.)	Ball game (*n*=257) (95% C.I.)	Power (*n*=185) (95% C.I.)	Technical (*n*=51) (95% C.I.)	Weight-Dependent (*n*=33) (95% C.I.)
General Pressures					
Function 1	-0.19 (-.35, -.03)[a]	0.05 (-.07, .17)[ab]	0.16 (0.00, .32)[b]	-0.13 (-.41, .15)[ab]	-0.12 (-.46, .22) [ab]
Sport Pressures					
Function 1	-0.88 (-1.04, -.72)[a]	0.19 (.07, .32)[b]	0.38 (.22, .54)[b]	-0.47 (-.74, -.19)[a]	1.57 (1.24, 1.91)
Function 2	0.62 (.46, .78)	-0.42 (-.54, -.30)[ab]	-0.10 (-.26, .06)[b]	-0.53 (-.82, -.28)[a]	1.49 (1.15, 1.82)
Internalization					
Function 1	-0.27 (-.43, -.11)[b]	0.14 (.02, .25)[ac]	-0.06 (-.22, .11)[ac]	0.23 (-.05, .50)[c]	0.24 (-.10, .58)[abc]
Body Image					
Function 1	-0.64 (-.80, -.48)[a]	0.20 (.08, .33)[bc]	0.36 (.20, .52)[b]	-0.09 (-.36, .18)[bc]	-0.23 (-.57, .11)[ac]
Eating Pathology					
Function 1	-0.03 (-.19, .12)[ab]	-0.02 (-.14, .10)[ab]	-0.27 (-.42, -.14)[a]	0.39 (.12, .65)[ab]	1.25 (.92, 1.58)

Note: [a,b] –Centroids that do not have any superscripts associated with them are significantly different at $p < .05$. Centroids that share a common superscript are not significantly different from each other.

Table 4

Canonical Correlations and Structure Coefficients for Functions of Sport Specific Pressures

Variables	Sport Type					
	Function 1			Function 2		
	R^2_c	Std. Coeff.	r_s	R^2_c	Std. Coeff.	r_s
	.31			.21		
CTP		1.076	.882*		.226	.375*
UP		-.494	-.112		.999	.825*
BA		-.033	.139		-.630	-.145

Note: CTP = Coach and Teammate Pressure. UP = Uniform Pressure. BA = Body Appearance and Weight Pressure. R^2_c = squared canonical correlation; Std. Coeff. = standardized coefficients; r_s = structure coefficients. *Significant contribution to function per Tabachnick & Fidell's (2013) guidelines.

Table 5

Canonical Correlations and Structure Coefficients for Function of Internalization Measures

Variables	Sport Type		
	Function 1		
	R^2_c	Std. Coeff.	r_s
	.03		
Athlete		1.493	.933*
General		-.665	.592*

Note: R^2_c = squared canonical correlation; Std. Coeff. = standardized coefficients; r_s = structure coefficients. *Significant contribution to function per Tabachnick & Fidell's (2013) guidelines.

Table 6

Canonical Correlations and Structure Coefficients for Functions of Body Image Concerns

Variables	Sport Type								
	Function 1			Function 2			Function 3		
	R^2_c	Std. Coeff.	r_s	R^2_c	Std. Coeff.	r_s	R^2_c	Std. Coeff.	r_s
	.17			.03			.02		
Sat-L		.270	-.254		-.056	.566*		-1.271	-.565*
Sat-UB		-.672	-.477*		.679	.807*		1.176	.053
MB		.939	.877*		.772	.372*		-.124	.258
MOBI		-.122	.620*		-.592	-.331*		.559	.451*

Note: Sat-L = Satisfaction with legs. Sat-UB = Satisfaction with upper body. MB = Muscularity behaviors. MOBI= Muscularity-oriented body image. R^2_c = squared canonical correlation; Std. Coeff. = standardized coefficients; r_s = structure coefficients. *Significant contribution to function per Tabachnick & Fidell's (2013) guidelines.

Table 7

Canonical Correlations and Structure Coefficients for Function of Eating Pathology

Variables	Sport Type		
	Function 1		
	R^2_c	Std. Coeff.	r_s
	.08		
DIS		1.057	.995*
BULIT		-.119	.434*

Note: DIS = Dietary Intent Scale total score. BULIT= Bulimia Test Revised total score. R^2_c = squared canonical correlation; Std. Coeff. = standardized coefficients; r_s = structure coefficients. *Significant contribution to function per Tabachnick & Fidell's (2013) guidelines.

APPENDIX

EXTENDED LITERATURE REVIEW

Eating Disorders and Subclinical Eating Disorders: Definitions and Prevalence

Eating pathologies, such as anorexia nervosa (AN), bulimia nervosa (BN), and binge-eating disorder (BED) are psychiatric disorders that are defined within the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V; American Psychiatric Association, 2013). AN is distinguished by having a low bodyweight relative to age and height (generally a BMI lower than 17 kg/m^2), distorted perceptions of one's own weight and placing significant personal value in one's weight. Individuals with AN typically limit food intake in order to display a greater level of control towards their own appearance. BN, on the other hand, is marked by periods of binge eating, followed by either purging, excessive exercise, laxative use or other compensatory behaviors. BN often coincides with feeling a lack of control, which these compensatory behaviors are proposed to temporarily soothe (APA, 2013). Finally, BED is marked by recurrent and persistent episodes of binge eating and a lack of compensatory behaviors (APA, 2013). Nearly half of individuals suffering from these disorders have some type of comorbid mood disorder, such as anxiety or depression (Fichter & Quadflieg, 2016). Furthermore, these disorders can increase the risk for suicide, as individuals with AN are 18 times more likely to die by suicide and individuals with BN are seven more times likely to die by suicide as compared to age and gender matched peers (Smith, Zuromski, & Dodd, 2018).

EDs were originally thought to only affect White, middle- or upper-class women (Bruch, 1973; DeFeciani, 2016). This perspective in early research and practice may have led to the initial underrepresentation of men, older individuals, and people of color in ED and body image research (Tylka & Subich, 2002). In the past 20 years, researchers have shifted efforts so as to understand boys and men in relation to EDs and body image, demonstrating that they too are at-risk and experience these disturbances at rates far higher than originally thought (Hudson, Hiripi,

Pope & Kessler, 2007; Pritchard, 2008; Bratland-Sanda & Sundgot-Borgen, 2011; Mitchison & Mond, 2015). For example, Hudson et al. (2007) reported that 0.05% to 0.3% of men have experienced AN at one point in their lives, compared to women at 0.5% to 0.9%. BED shows the highest prevalence rate of the eating pathologies for adult men in the United States, with estimates of lifetime prevalence to be ranging from 0.78% to 2.0% (Taylor et al., 2007; Alegria et al., 2007; Hudson et al., 2007). Hilbert, De Zwaan and Braehler (2012) found identical rates of binge eating (4.2% each) in a large sample of German men and women, ranging from 14 to 95 years old, as well as similar levels of engagement in extreme caloric restriction (7.7% for men, 11.9% of women). The majority of male eating disorders based upon DSM-IV criteria, however, were in the eating disorder not otherwise specified (EDNOS, which at the time was inclusive of binge eating disorder) category, with a lifetime prevalence of 3.38% reported by Le Grange et al. (2012).

Nearly ten percent of the United States population (about 20 million women and 10 million men) are suggested to suffer from a clinically significant eating disorder or are at minimum symptomatic, suggesting a sub-clinical disturbance (i.e., the experience of eating disorder symptoms but not with the frequency or severity to warrant a clinical diagnosis; Wade, Keski-Rahkonen, and Hudson, 2011). Subclinical ED behaviors (binging and purging, laxative abuse, fasting for weight management purposes) are nearly as common among men as they are among women (Mond, Mitchison, & Hay, 2014). In a sample of male undergraduate students, Tylka and Subich (2002) reported that 37% were categorized as symptomatic of disordered eating as compared to 12% that were categorized as eating disordered using the Questionnaire for Eating Disorder Diagnosis (QEDD; Mintz, O'Halloran, Mulholland, & Schneider, 1997).

Peck and Lightsey (2008) found similar rates in a sample of female undergraduate students using the QEDD, reporting 36.4% as symptomatic and 11.8% were classified as eating disordered.

