“EXPLORING RELATIONSHIPS OF DISORDERED EATING AND BODY DISSATISFACTION WITH LEAN, NON-LEAN, AND MIXED SPORT ATHLETES”

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ABSTRACT OF THE THESIS

“EXPLORING RELATIONSHIPS OF DISORDERED EATING AND BODY DISSATISFACTION WITH LEAN VERSUS NON-LEAN ATHLETES”

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Prior literature has found disordered eating patterns and body dissatisfaction to be prevalent among specific populations including women, adolescents, and young adults, as well as athletes. However, there is limited research pertaining to men athletes as it is believed that women athletes are at greater risk of body dissatisfaction and endorsement of disordered eating practices. There is ample research that focuses on eating disorders among athletes, yet research lacks when comparing prevalence of disordered eating and body dissatisfaction between lean vs. non-lean athletes using comprehensive measures. Thus, the purpose of this secondary data analysis was to determine the prevalence of disordered eating and body satisfaction among women and men athletes, and to explore disordered eating and body satisfaction differences among lean, non-lean, and mixed sport-type athletes. Participants (N=1,279) ages 18-25 years old from Rutgers University in New Jersey were recruited via student listserves as well as announcements in freshmen and sophomore level classes at Rutgers University to complete a cross-sectional, online survey with valid and reliable instruments that assessed disordered eating behaviors and body shape satisfaction using the Eating Disorder Examination Questionnaire, self-
reported height and weight (i.e., body mass index [BMI]), and demographic characteristics (e.g., age, race/ethnicity). Independent t-tests examined body shape satisfaction and disordered eating behavior differences between men (n=498) and women (n=781) with effect sizes determined by Cohen’s d tests. Athletes were further classified into non-lean (n=809), lean (n=240), and mixed athlete (n=230) groups based on their sport participation and stratified by gender. Analysis of variance (ANOVA) with Tukey post-hoc follow-up tests examined disordered eating behavior differences among and between athlete classification groups by gender. Partial ETA-squared were considered small (η²= 0.01), medium (η²= 0.06) and large (η²= 0.14) in effect size. On average, participants were neither satisfied nor dissatisfied with their body shape (3.07±0.82SD, 5-point Likert scale). Additionally, participants reported within the last 28 days, they experienced between 1 and 5 days of eating, shape, and weight concerns. Binge eating was the most common behavior reported; on average, participants reported binge eating 3 times in the last 28 days. Purging behaviors remained low with participants reporting using excessive exercise (1.75±1.33), laxative use (1.14±0.79) and self-induced vomiting (1.11±0.70) around 1 to 2 times in the last 28 days in the effort to control their body weight. Independent t-tests found women had significantly (p<0.05) lower body satisfaction and higher shape, weight, and eating concerns compared to men with small to medium effect sizes. Women were also significantly (p=0.043) more likely to report using laxatives and significantly (p<0.001) less likely to report exercising excessively in the past month to control their body weight and shape compared to men with small effect sizes. When comparing the three athlete classifications using ANOVA, there was no significant body shape satisfaction, and eating, shape and weight concerns, and
disordered eating behavior differences in men and women. Findings suggest women athletes are at higher risk of disordered eating practices compared to men athletes with little discernable differences by athlete classification of lean, non-lean of mixed athlete. When considering future research, it is important to determine a framework in which classifications of sports are assigned; this would include a definition of what would be considered a ‘lean,” “non-lean,” and “mixed” athlete. Addressing the level of difficulty of the sports may be important to examine in future work as well longitudinal studies to better examine temporal relationships. Understanding the implications and risk factors that are associated with different sport types may help with the prevention of disordered eating in athletes.
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CHAPTER ONE: INTRODUCTION

Eating disorders (ED) and disordered eating (DE) have become overwhelmingly present within society.\(^1\) EDs are clinically diagnosed mental health disorders.\(^2\) They are often associated with intentional behaviors pertaining to controlling one’s body weight and shape.\(^2\) These behaviors are often displayed as DE patterns where there is a severe disruption in a person’s eating patterns, thoughts, and emotions.\(^3\) When considering DE behaviors individually, they do not encompass a clinical ED; however, DE can still have negative health impacts that may mirror ED.\(^4\)

Studies have shown that among the general population, adolescent and young adult females are at the greatest risk for DE.\(^5\) Factors that may impact the likeliness of developing DE often include specific personality traits, such as perfectionism, anxiety and depression, body dissatisfaction, family history, and environmental factors. DE and body dissatisfaction may also develop due to the increasing concern of body size and shape during adolescence and young adulthood, and the physical changes that come along with puberty.\(^5\)