Athletes may face sport specific demands (e.g., weight, body, physique, and eating pressures) in addition to the general societal pressures that all individuals experience in regards to their bodies (Petrie & Greenleaf, 2012), which make them a subpopulation of interest for ED researchers. Overall, rates of EDs and DE may be slightly more prevalent as compared to non-athletes (Hausenblas & Carron, 1999; Smolak, Murnen, & Ruble, 2000); these trends have been found particularly among elite female level performers (e.g., Martinsen & Sundgot-Borgen, 2013). Over the last decade, researchers have come to acknowledge that male athletes also are at-risk for body image concerns and disordered eating behaviors due to similar unique pressures from within sport environments (e.g., Thompson & Sherman, 2010; Petrie, Galli, Greenleaf, Reel, & Carter, 2014). For example, DiPasquale and Petrie (2013) found that 14.6% of collegiate male athletes in their sample reported feeling that certain body parts were too fat. In addition to concerns about body fat, male athletes are also concerned about muscularity. In a multi-sport sample consisting of 117 Division II collegiate male athletes, Raudenbush and Meyer (2003) found that collegiate male athletes tended to believe that their actual physique, as represented through figure drawings, was significantly less muscular than the ideal physique for their sport and the physique they considered would be attractive to the opposite sex. Results also indicated that soccer and lacrosse players chose an ideal physique larger than the one they thought was attractive to the opposite sex, whereas swimmers chose an ideal physique smaller than the one they thought was attractive to the opposite sex. Utilizing the Body Shape Questionnaire (BSQ; Cooper et al., 1987), Kristjánsdóttir et al. (2019) found that 3.9% of Icelandic elite male athletes presented with severe or moderate body image concern. Thus, researchers have started to focus

exclusively on male athletes' eating disorders and disordered eating symptoms (EDs/DE) and experiences, recognizing that comparisons with female athletes are unneeded and likely methodologically limiting (Petrie & Greenleaf, 2012).

There have been mixed results in studies examining the prevalence of clinical eating disorders in male athletes. When using the QEDD to determine ED classification in a sample of 199 collegiate male athletes, Petrie, Greenleaf, Carter, & Reel (2007) found that only 2 (1.0%) of the athletes were diagnosed as eating disordered; one athlete was classified with subthreshold BN and another with non-bingeing BN. In a similar study, Petrie, Greenleaf, Reel, & Carter (2008) reported that none of their mixed sport sample (n = 203) met criteria for an eating disorder. Chatterton and Petrie (2013) found that only 1.1% of the male athletes in their mixed sport collegiate sample were classified with an eating disorder (specifically, EDNOS) and DiPasquale and Petrie (2013) reported that 0% of the male athletes in their study of a mixed sport sample were classified with an eating disorder. Sundgot-Borgen and Tortsviet (2004) used structured clinical interviews with 687 elite male Norwegian athletes (mean age = 23.2 years) to assess symptomatology; 6.98% were classified as clinically eating disordered. Specifically, 3% were classified with BN, and 5% were classified with EDNOS. Martinsen and Sundgot-Borgen (2013) found that 3.2% of their sample (Norwegian students at elite sport high schools; mean age = 16.5 years) met criteria for at least one eating disorder, which was determined by the Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994), as well as clinical interviews. Specifically, five male athletes were classified as having EDNOS, one with BD and none with AN.

Like in nonathlete samples, the prevalence of clinical EDs is relatively low in athlete samples. Thus, researchers also have focused on determining rates of subclinical EDs in the

athletic population, recognizing that athletes are likely to engage in behaviors, such as excessive exercising or binge eating, but at frequencies and/or intensities too low to meet clinical diagnoses but high enough to be problematic. For example, Chatterton and Petrie (2013) found that only 1% of the male athletes in their sample were classified with an eating disorder, whereas 16.6% could be categorized as symptomatic. Similarly, DiPasquale and Petrie (2013) reported that 0% of the male athletes in their study were classified with an eating disorder, 12.2% were symptomatic. Petrie et al. (2007) and Petrie et al. (2008) reported 16.6% and 19.2% of their samples were symptomatic, respectively. Regarding pathogenic weight control behaviors in collegiate male athletes, Petrie et al. (2008) found that 37% used exercising and 14.2% used fasting/dieting, but fewer than 10% used vomiting, laxatives, or diuretics. Due to the higher prevalence, subclinical eating disorders are considered as more salient outcomes for research on disordered eating in athletic populations.

Summary

Male athletes, like nonathletes, experience clinical and subclinical EDs and use a range of pathogenic weight control behaviors (Sundgot-Borgen & Torstviet, 2004). Prevalence rates from multiple studies investigating male athletes (e.g., Petrie et al., 2007; Petrie et al., 2008; DiPasquale & Petrie, 2013; Chatterton & Petrie, 2013) consistently suggest subclinical EDs and weight control behaviors occur far more often than clinically diagnosable eating disorders. Similar to clinical EDs, subclinical eating disorders and pathogenic behaviors are associated with similar health risks (e.g., chronic fatigue), psychological distress, and reduction in performance (Hudson et al., 2007). Additionally, athletes with subclinical eating concerns are at-risk for developing clinical EDs in the future (Thompson et al., 2017) and when compared to athletes with clinical EDS, athletes with subclinical EDs show similar presentations of disordered eating

attitudes and behaviors (e.g., internalization, body dissatisfaction, and negative affect; Petrie et al., 2009). Given the higher prevalence, similar etiology, and risk for developing into clinical EDs, it is important to explore and understand the factors that contribute to subclinical eating disorders.

Sociocultural Perspectives of ED Development

Biological, physical, personality, sociocultural, familial, and psychological factors have been identified as increasing individuals' risk in the etiology of developing body image concerns and ultimately disordered eating behaviors (e.g., Stice, South, & Shaw, 2012; de Carvalho, Alvarenga & Ferreira, 2017). Although researchers acknowledge that EDs are determined by multiple factors, many theoretical models have focused on sociocultural variables as being particularly pernicious and pervasive, and thus influential in determining who is at-risk (Moradi, 2010; Stice et al., 2012).

From a sociocultural perspective, researchers have suggested that repeated exposure to appearance expectations and ideals that are communicated from an array of sources, including friends, family and media (The Tripartite Influence Model; Thompson et al., 1999), may result in the internalization of such ideals (or the development of schema representing how men or women should look, behave, eat, etc.). These schema then become the norm against which men and women compare their actual bodies, appearance, and behaviors; because so many fall short of these internalized ideals, they experience discrepancies between how they currently are and how they would like to be that can influence their self-perceptions (Higgins, 1987). As this real-ideal discrepancy increases, so does the likelihood of men and women becoming concerned with and dissatisfied by their body size and shape and their general overall appearance (Martin & Racine, 2017; Xiaojing, 2017).

Objectification Theory (Fredrickson & Roberts, 1997) posited that experiences of sexual objectification would affect women's psychological well-being and lead to the development of eating disorders. Moradi (2010) expanded upon this theory by acknowledging the importance of general socialization experiences (beyond sexual objectification, such as gender or cultural identity conflict/marginalization, experiences of heterosexism or racism, and masculine appearance norm pressures) and suggesting that such experiences are central to the internalization of dominant culture's attractive/beauty ideals. When individuals view their bodies as objects (i.e., become self-objectifying), they are more likely to engage in frequent self-monitoring, comparing, and evaluating and thus increase the likelihood of experiencing shame and dissatisfaction in relation to their bodies and appearance.

Increases in negative emotions and intentions to diet are thought to be the precursors to eating disorders (Greenleaf & Petrie, 2012; Shammugam, Jowett, & Meyer, 2012). In response to this increasing dissatisfaction with appearance and physique, eating disorder symptomology may increase indirectly through negative affect and dietary restraint in two different pathways (Dual Pathway Model; Stice & Agras, 1999). In the affect pathway, men and women may experience more general negative affect (e.g., feel sad, stressed, ashamed) when they are dissatisfied with their bodies and use food as means to lessen negative emotions they feel (Stice, 2001). Eating to cope with psychological distress may lead to a cycle of increased binge eating then subsequent purging to compensate, which may lead to the development of BN (Kerin, Webb, & Zimmer-Gembeck, 2019). In the restraint pathway, individuals engage in behaviors they think will change their bodies to more closely approximate the ideal (i.e., restrict food intake) when they are dissatisfied with how their body looks. This process requires an individual to deny physiological cues of hunger and satiety and disrupt intuitive eating processes (e.g., eating when hungry,

stopping when satiated), which can lead to dysregulated eating (Tylka, 2006). Support for the dual pathway model has been noted in the literature (e.g., Stice, Nemeroff, & Shaw, 1996; Stice, Shaw, & Nemeroff, 1998; Stice, 2002).

Although the development of ED/DEs is generally recognized as multifactorial (e.g., biological, physical, personality), a sociocultural perspective that focuses on the pressures and messages that exist within differing social environments about appearance, body, weight, and eating may be foundational (e.g., Striegel-Moore & Bulik, 2007; Thompson & Sherman, 2010). From this theoretical perspective, men's and boys' exposure to expectations about appearance, body, weight, masculinity, and eating that exist within societies, and are communicated through multiple sources (e.g., friends, family and media), is expected to result in the internalization of such ideals (e.g., Stice, 2001). These cognitive schema then influence how boys and men feel about themselves and their bodies, and ultimately, how they relate to food and weight through eating and exercise.

Sociocultural Model for Sport

Based upon established sociocultural models (e.g., Moradi, 2010; Stice et al., 2012), a similar sociocultural perspective has been proposed for athletes (e.g., Petrie & Greenleaf, 2007; 2012) that suggests there are pressures and expectations about weight, physique, and performances within the sport environment that are unique from those present within general society and may be particularly important in understanding the development of athletes' ED/DEs (Galli et al., 2011). Similar to general sociocultural models, these pressures are suggested to lead to internalization, which in turn increases body dissatisfaction. Body dissatisfaction is suggested to increase disordered eating directly, as well as indirectly through increases in negative affect and intentions to engage in dietary behavior. Anderson et al. (2011) reported that sport pressures

also had direct effects on body dissatisfaction and dietary restraint in a sample of collegiate female athletes. Petrie and Greenleaf (2012) also noted that athletes' drive for muscularity may contribute to the development of disordered eating behaviors and included it in their model. The following sections define and relate the constructs from the Petrie and Greenleaf (2012) model to the development of ED/DEs in male athletes.

General Sociocultural Pressures

Through multiple sources, such as peers, family, and media, male athletes, as well as men in general, can be exposed to societal pressures and expectations about their weight, appearance, and body size/shape (Greenleaf & Petrie, 2013). Male adolescents and adults face increased pressure to be lean and muscular (Cafrie et al., 2005). Leit, Gray, and Pope Jr. (2002) found that college-aged men exposed to media images of muscular men representing a masculine appearance ideal showed greater discrepancy between their own perceived muscularity and their ideal muscularity as compared to a control group that was shown neutral images (i.e., no human images or images focusing on the body). Through a series of qualitative interviews, Galli and Reel (2009) found that male athletes' opinions about how they should look were influenced by sociocultural messages, with friends and family members bringing attention to changes in their muscularity or media images exposing them to body ideals. With the advent of social media and increased involvement with online sources (e.g., Instagram), athletes (and nonathletes) may be becoming even more exposed to potentially damaging messages about fitness, body, and appearance (e.g., Holland & Tiggemann, 2016; Raggat et al., 2018).

Continued exposure to societal pressures and expectations can lead male athletes to internalize these ideals and increase dissatisfaction with their appearance (Petrie & Greenleaf, 2012). General sociocultural pressures were related to body dissatisfaction, negative affect, and

drive for muscularity in a sample of 203 male collegiate athletes representing multiple sports (Petrie et al., 2014). Similar results were found in a study conducted by Galli et al. (2015), though general sociocultural pressures were not significant predictors of muscularity-oriented body image or behaviors. Chatterton et al. (2017) found support for the proposed pathway, reporting that general societal pressures significantly predicted higher levels of internalization and negative affect in a sample of male collegiate athletes.

Sport Environment Pressures

Beyond the pressures and expectations that men face from society, male athletes are also exposed to messages from their teammates, coaches, and other sport personnel regarding sport-specific expectations about weight, body size, appearance, physique, muscularity, eating behaviors, and what it means to be a male athlete (Galli & Reel, 2009; Voelker et al., 2018). Coaches are noted as having a strong influence on athletes' body image, particularly in individual sports (Galli & Reel, 2009; Jones, Glintmeyer, & McKenzie, 2005). Given the high personal value elite athletes place on their abilities and fitness training, criticism can be notably detrimental (Jones et al., 2005). Sport environment pressures are proposed to directly increase internalization, drive for muscularity, dietary restraint, and negative affect, as well as to increase body dissatisfaction directly and indirectly through internalization.

In developing the Weight Pressures in Sport scale for male athletes in a sample of 203 collegiate male athletes, Galli et al. (2011) found that pressure related to appearance was related to lower self-esteem, more emphasis on their appearance, and increased negative affect in collegiate male athletes, whereas coach and teammate pressures (regarding their ability to function in sport) were predictive of disordered eating (AN & BN). Within the male sport environment, weight, body and appearance pressures were found to be related to comments made

by coaches and teammates, the uniforms worn by the athletes, and the importance of appearance and weight in the sport in a mixed-sport sample of 345 male collegiate athletes (Galli, Petrie, Reel, Chatterton, & Baghurst, 2014). These sport pressures significantly predicted higher levels of drive for muscularity in a mixed sport sample of 183 collegiate male athletes (Galli et al., 2015).

Athletes in sports that emphasize physique and/or physical size, such as gymnastics, skating, swimming, and wrestling, often have a higher likelihood of disordered eating or exercise behaviors (Lentillon-Kaestner, 2014). Sport pressures regarding revealing uniforms have been noted in male and female cheerleaders (Reel & Gill, 1998), as uniforms can bring unwanted attention to the body and possible aesthetic flaws (Galli et al., 2014). Involvement in sports that encourage or necessitate specific bodyweight has been noted in the literature as a significant contributor of eating disturbances (Sundgot-Borgen & Torstveit, 2004). For example, Voelker et al. (2018) found that 23 of the 29 (79.3%) male figure skaters (mean age = 18.45 years) viewed pressures to lose or maintain weight as a natural component in the culture of figure skating. Additionally, figure skaters who reported experiencing greater pressure about their body, weight, and appearance reported more disordered eating symptomology.

Internalization

Internalization refers to the development of schema regarding the ideals of how men should appear, often from multiple sources (friends, family, & media; Thompson et al., 1999). These schema become the norm in which men compare their actual bodies, which can lead to body dissatisfaction if the discrepancy with the internalized ideals is large enough (i.e. real-ideal discrepancy). Contrary to common belief that men are immune from endorsements of a certain body type, the internalization of an ideal body type is key to the development of muscle

dysmorphia, a type of body image concern (Grieve, 2007). Male athletes appear to be influenced by the internalization of media images and influences regarding body image. For example, Pritchard and Nielsen (2014) found that internalization of media images of athletic bodies was a significant predictor for drive for muscularity in a sample of collegiate male athletes.

Despite the paucity of research examining the direct relationship between internalization and ED/DEs in athletes (Petrie, 2019), evidence suggests an indirect relationship through the other psychological correlates in the Petrie and Greenleaf (2012) model. In a sample of 698 collegiate male athletes representing 17 sports, Chatterton, Petrie, Schuler, and Ruggero (2017) found that internalization explained 9% of the variance in body dissatisfaction, specifically that higher levels of internalization, as measured by the Sociocultural Attitudes Toward Appearance Questionnaire-3 (SATAQ-3; Thompson et al., 2004) were related to increased levels of body dissatisfaction. Certain behaviors can also serve as a proxy for internalization, such as body surveillance (viewing oneself from the perspective of others), body monitoring (engaging in behaviors to examine one's body size/shape/appearance). One example of body monitoring is frequent self-weighing outside of weigh-ins (Petrie, 2019). Galli, Petrie, and Chatterton (2017) found that male collegiate athletes who self-weighed at least seven times a week reported higher pressure to lose weight and be lean and muscular, dietary restraint, bulimic symptomatology, and drive for muscularity, supporting the notion that a behavior serving as a proxy for internalization has a relationship with other variables connected to ED/DE.

Body Dissatisfaction

Body dissatisfaction refers to how individuals feel about their weight, body size, body shape, and outward physical appearance, comprising the attitudinal component of body image concerns. McFarland and Petrie (2012) highlighted that body satisfaction must be defined

beyond fat or muscle content and needed to include male body ideals such as an upper torso that is lean, muscular, and V-shaped, and well defined legs. Men generally believe that they should be bigger or more muscular and often engage in exercise behaviors that target the upper body (Tylka & Subich, 2002; Andersen, 1999). Initially thought to be indirectly related to ED/DE through negative affect and dieting (Stice, 2001), current models (Petrie & Greenleaf, 2012) also propose direct effects (Petrie, 2019).

Although male athletes generally report significantly higher satisfaction with their bodies than male nonathletes (Hausenblas & Downs, 2001), male athletes still experience concerns about their bodies, such as not believing they are sufficiently lean or muscular (e.g., Galli & Reel, 2009). These concerns can bring rise to affective and behavioral responses (Petrie & Greenleaf, 2012). Due to physical appearance's role as a central component of self-concept in athletes, male athletes may experience negative affect (e.g., sadness, shame, anger) in response to their body dissatisfaction. In a sample of collegiate male athletes, there were significant correlations between body and face dissatisfaction and feelings of depression and sadness alongside stress (Petrie et al., 2007). Behaviorally, male athletes may address body dissatisfaction by restricting caloric intake to lose weight or increase caloric intake and take muscle enhancing products to increase muscle mass and strength. Chatterton et al. (2017) found that body dissatisfaction was significantly related to dietary restraint (32% variance explained), negative affect (30% variance explained), and bulimic symptomology (48% variance explained), supporting the direct and indirect effects of body satisfaction proposed by Petrie and Greenleaf (2012).

Negative Affect

Negative emotions can be the catalyst for self-nurturing behaviors. The experience of

negative affect, such as shame, anger, fear, guilt, or sadness, can motivate individuals to engage in coping to comfort and/or distract themselves from typically aversive and unsettling feelings. Although hunger represents a physical/psychological need, individuals may also eat for emotional reasons and rely on food to cope with psychological distress (Kerin et al., 2019). This "comfort eating" can dysregulate food intake and increase binge eating. In response to binge eating, individuals may experience guilt or shame, which may lead to compensatory over-exercising, dieting, or other unhealthy behaviors, such as vomiting. This binge/purge cycle may lead to the development of BN and related symptomatology (Fairburn, Cooper, Doll, & Davies, 2005).