Another high-risk group are athletes who face many of the same risk factors that are found within the general population. Athletes, while facing the same biological effects of puberty and body changes, often aspire to look and perform like their favorite sport-bound role models.\(^6,7\) There is also additional pressure of appearance of owning the title ‘athlete;’ athletes are often imagined to be fit with a body build that is lean and muscular.\(^8\) There may be conflicting ‘ideal’ body types when comparing an athlete’s ideal body shape with society’s ideal body shape\(^9\) that may also aid in body dissatisfaction among athletes. Athletes differ from the general population due to the
excess stress that comes with sport performance. Research suggests athletic populations at greatest risk of DE include collegiate and elite athletes with calorie restricting found to be the most common weight control behavior endorsed.\textsuperscript{10}

The type of sport an athlete participates in has been shown to potentially impact the risk of developing ED or DE. Sports are often classified into two categories: lean and non-lean. Lean sports, also referred to as weight sensitive sports, (e.g., aesthetic, weight dependent, and endurance) often rely on the athlete’s body weight to dictate one’s performance levels.\textsuperscript{11} Non-lean sports (e.g., ball-game, power, and technical) do not base performance on one’s body weight; in fact, the skill sets are often not directly correlated with body weight or shape.\textsuperscript{8} Research has consistently suggested that athletes in lean sports may be at greater risk for developing ED and DE compared to non-lean sports.\textsuperscript{6}

Although ED and DE can have detrimental effects on any individual, there are additional consequences that may impact an athlete. Athletes that suffer from insufficient energy balance may lead to weight loss as well as a lack of energy. This often will lead to negative effects on performance and may have severe impacts on the athlete’s health and career.\textsuperscript{2}

There is ample research that focuses on ED among athletes, yet research lacks when comparing the prevalence of DE and body dissatisfaction between lean vs. non-lean sport athletes using comprehensive measures. Thus, the purpose of this study was to determine the prevalence of disordered eating and body satisfaction among women and men athletes and to explore DE and body dissatisfaction differences among lean, non-lean, and mixed athletes. Findings from this study will be informative in determining which group of athletes are at greater risk for disordered eating and body satisfaction.
Research questions for this study are the following:

RQ1: What is the prevalence of disordered eating and body satisfaction among athletes by gender?

RQ2: Are there significant disordered eating and body satisfaction differences among lean, non-lean, and mixed athletes by gender?

Due to the impact that body weight has on performance,\textsuperscript{11} it was hypothesized that lean sport athletes, particularly women, will have more DE and less body satisfaction compared to non-lean and mixed sport athletes as well as men athletes.
CHAPTER TWO: LITERATURE REVIEW

A comprehensive review of the literature includes discussion of the following sections: Overview of Eating Disorders and Disordered Eating, Prevalence and Development of Eating Disorders and Disordered Eating in the General Population, Common Risk Factors for Eating Disorders and Disordered Eating, Prevalence and Development of Eating Disorders and Disordered Eating in Athletes, Risk Factors for Eating Disorders and Disordered Eating in Athletes, and Instruments Used to Assess Eating Disorder Risk. This comprehensive literature review will conclude with a summary as well as potential for future research regarding these topics.

Overview of Eating Disorders and Disordered Eating

Eating disorders (ED) are clinically diagnosed mental health disorders that are associated with intentional behaviors to lose weight for the purposes of controlling one’s body weight and shape. The three common clinical EDs along with their various subtypes are outlined in the Diagnostic Statistical Manual for Mental Health Disorders Fifth Edition (DSM-5) and include anorexia nervosa (AN), bulimia nervosa (BN), and binge eating disorder (BED). For a diagnosis of an ED, an individual must meet criteria specified in the DSM-5. EDs that meet most, but not all of the diagnostic criteria for AN, BN and BED can be classified as Other Specified Feeding or Eating Disorders (OSFED).

AN is characterized by persistent and successful weight loss that is often resultant of caloric restriction. AN has been shown to have the highest mortality rate not only within EDs but within all mental health disorders. Two subtypes of AN have been
determined: restrictive (ANR) and binging/purging (ANBP).\textsuperscript{15} ANR involves a heavy caloric restriction that can take the form of dieting, fasting, and/or excessive exercise.\textsuperscript{16} ANBP consist of episodes of extreme food restriction along with self-induced vomiting, laxative use, or excessive exercise followed by episodes of extreme binging (large amount of food consumption in a short period of time).\textsuperscript{16} In order to diagnose AN, the three following criteria outlined in DSM-5 must be met- a pronounced decrease in body mass index (BMI), anxiety regarding gaining weight, and a disfigured view of one’s body while determining one’s self-worth based on these feelings.\textsuperscript{17}

Like ANBP, BN is also characterized by binge/purge cycles. The episodes of binge eating followed by purging must occur at least once a week, on average, over a three-month period.\textsuperscript{17} Similar to the criteria for AN, individuals with BN engage in disordered eating behaviors with the goal to prevent a change in weight status. Additionally, individuals with BN, like AN, relate their self-worth to their body weight/shape.\textsuperscript{18} Unlike individuals with AN, those with BN are generally in a normal to overweight BMI range.\textsuperscript{18}