In studies examining undergraduate students, higher scores on self-report measures of depression were found to be related to disordered eating symptoms in UK male and female undergraduate students (Shanmugam et al., 2012) and mood disorders are associated with increased bulimic symptomatology (Okatmoto et al., 2018). Anderson et al. (2011) found that greater negative affect (e.g., feelings of sadness, anger, fear) was related to body dissatisfaction in a sample of US collegiate swimmer/divers and gymnasts. In a mixed-sport sample of 203 collegiate male athletes, Petrie et al. (2014) found that negative affect was associated with higher bulimic symptomatology (measured with Bulimia Test Revised scores; BULIT-R; Thelen, Mintz, & Vander Wal, 1996), body dissatisfaction, dietary restraint, muscularity-oriented body image, and muscularity behavior at the bivariate level. However, negative affect was non-significant with bulimic symptomatology when tested in a full regression model with other psychosocial correlates (e.g., internalization, sport pressures) from Petrie and Greenleaf's (2012) sociocultural model.

Dietary Intent

Dietary intent refers to goal-directed behavior to engage in caloric restriction with the intent of changing weight. Dieting often includes set rules of what should be eaten and requires individuals to ignore the normal physiological signs of hunger and satiety in order to reach their weight goals. When dieting, individuals selectively deny physiological cues (e.g., convincing themselves that they are not actually hungry; Petrie et al., 2014) or only eating certain foods, regardless of nutritional value, if they do acknowledge the hunger. Disrupting these intuitive eating processes, such as eating when hungry or stopping when satiated, can lead to dysregulated eating (Neumark-Sztainer, Wall, Larson, Eisenberg, & Loth, 2011; Tylka, 2006).

In a sample of 1,200 undergraduate women and men, Tylka and Kroon van Diest (2013) found that intuitive eating was negatively correlated with EAT-26 (Eating Attitudes Test-26 Item; Garner et al., 1982) scores and was positively related to body appreciation (Body Appreciation Scale; Avalos, Tylka, & Wood-Barcalow, 2005). Dietary restraint was a significant predictor of body shame, eating disorder risk, and compensatory behaviors (e.g., laxative use, vomiting, excessive exercise) in a sample of undergraduate men (Schaumberg & Anderson, 2016). In a sample of male collegiate athletes, dietary intent and muscularity behaviors were significantly related to higher levels of bulimic symptomatology, explaining 21% of its variance (Petrie et al., 2014).

Drive for Muscularity

Petrie and Greenleaf (2012) posited that the need for power and strength in sport performance, and the necessary muscle mass to provide for that need, may increase a “drive for muscularity” that could increase athletes chances of developing disordered eating attitudes and behaviors. Drive for muscularity refers to the preoccupation to attain a muscular or mesomorphic

body (muscularity-oriented body image; measured by the individual's perceived closeness to their muscular ideal) and the muscularity behaviors that individuals will engage in to achieve that physique (e.g., lifting weights, using protein supplements; McCreary & Sasse, 2000; McCreary, Sasse, Saucier, & Dorsch, 2004). For male college students, this body type is characterized by definition (leanness), large size, athletic appearance, and an ambiguous balance of being "big… but not too big" (Ridgeway & Tylka, 2005, p. 213) and a primary focus on body areas from the waist up (e.g., abdomen, arms, chest; Ridgeway & Tylka, 2005). Of the two dimensions, muscularity behaviors appears to be the most related to disordered eating. For example, McFarland and Petrie (2012) found that male undergraduate students' endorsement of muscularity behaviors, but not their muscularity-oriented body image, was related to higher BULIT-R scores.

Male collegiate athletes are not excluded from these concerns. In a sample of 203 collegiate male athletes representing multiple sports, Petrie et al. (2014) found that muscularity behaviors were associated with higher BULIT-R scores. Similar results were found by Chatterton et al. (2017) in a sample of undergraduate male collegiate athletes. From the same sample of participants as Petrie et al. (2014), Galli et al. (2015) found that after controlling for body mass index (BMI) and sport type, sport-specific pressures (e.g., pressure to maintain from coaches), negative affect, and body satisfaction were significant predictors of muscularity-oriented body image and muscularity behaviors, accounting for 15% of the variance in muscularity-oriented body image and 34% of the variance in muscularity building behaviors. Galli et al. (2015) also found that non-lean sport athletes reported engaging in muscularity-building behaviors more than lean sport athletes.

Summary

Petrie and Greenleaf's (2012) sociocultural model of disordered eating suggests that pressures, both general sociocultural and sport-specific, increase the risk of developing eating disorders in athletes by increasing internalization, body dissatisfaction, negative affect, dietary restraint, and drive for muscularity. General societal pressures have been related to higher levels of body dissatisfaction, negative affect, and drive for muscularity, though general societal pressures have only been predictive of internalization in the overall model (Anderson et al., 2011; Petrie et al., 2014). Sport-specific pressures, particularly messages about their bodies from teammates and coaches, have been shown to be more salient predictors of other ED/DE correlates (i.e., internalization, body dissatisfaction, drive for muscularity, dietary intent, negative affect) in athletes than general societal pressures (e.g., Anderson et al., 2011; Galli et al., 2015; Petrie et al., 2014). Internalization has been well-supported as a precursor to body dissatisfaction in athletes (e.g., Anderson et al., 2012; Chatterton et al., 2017), though, as noted by Petrie (2019), there has been little research on the direct effect of internalization on ED/DEs. Body dissatisfaction's relationship with dietary restraint, negative affect, and ED/DEs has been supported (e.g., Anderson et al., 2011; Petrie et al., 2014; Voelker et al., 2018), though there was not a supported longitudinal relationship between body dissatisfaction and dietary restraint or bulimic symptomatology in a study of female collegiate gymnasts conducted by Voelker et al. (2016). Rather, bulimic symptoms led to increases in body dissatisfaction over a five-month period. Additionally, body dissatisfaction has been supported as an antecedent of drive for muscularity, specifically higher levels of muscularity oriented body image but not muscle building behaviors, in male athletes (Chatteron et al., 2017; Galli et al., 2015; Petrie et al., 2014). Drive for muscularity, specifically muscle building behaviors, have been associated with higher

levels of ED/DE in male athletes (Chatteron et al., 2017; Petrie et al., 2014). Relationships between dietary restraint and negative affect and ED/DE have been supported in samples of collegiate athletes (e.g., Chatterton et al., 2017, Petrie et al., 2014), though the longitudinal effects of dietary restraint and negative affect on bulimic symptomatology have not been supported (Voelker et al., 2016).

Research examining the overall model in female and male athletes (e.g., Anderson et al., 2011; Chatterton et al., 2017) has given it empirical grounding and generally support the proposed pathways in the etiology of ED/DEs. Given that the majority of studies were cross-sectional, there is concern that the causal risk factors in the sociocultural model proposed by Petrie & Greenleaf (2012) are simply correlates of disordered eating (Stoyel, Slee, Meyer, & Serpell, 2020). Petrie (2019) acknowledges this limitation, and notes that longitudinal studies examining these factors, such as sport environment pressures (e.g., Anderson et al., 2012), have shown initial support for the model. Given the results of studies that examined sport type (e.g., Galli et al., 2015) showed differences in athletes representing different sports, it is suggested that examining the type of sport an athlete plays as a potential proxy for pressures unique to that sport environment (Thompson & Sherman, 2010).

Sport Pressures in Relation to EDs and ED Outcomes

For boys and men, general societal messages regarding attractiveness include characteristics that are defined through height, muscularity, and leanness, such as being independent, competitive, and confident, as well as appearance ideals (Drummond, 2002). Within sport environments, male athletes are exposed to unique messages and pressures about body, weight, physique, and performance that are communicated by coaches, teammates, sport judges, and even the uniforms they must wear to compete. For example, the weight and body

expectations for a cross-country runner are likely to be very different than what a football player (e.g., offensive lineman) might experience. That is, the messages communicated to a cross country runner would likely be about maintaining a low body weight and having a lean physique to meet the demands of an endurance sport, whereas an offensive lineman might experience expectations about obtaining a higher weight (that includes muscle mass and strength) so as to function well within his sport. Thus, in many ways, the sport environment (or sport type) serves as a proxy for the messages and expectations to which athletes are exposed, having differential influence on how athletes experience, and feel about, themselves and their bodies and how they eat and exercise in their pursuit of a specific physique (Thompson & Sherman, 2010).

Across male and female athletes, researchers have examined sport environment pressures through the lens of sport type (e.g., Hausenblas & McNally, 2004; Sundgot-Borgen & Torstviet, 2004; Rosendahl et al., 2009; Kantanista et al., 2018). Initial conceptualizations of sport type were often dichotomous, focusing on whether or not the sport itself tended toward a lean (e.g., wrestling, swimming) or nonlean (football, basketball) body types. Thompson and Sherman (2014) acknowledged the simplicity of the lean/nonlean approach for ease of analysis, but caution that this approach can overlook the complexity of sport environments. For example, track and field is a sport environment that contains multiple sport body ideals depending on the event an individual competes in (e.g., the body ideal of a high jumper versus the body ideal of a discus thrower). Other sports, such as tennis, arguably fit in both non-lean and lean categories due to the demands of the sport and the uniforms worn by the athletes. Other researchers have adopted a taxonomy based upon the demands of the sport first proposed by Sundgot-Borgen and Larsen (1993) in order to conduct a more fine-tuned analysis (e.g., Sundgot-Borgen & Torstviet, 2004; Rosendahl et al., 2009).

Research examining sport type has primarily focused on those lean sports, defined by Petrie (1996) as events that demand low or specific weight and if appearance and build was potentially related to success. In their examination of collegiate male and female lean and non-lean sport athletes and nonathletes, Petrie (1996) found that female lean sport athletes had significantly higher drive for thinness scores (Drive for Thinness subscale from the Eating Disorder Inventory; EDI; Garner, Olmstead, & Polivy, 1983) than female non-lean sport athletes and nonathletes. Kong & Harris (2015) examined a sample of 320 female athletes, whose ages ranged from 17 to 30 years (mean age = 21.7 years), representing multiple levels of competition ranging from noncompetitive to elite leanness-focused (dance, performance sports, or gymnastics) and non-leanness-focused (majority of the sample was drawn from ball sports, such as football, netball, and soccer) sports. Their results indicated that female athletes in leanness-focused sports experienced more body dissatisfaction and societal appearance pressures (using the Figure Rating Scale [FRS; Stunkard, Sorensen, & Schulsinger, 1983]) compared to those in non-leanness-focused sports. Additionally, they found that leanness-focused sport athletes reported significantly higher total EAT-26 scores than non-leanness-focused sport athletes, and elite level athletes reported higher total EAT-26 scores than recreational and non-competitive athletes. Similar results were found in a sample of 113 German rowers (42 women; mean age = 21.19 years; Kraus et al., 2018), where lightweight rowers (competing with a set restriction on their weight) had significantly higher drive for thinness scores (from the German version of the Eating Disorder Inventory-2 [EDI-2]; Paul & Thiel, 2005) compared to heavyweight rowers (do not have a designated weight limit), regardless of gender.

Karr et al. (2013) found that body dissatisfaction (as measured by the Body Dissatisfaction subscale of the Eating Disorders Inventory-3 [EDI-3]; Garner, 2004) did not

differ between esthetic/lean (athlete's score may be based on an esthetic quality of their performance, and a lean physique might enhance one's ability to execute difficult moves; i.e., gymnastics; n = 202), non-esthetic/lean (performance is not based on appearance, yet a lean physique is often correlated with successful performance; i.e., cross-country; n = 224), and non-esthetic/non-lean (neither appearance nor leanness is necessary for enhanced performance; i.e., softball n = 201) high school female athletes. Their results suggest that differences between sport types in some correlates related to disordered eating, such as body dissatisfaction, may not be apparent in lower levels of sport in female athletes. Similarly, Nichols et al. (2007) found that high school female athletes (n = 423) from lean sports (cross-country, track, swimming) and non-lean sports (tennis, volleyball, basketball, softball, soccer, lacrosse, field hockey, and field events) did not differ in their EDE-Q scores (which provides a measure of disordered eating). In a sample of 217 high school, university, and elite male and female athletes, Hausenblas & McNally (2004) found no sport-group differences between middle/long distance (endurance sport) and sprint and field (power sport) across sport level and gender on EDI-2 (Eating Disorder Inventory-2; Garner, 1991) scores or QEDD classification. Galante et al. (2017) reported no differences in EAT-26 scores in a sample of 137 male and female collegiate athletes from lean sports (judging criteria and tight fitting uniforms; aesthetic; cross-country, gymnastics, and diving) and non-lean sports (nonjudged with tight fitting uniforms or no tight-fitting uniforms or judging criteria; volleyball, football). Despite the lack of results on the EAT total score, the lean sport athletes were more likely to use weight-conscious drinking behaviors (e.g., skipping meals to account for calories consumed from alcohol) related to diet and exercise.

Concurrent with the literature suggesting that athletes from leanness focused sports are at a higher risk (Lentillon-Kaestner, 2014), male athletes in lean sports, particularly weight-class

sports and antigravitation sports, are suggested to be more at-risk to developing ED/DE and typically have a higher prevalence for ED/DE. For example, in a sample of 347 young advanced dancers (mean age=14.44 years) from training centers in the UK, Nordin-Bates, Walker, and Redding (2011) indicated that male dancers may have an equal or greater risk of developing disorders than female dancers based on EAT-26 total scores above 20, suggesting symptomology of an eating disorder (7.6% versus 7.3%). Rosendahl et al. (2009) found that in a sample of 567 German male high school athletes, 5.4% who competed in ball game, 10% in endurance, 17% in weight class, and 42% in antigravitation sports were identified as being at-risk for developing ED/DE as indicated by their scores on the EAT-26. Similarly, clinical interviews based on DSM-IV criteria with 61 elite male Norwegian athletes found eating disorders (AN, BN, and EDNOS) in 22% of antigravitation sport athletes, as compared to 9% in endurance sports and 5% in ball game sports (Sundgot-Borgen & Torstviet, 2004). In a sample of 156 adult Brazilian male athletes (mean age = 27.83 years), Goltz, Sentzel, & Schnieder (2013) found no differences between weight-dependent sports (jiu-jitsu, judo, karate, and rowing), sports where leanness is thought to improve performance (track events, swimming, triathlon, and horse racing), and sports with aesthetic ideals (ballet, dance, artistic gymnastics, and skating) in eating behavior as measured by the EAT-26 and the Bulimic Inventory Test, Edinburgh (BITE; Henderson & Freeman, 1987) and body image using the BSQ. Dimitrova and Vanlyan (2019) examined disordered eating using the EDE-Q in a sample of 138 of university male athletes representing lean sports (low body weight/lean body or aesthetic appearance gives competitive or biomechanical advantage; i.e., aesthetic sports, endurance sports, weight-dependent sports, antigravitation sports) and non-lean sports (i.e., ball games, tennis, shooting sports, motor racing). Although there were no differences in the EDE-Q subscales between the sport types, the

prevalence of excessive exercising in lean sport athletes (38.2%) was significantly higher than in non-lean athletes (13.8%).

Wrestlers are the most associated group of male athletes in regard to the endorsement of ED/DE (Thompson & Sherman, 2010), but similar results are suggested in other male weight-dependent sports. Stoutjesdyk and Jevne (1993) found male athletes in weight-dependent sports (judo and lightweight rowing) showed highest percentages of EAT-40 (Eating Attitudes Test; Garner & Garfinkel, 1979) scores in the anorexic range (EAT-40 score > 40) (7.7% and 11.1%, respectively) as compared to leanness sports (gymnastics and diving; 0% in both) and sports not requiring weight restrictions or emphasize leanness (Volleyball and heavyweight rowing; 4.5% and 4.3%, respectively).

Although non-lean sport athletes are understood as being less at-risk for eating problems than their lean sport counterparts, the literature suggests they still experience EDs/DE (e.g., Sherman & Thompson, 2010), and non-lean sport environments can still illicit issues with body size and body image. For example, American football players report wanting larger upper bodies (Stewart et al., 2003) and to be more muscular than their current physique (Raudenbush & Meyer, 2003) than other non-lean sports (e.g., soccer, basketball, lacrosse). Kantanista et al. (2018) examined differences in body image (measured by Feelings and Attitudes towards Body Scale in the Body Investment Scale; BIS; Orbach and Mikulincer, 1998) between aesthetic sports (gymnastics and dance) and non-aesthetic (floorball, soccer, volleyball, basketball, karate, swimming, rugby, field hockey, and sprinters) in 242 Polish female athletes representing different ages (13-30 years; Mean age: 20.00). The results indicated that there were no differences between aesthetic and non-aesthetic sports, whereas dancers had significantly higher body image satisfaction than field hockey players, soccer players, and floorball players, and

synchronized swimmers had significantly higher body image satisfaction than floorball players. In contrast, Perelman, Buscemi, Dougherty, and Haedt-Matt (2018) examined body dissatisfaction (measured by Body Shape Questionnaire-Revised-10; BSQ-R-10; Mazzeo, 1999) in a sample of 191 collegiate athletes from NCAA Division I and Division III teams. Male athletes in lean-promoting sports (cross country/track and field, swimming and diving, gymnastics, and volleyball) reported greater body dissatisfaction than men in non-lean sports (soccer, golf, lacrosse, baseball, softball, basketball, and tennis). These contrasting results may be due to the measures used, as the BIS reflects how positively the respondent feels about their body, whereas the BSQ-R-10 bases dissatisfaction on a thin body idea. The BSQ-R-10 may be more relevant for lean sport male athletes, whereas non-lean male athletes may be examining their bodies through a lens concerned with muscularity and larger size (i.e., drive for muscularity).

Summary

Researchers have extensively explored the relationship between sport type and DE/ED prevalence, and some research has explored risk factors and psychosocial correlates (e.g., body dissatisfaction) among male and female athletes (e.g., Kong & Harris, 2015). The literature finds support for how the type of sport an athlete competes in can serve as a proxy for the pressures they may experience. Emphasis in the literature for the effect of sport environments on male athletes has been placed on prevalence of ED/DE within different sport environment and types, with the majority of the focus being on lean sport athletes (Sherman & Thompson, 2011) and often on diagnosable criteria rather than underlying correlates. Some taxonomies may overlook the intricacies of the sport environment in lieu of simplicity for analysis, as some sports have multiple body ideals (e.g., jumpers and throwers within track and field), whereas other sports

(e.g., tennis) fit in both non-lean and lean categories (Thompson & Sherman, 2014). Additionally, the make-up and inclusion of sports in a sample of a designated lean sport type group can vary extensively. Regardless of the classification system, research suggests that experience in different sport environments could impact rates of ED/DE, though these varied results are dependent on various measures (e.g., EAT-26, EDE-Q) or used non-current diagnostic criteria (e.g., using DSM-IV criteria) in studies examining athletes (Chapman & Woodman, 2016). Although research on ED/DE in different female sports has begun to explore the relationships between the understood correlates in the development of ED/DE (e.g., Kong & Harris, 2015), the research in the male athlete population is currently lacking investigation in these relationships within a guiding framework. Petrie and Greenleaf (2012) have provided a conceptual model that sought to explain how DE and EDs develop within competitive sport environments through a multifactorial, socioculturally-based process. Put briefly, athletes are exposed to pressures, in and out of the sport environment, that can increase body dissatisfaction, which could increase the risk of developing EDs/DE. Although some research notes a difference between sport types in the presentation of EDs/DE, there is less understanding of how each sport type can differ in the various correlates related to EDs/DE. Thus, research is needed to better understand how the different sport environments can impact psychosocial variables related to the development of DE/ED.

REFERENCES

Alegria, M., Woo, M., Cao, Z., Torres, M., Meng, X. L., & Striegel-Moore, R. (2007). Prevalence and correlates of eating disorders in Latinos in the United States. *International Journal of Eating Disorders*, *40*(3),15-21.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, DC: Author.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Andersen, A. E. (1999). Eating disorders in gay males. *Psychiatric Annals, 29*, 206 –212.

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 and Exercise Psychology*, *33*(4), 483-505.

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

Avalos, L. C., Tylka, T. L., & Wood-Barcalow, N. (2005). The Body Appreciation Scale: Development and psychometric evaluation. *Body Image*, *2*, 285–297.

Bar, R. J., Cassin, S. E., & Dionne, M. M. (2016). Eating disorder prevention initiatives for athletes: A review. *European journal of sport science, 16*, 325-335.

Birrer, D. (2019). Rowing Over the Edge: Nonfunctional Overreaching and Overtraining Syndrome as Maladjustment—Diagnosis and Treatment From a Psychological Perspective. *Case Studies in Sport and Exercise Psychology*, *3*(1), 50-60.

Bordin, D. M., Bettim, B. B., Perdona, G. C., de Campos, E. G., & De Martinis, B. S. (2017). Understanding alterations on blood and biochemical parameters in athletes that use dietary supplements, steroids and illicit drugs. *Toxicology, 376*, 75-82.

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*(5), 499–508.

Bruch, H. (1973). *Eating Disorders: Obesity, Anorexia Nervosa, and the Person Within*. New York: Basic Books.

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*(2), 215-239.

Chapman, J., & Woodman, T. (2016). Disordered eating in male athletes: a meta-analysis. *Journal of Sports Sciences*, *34*(2), 101-109.

Chatterton, J. M., & Petrie, T. A. (2013). Prevalence of disordered eating and pathogenic weight control behaviors among male collegiate athletes. *Eating disorders*, *21*(4), 328-341.

Chatterton, J., Petrie, T. A., Schuler, K. L., & Ruggero, C. (2017). Bulimic Symptomatology Among Male Collegiate Athletes: A Test of an Etiological Model. *Journal of Sport and Exercise Psychology*, *39*(5), 313-326.

Cooper, P.J.; Taylor, M.J.; Cooper, Z.; Fairburn, C.G. (1987). The development and validation of the Body Shape Questionnaire. *International Journal of Eating Disorders*, *6*, 485–494.

de Carvalho, P.H.B., Alvarenga, M. d. S., & Ferreira, M. E. C. (2017). An etiological model of disordered eating behaviors among Brazilian women. Appetite, 116, 164-172.

DeFeciani, L. (2016). Eating disorders and body image concerns among male athletes. *Clinical Social Work Journal*, *44*(1), 114-123.

Dimitrova, D., & Vanlyan, G. (2019). Factors Associated with Eating Disorders in Male Athletes. *Spor Hekimliği Dergisi*, *54*(2), 89-98.

DiPasquale, L. D., & Petrie, T. A. (2013). Prevalence of disordered eating: A comparison of male and female collegiate athletes and nonathletes. *Journal of Clinical Sport Psychology*, *7*(3), 186-197.

Drummond, M. (2002). Sport and Images of Masculinity: The Meaning of Relationships in the Life Course of “Elite” Male Athletes. *The Journal of Men’s Studies*, *10*(2), 129–141.

Fairburn, C. G., & Beglin, S. J. (1994). Assessment of eating disorders: Interview or self-report questionnaire?. *International journal of eating disorders*, *16*(4), 363-370.

Fairburn, C. G., Cooper, Z., Doll, H. A., & Davies, B. A. (2005). Identifying dieters who will develop an eating disorder: a prospective, population-based study. *American Journal of Psychiatry*, *162*(12), 2249-2255.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*, 1149-1160.

Fichter, M. M., & Quadflieg, N. (2016). Mortality in eating disorders - results of a large prospective clinical longitudinal study. *International Journal of Eating Disorders*, *49*(4), 391-401.

Field, A. P. (2013). *Discovering statistics using IBM SPSS statistics: And sex and drugs and rock 'n' roll* (4th ed.). Los Angeles: Sage.

Fredrickson, B. L., & Roberts, T. A. (1997). Objectification theory: Toward understanding women's lived experiences and mental health risks. *Psychology of women quarterly*, *21*(2), 173-206.

Galante, M., Ward, R. M., & Weinberg, R. (2017). Comparing weight-conscious drinking among athletes and nonathletes. *Journal of Clinical Sport Psychology*, *11*(4), 273-286.

Galli, N., & Reel, J. J. (2009). Adonis or Hephaestus? Exploring body image in male athletes. *Psychology of men & masculinity*, *10*(2), 95.

Galli, N., Petrie, T. A., Reel, J. J., Chatterton, J. M., & Baghurst, T. M. (2014). Assessing the validity of the Weight Pressures in Sport Scale for Male Athletes. *Psychology of Men & Masculinity*, *15*(2), 170.

Galli, N., Reel, J. J., Petrie, T. P., Greenleaf, C., & Carter, J. (2011). Preliminary development and validation of the weight pressures in sport scale for male athletes. *Journal of Sport Behavior*, *34*, 47– 68.

Garner, D. M. (1991). *Eating disorder inventory-2*. Odessa, FL: Psychological Assessment Resources.

Garner, D. M., & Garfinkel, P. E. (1979). The Eating Attitudes Test: An index of the symptoms of anorexia nervosa. *Psychological medicine*, *9*(2), 273-279.

Garner, D. M., Olmstead, M. P., & Polivy, J. (1983). Development and validation of a multidimensional eating disorder inventory for anorexia nervosa and bulimia. *International journal of eating disorders*, *2*(2), 15-34.

Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The eating attitudes test: psychometric features and clinical correlates. *Psychological medicine*, *12*(4), 871-878.

Garner, D.M. (2004). *Eating disorder inventory-3: professional manual*. Lutz, FL: Psychological Assessment Resources.

Goltz, F. R., Stenzel, L. M., & Schneider, C. D. (2013). Disordered eating behaviors and body image in male athletes. *Revista Brasileira De Psiquiatria (Sao Paulo, Brazil : 1999)*, *35*(3), 237-242.

Grieve, F. G. (2007). A conceptual model of factors contributing to the development of muscle dysmorphia. *Eating Disorders*, *15*(1), 63-80.

Greenleaf, C., & Petrie, T. A. (2013). Studying the athletic body. In *Gender relations in sport* (pp. 119-140). Brill Sense.

Hausenblas, H. A., & Carron, A. V. (1999). Eating disorder indices and athletes: An integration. *Journal of Sport and Exercise Psychology*, *21*(3), 230-258.

Hausenblas, H. A., & Downs, D. S. (2001). Comparison of body image between athletes and nonathletes: A meta-analytic review. *Journal of applied sport psychology*, *13*(3), 323-339.

Hausenblas, H. A., & McNally, K. D. (2004). Eating disorder prevalence and symptoms for track and field athletes and nonathletes. *Journal of Applied Sport Psychology*, *16*(3), 274-286.

Henderson, M., & Freeman, C. P. L. (1987). A self-rating scale for bulimia the 'bite'. *The British Journal of Psychiatry*, *150*(1), 18-24.

Higgins, E. T. (1987). Self-discrepancy: a theory relating self and affect. *Psychological Review*, *94*(3), 319.

Hilbert, A., De Zwaan, M., Braehler, E. (2012). How frequent are eating disturbances in the population? Norms of the eating disorder examination-questionnaire. *PLoS One, 7*(1).

Himmelstein, M. S., Puhl, R. M., & Quinn, D. M. (2018). Weight stigma and health: The mediating role of coping responses. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, *37*(2), 139-147.

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.

Hudson, J. I., Hiripi, E., Pope Jr, H. G., & Kessler, R. C. (2007). The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. *Biological psychiatry*, *61*(3), 348-358

Jones, R. L., Glintmeyer, N., & McKenzie, A. (2005). Slim bodies, eating disorders and the coach-athlete relationship: A tale of identity creation and disruption. *International Review for the Sociology of Sport, 40*(3), 377-391.

Kantanista, A., Glapa, A., Banio, A., Firek, W., Ingarden, A., Malchrowicz-Mośko, E., ... & Maćkowiak, Z. (2018). Body image of highly trained female athletes engaged in different types of sport. *BioMed research international*, *2018*.

Karr, T. M., Davidson, D., Bryant, F. B., Balague, G., & Bohnert, A. M. (2013). Sport type and interpersonal and intrapersonal predictors of body dissatisfaction in high school female sport participants. *Body Image*, *10*(2), 210-219.

Kerin, J. L., Webb, H. J., & Zimmer-Gembeck, M. J. (2019). Intuitive, mindful, emotional, external and regulatory eating behaviours and beliefs: An investigation of the core components. *Appetite*, *132*, 139-146.

Kong, P., & Harris, L. M. (2015). The sporting body: body image and eating disorder symptomatology among female athletes from leanness focused and nonleanness focused sports. *The Journal of psychology*, *149*(2), 141-160.

Kraus, U., Holtmann, S. C., & Legenbauer, T. (2018). Eating Disturbances in Competitive Lightweight and Heavyweight Rowers. *Journal of Clinical Sport Psychology*, *12*(4), 630-646.

Kristjánsdóttir, H., Sigurðardóttir, P., Jónsdóttir, S., Þorsteinsdóttir, G., & Saavedra, J. (2019). Body Image Concern and Eating Disorder Symptoms Among Elite Icelandic Athletes. *International journal of environmental research and public health*, *16*(15), 2728.

Le Grange, D., Swanson, S. A., Crow, S. J., & Merikangas, K. R. (2012). Eating disorder not otherwise specified presentation in the US population. *International Journal of Eating Disorders*, 45(5), 711-718.

Leit, R. A., Gray, J. J., & Pope Jr, H. G. (2002). The media's representation of the ideal male body: A cause for muscle dysmorphia? *International Journal of Eating Disorders*, *31*(3), 334-338.

Lentillon-Kaestner, V. (2014). Eating disorders among male athletes: A psychosocial perspective. In C. Mohiyeddini (Ed.), *Psychology of emotions, motivations and actions. Contemporary topics and trends in the psychology of sports* (p. 177–200). Nova Science Publishers.

Martin, S. J., & Racine, S. E. (2017). Personality traits and appearance-ideal internalization: differential associations with body dissatisfaction and compulsive exercise. *Eating Behaviors*, *27*, 39-44.

Martinsen, M., & Sundgot-Borgen, J. (2013). Higher prevalence of eating disorders among adolescent elite athletes than controls. *Medicine & Science in Sports & Exercise*, *45*(6), 1188-1197.

Mazzeo, S. E. (1999). Modification of an existing measure of body image preoccupation and its relationship to disordered eating in female college students. *Journal of Counseling Psychology*, *46*(1), 42.

McCreary, D. R., & Sasse, D. K. (2000). An exploration of the drive for muscularity in adolescent boys and girls. *Journal of American college health*, *48*(6), 297-304.

McCreary, D. R., Sasse, D. K., Saucier, D. M., & Dorsch, K. D. (2004).Measuring the drive for muscularity: Factorial validity of the Drive for Muscularity Scale in men and women. *Psychology of Men & Masculinity*, *5*, 49–58.

McFarland, M., & Petrie, P. (2012). Male body satisfaction: Factorial and construct validity of the body parts satisfaction scale for men. *Journal of Counseling Psychology*, *59*(2), 329-337.

Mintz, L. B., O'Halloran, M. S., Mulholland, A.M., & Schneider, P. A. (1997). Questionnaire for eating disorder diagnoses: Reliability and validity of operationalizing DSM-IV criteria into a self-report format. *Journal of Counseling Psychology, 44*, 63–79.

Miskulin, A. P. C., & Milanovic, F. (2018). Overtraining Syndrome: a Warning to Athletes. *International Journal of Nutrology*, *11*(S 01), Trab609.

Mitchison, D., & Mond, J. M. (2015). Epidemiology of eating disorders, eating disordered behaviour, and body image disturbance in males: A narrative review. *Journal of Eating Disorders*, *3*, 20.

Mond, J.M., Mitchison, D., & Hay, P. (2014) "Prevalence and implications of eating disordered behavior in men" in Cohn, L., Lemberg, R. (2014) *Current Findings on Males with Eating Disorders*. Philadelphia, PA: Routledge.

Moradi, B. (2010). Addressing gender and cultural diversity in body image: Objectification theory as a framework for integrating theories and grounding research. *Sex Roles*, *63*(1-2), 138-148.

Moradi, B., Dirks, D., & Matteson, A. V. (2005). Roles of sexual objectification experiences and internalization of standards of beauty in eating disorder symptomatology: A test and extension of Objectification Theory. *Journal of Counseling Psychology*, *52*(3), 420-428.

Neumark-Sztainer, D., Wall, M., Larson, N. I., Eisenberg, M. E., & Loth, K. (2011). Dieting and disordered eating behaviors from adolescence to young adulthood: findings from a 10-year longitudinal study. *Journal of the American Dietetic Association*, *111*(7), 1004-1011.

Nichols, J. F., Rauh, M. J., Barrack, M. T., Barkai, H. S., & Pernick, Y. (2007). Disordered eating and menstrual irregularity in high school athletes in lean-build and nonlean-build sports. *International journal of sport nutrition and exercise metabolism*, *17*(4), 364-377.

Nordin-Bates, S. M., Walker, I. J., & Redding, E. (2011). Correlates of disordered eating attitudes among male and female young talented dancers: Findings from the UK Centres for Advanced Training. *Eating disorders*, *19*(3), 211-233.

Okamoto, Y., Miyake, Y., Nagasawa, I., & Yoshihara, M. (2018). Cohort survey of college students' eating attitudes: Interventions for depressive symptoms and stress coping were key factors for preventing bulimia in a subthreshold group. *BioPsychoSocial Medicine*, *12*(1), 8.

Orbach, I., & Mikulincer, M. (1998). The Body Investment Scale: Construction and validation of a body experience scale. *Psychological Assessment*, *10*(4), 415.

Perelman, H., Buscemi, J., Dougherty, E., & Haedt-Matt, A. (2018). Body dissatisfaction in collegiate athletes: Differences between sex, sport type, and division level. *Journal of Clinical Sport Psychology*, *12*(4), 718-731.

Petrie, T. (2019). Eating Disorders in Sport: From Etiology to Prevention. (In Press).

Petrie, T. A., & Greenleaf, C. (2012). Eating disorders in sport. In S. M. Murphy (Ed.), *Oxford library of psychology. The Oxford handbook of sport and performance psychology* (p. 635–659). Oxford University Press.

Petrie, T. A., Greenleaf, C., Reel, J., & Carter, J. (2008). Prevalence of eating disorders and disordered eating behaviors among male collegiate athletes. *Psychology of Men & Masculinity, 9*(4), 267.

Petrie, T. A., Greenleaf, C., Reel, J., &; Carter, J. (2009). An examination of psychosocial correlates of eating disorders among female collegiate athletes. *Research Quarterly for Exercise and Sport, 80*, 621-632.

Petrie, T., Galli, N., Greenleaf, C., Reel, J., & Carter, J. (2014). Psychosocial correlates of bulimic symptomology among male athletes. *Psychology of Sport and Exercise, 15*, 680-687.

Petrie, T., Greenleaf, C., Carter, J., & Reel, J. (2007). Psychological correlates of disordered eating among male collegiate athletes. *Journal of Clinical Sport Psychology, 1*, 340-357.

Pritchard, M. (2008). Disordered eating in undergraduates: Does gender role orientation influence men and women the same way? *Sex Roles, 59*, 282–289.

Pritchard, M., & Nielsen, A. (2014). What Predicts Drive for Muscularity in Collegiate Athletes v. Non-Athletes?. *Athletic Insight, 6*(1), 1-15.

Raggatt, M., Wright, C. J. C., Carrotte, E., Jenkinson, R., Mulgrew, K., Prichard, I., & Lim, M. S. C. (2018). "I aspire to look and feel healthy like the posts convey": Engagement with fitness inspiration on social media and perceptions of its influence on health and wellbeing. *BMC Public Health, 18*(1), 1-11.

Raudenbush, B., & Meyer, B. (2003). Muscular dissatisfaction and supplement use among male intercollegiate athletes. *Journal of Sport and Exercise Psychology*, *25*(2), 161-170.

Ridgeway, R. T., & Tylka, T. L. (2005). College Men's Perceptions of Ideal Body Composition and Shape. *Psychology of Men & Masculinity, 6*(3), 209.

Reel, J. J., SooHoo, S., Petrie, T. A., Greenleaf, C., & Carter, J. E. (2010). Slimming down for sport: Developing a weight pressures in sport measure for female athletes. Journal of Clinical Sport Psychology, 4(2), 99-111.

Riebl, S. K., Subudhi, A. W., Broker, J. P., Schenck, K., & Berning, J. R. (2007). The prevalence of subclinical eating disorders among male cyclists. *Journal of the American Dietetic Association*, *107*(7), 1214-1217.

Rosendahl, J., Bormann, B., Aschenbrenner, K., Aschenbrenner, F., & Strauss, B. (2009). Dieting and disordered eating in German high school athletes and non-athletes. *Scandinavian journal of medicine & science in sports*, *19*(5), 731-739.

Schaumberg, K., & Anderson, D. (2016). Dietary restraint and weight loss as risk factors for eating pathology. *Eating behaviors*, *23*, 97-103.

Shanmugam, V., Jowett, S., & Meyer, C. (2012). Eating psychopathology amongst athletes: Links to current attachment styles. *Eating Behaviors, 13*(1), 5-12.

Smith, A. R., Zuromski, K. L., & Dodd, D. R. (2018). Eating disorders and suicidality: what we know, what we don't know, and suggestions for future research. *Current opinion in psychology*, *22*, 63-67.

Smolak, L., Murnen, S. K., & Ruble, A. E. (2000). Female athletes and eating problems: A meta-analysis. *International journal of eating disorders*, *27*(4), 371-380.

Stewart, A. D., Benson, P. J., Michanikou, E. G., Tsiota, D. G., & Narli, M. K. (2003). Body image perception, satisfaction and somatotype in male and female athletes and non-athletes: results using a novel morphing technique. *Journal of sports sciences*, *21*(10), 815-823.

Stice, E. (1998a). Prospective relation of dieting behaviors to weight change in a community sample of adolescents. *Behavior Therapy, 29*, 277–297.

Stice, E. (1998b). Relations of restraint and negative affect to bulimic pathology: A longitudinal test of three competing models. *International Journal of Eating Disorders, 23*, 243–260.

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*, 123-135.

Stice, E. (2002). Risk and maintenance factors for eating pathology: A meta-analytic review. *Psychological Bulletin*, *128*(5), 825-848.

Stice, E., & Agras, W.S. (1998). Predicting onset and cessation of bulimic behaviors during adolescence: A longitudinal grouping analysis. *Behavior Therapy, 29*(2), 257-276.

Stice, E., & Agras, W. S. (1999). Subtyping bulimic women along dietary restraint and negative affect dimensions. *Journal of Consulting and Clinical Psychology*, *67*(4), 460.

Stice, E., Fisher, M., & Lowe, M. (2004). Are dietary restraint scales valid measures of acute dietary restriction? Unobtrusive observational data suggest not. *Psychological Assessment, 16*, 51-59.

Stice, E., Nemeroff, C., & Shaw, H. E. (1996). Test of the dual pathway model of bulimia nervosa: Evidence for dietary restraint and affect regulation mechanisms. *Journal of Social and Clinical Psychology, 15*(3), 340-363.

Stice, E., Shaw, H., & Nemeroff, C. (1998). Dual pathway model of bulimia nervosa: Longitudinal support for dietary restraint and affect-regulation mechanisms. *Journal of Social and Clinical Psychology, 17*(2), 129-149.

Stice, E., South, K., & Shaw, H. (2012). Future directions in etiologic, prevention, and treatment research for eating disorders. *Journal of Clinical Child & Adolescent Psychology*, *41*(6), 845-855.

Stirling, A. E., Cruz, L. C., & Kerr, G. A. (2012). Influence of retirement on body satisfaction and weight control behaviors: Perceptions of elite rhythmic gymnasts. *Journal of applied sport psychology*, *24*(2), 129-143.

Stoutjesdyk, D., & Jevne, R. (1993). Eating disorders among high performance athletes. *Journal of Youth and Adolescence*, *22*(3), 271-282.

Stoyel, H., Slee, A., Meyer, C., & Serpell, L. (2020). Systematic review of risk factors for eating psychopathology in athletes: A critique of an etiological model. *European Eating Disorders Review*.

Striegel-Moore, R. H., & Bulik, C. M. (2007). Risk factors for eating disorders. *American psychologist*, *62*(3), 181.

Stunkard, A. J., Sorensen, T., & Schulsinger, F. (1983). *Use of the Danish Adoption Register for the study of obesity and thinness* In: Kety SS, Rowland LP, Sidman RL, Matthysse SW, editors. *The Genetics of Neurological and Psychiatric Disorders*.

Sundgot-Borgen, J., & Larsen, S. (1993). Pathogenic weight-control methods and self-reported eating disorders in female elite athletes and controls. *Scandinavian journal of medicine & science in sports*, *3*(3), 150-155.

Sundgot-Borgen, J., & Torstveit, M. K. (2004). Prevalence of eating disorders in elite athletes is higher than in the general population. *Clinical journal of sport medicine*, *14*(1), 25-32.

Tabachnick, B., & Fidell, L. (2013). *Using multivariate statistics* (6th ed.). Needham, MA: Allyn & Bacon.

Taylor, J. Y., Caldwell, C. H., Baser, R. E., Faison, N., & Jackson, J. S. (2007). Prevalence of eating disorders among Blacks in the National Survey of American Life. International Journal of Eating Disorders, 40(S3), S10-S14

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.

Thiel, A., Gottfried, H., & Hesse, F. (1993). Subclinical eating disorders in male athletes. A study of the low weight category in rowers and wrestlers. *Acta Psychiatry Scandinavia*, *88*(4), 259-265.

Thompson, J. K., Van den Berg, P., Roehrig, M., Guarda, A. S., & Heinberg, L. J. (2004). The sociocultural attitudes towards appearance scale-3 (SATAQ-3): Development and validation. *International journal of eating disorders*, *35*(3), 293-304.

Thompson, R. A., & Sherman, R. (2014). Reflections on athletes and eating disorders. *Psychology of Sport and Exercise*, *15*(6), 729-734.

Thompson, R. A., & Sherman, R. T. (2010). *Eating disorders in sport*. Routledge.

Tylka, T. L. (2006). Development and psychometric evaluation of a measure of intuitive eating. *Journal of Counseling Psychology*, *53*(2), 226.

Tylka, T. L., & Kroon Van Diest, A. M. (2013). The Intuitive Eating Scale–2: Item refinement and psychometric evaluation with college women and men. *Journal of Counseling Psychology, 60*(1), 137.

Tylka, T. L., & Mezydlo Subich, L. (2002). A preliminary investigation of the eating disorder continuum with men. *Journal of Counseling Psychology, 49*(2), 273-279.

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.

Voelker, D. K., Petrie, T. A., Reel, J. J., & Gould, D. (2018). Frequency and psychosocial correlates of eating disorder symptomatology in male figure skaters. *Journal of Applied Sport Psychology*, *30*(1), 119-126.

Wade, T. D., Keski-Rahkonen A., & Hudson J. (2011). *Epidemiology of eating disorders. In M. Tsuang and M. Tohen (Eds.), Textbook in Psychiatric Epidemiology* (3rd ed.) (pp. 343-360). New York: Wiley.

Watson, D., & Clark, L. A. (1994). *The PANAS–X manual for the Positive and Negative Affect Schedule—Expanded Form.* Unpublished manuscript, University of Iowa.

Winitch, R. F. (1993). *Male body image dissatisfaction*. Unpublished master's thesis, Shippensburg University, Shippensburg, PA.

Xiaojing, A. (2017). Social networking site uses, internalization, body surveillance, social comparison and body dissatisfaction of males and females in mainland China. *Asian Journal of Communication, 27:*6, 616-630.