BED, unlike the previously described eating disorders, is a compulsive eating disorder including episodes of binging, however, there are no recurrent compensatory strategies.\textsuperscript{18} Similar to both AN and BN, BED can be catalyzed by one’s dissatisfaction with their body shape or size.\textsuperscript{19} Additionally, individuals that experience low self-esteem may use food as a source of comfort in an unreasonable fashion characteristic of BED.\textsuperscript{19} Consistent binging behaviors often result in a significant increase in body weight due to the over consumption of calories.\textsuperscript{20} The increase in body weight often leads the individual to become obese (BMI >30).\textsuperscript{19} Diagnosis of BED include at least three of the following
symptoms: eating at a faster pace than considered normal, eating enough to feel uncomfortably full, eating in large quantities without physical hunger, eating alone to avoid embarrassment about the binge, and/or feeling guilty, depressed, and disgusted after the binge ends.\textsuperscript{17} According to DSM-5, binge episodes must occur at least once a week on average for three months to meet the criteria for diagnosis.\textsuperscript{17}

ED often develop from disordered eating (DE). DE is defined as afflictions in which people face severe disruption in their eating patterns, thoughts, and emotions.\textsuperscript{3} Dysfunctional and unhealthy eating patterns can consist of fasting, dieting, excessive exercising, misuse of medicine (e.g., laxatives or diuretics), self-induced vomiting, overeating, and binge eating.\textsuperscript{8} Alone, these actions do not meet the criteria that would lend to diagnosis of an ED, yet can have similar medical and/or psychological repercussions.\textsuperscript{4} Unlike ED, there is no specified criteria that needs to be met in order to characterize an eating behavior as disordered. However, DE occurs on a continuum and overtime as the severity of DE worsens an individual may be prone to a clinical diagnosis with an ED.\textsuperscript{21}

\textbf{Prevalence and Development of Eating Disorders and Disordered Eating in the General Population}

It has been found that up to 21\% of the general population suffers from ED.\textsuperscript{4} Studies have found the lifetime prevalence of ED, respectively, are 0.9\%, 1.5\%, and 3.5\% for AN, BN, and BED for women whereas men experience a lifetime prevalence of 0.3\%, 0.5\% and 2.0\%.\textsuperscript{22} DE, on the other hand, tends to be higher in its prevalence; studies have shown that about 50\% of girls/women and about 38\% of boys/men participate in unhealthy weight control behaviors.\textsuperscript{23} Thus, ED and DE are more prevalent in
girls/women than boys/men. A 15-year longitudinal study consisting of 3,672 participants, showed that both male and female adolescents who display DE have a greater risk of engaging in these behaviors into adulthood. Project EAT III, a longitudinal cohort study, followed both girls and boys (12 to 16 years of age) through young adulthood (23 to 26 years of age), and found of the 2,287 participants, about 50% of girls and 25% of boys reported dieting within that year. Additionally, they found the rates of engagement in dieting among girls was consistently high from adolescence into young adulthood, yet boys showed increases in dieting behaviors as they aged. Furthermore, both girls and boys had increased prevalence rates of engaging in extreme weight control behaviors (e.g., consuming diet pills, self-induced vomiting, and/or taking laxatives) as they transitioned into young adulthood.

Adolescents and young adults are often at the greatest risk for developing ED and DE. At these life stages, there is an increasing concern for one’s body’s size and shape which may be related to physical body changes that occur during puberty. For instance, girls may experience widening of hips and weight gain during puberty; this is often contradictory to the social standard of what a women ‘should’ look like. The media constructs the idea of what beautiful is for both men and women; individuals may strive for these unattainable goals established by the media. The desire to look thin and slim may lead to body dissatisfaction and adoption of unhealthy weight control behaviors and dieting at an early age. Among boys, social media influence also plays a large role in contributing to potential ED and DE behaviors. Like women, the ideal body shape for men is lean, however there is an emphasis on musculality. Research has shown that about 90% of teen males exercise with the intention of ‘bulking up’. These male-
oriented standards often lead to a condition known as ‘muscle dysmorphia’ (MD), a subgroup under body dysmorphic disorder (BDD) that is common in male body builders. MD is characterized by an obsession in growing one’s muscles through excessive body building as well as unhealthy eating behaviors. Those with MD often result to strict dieting tactics, such as elimination diets as well as the consumptions of anabolic substances, such as steroids. MD often results in a variety of negative outcomes, including both low self-esteem as well as body dissatisfaction.

Unlike binging and purging, physical activity is generally praised no matter the circumstances. Regarding ED and DE, physical activity should not be overlooked as excessive exercise for the purposes of weight management is characterized as a disordered behavior and can be associated with detrimental health effects. While moderate exercise, as outlined in the Physical Activity Guidelines, may be beneficial to health, compulsive exercise may be detrimental to health. Individuals with ED have been found to use exercise as a maladaptive coping mechanism to manage negative emotions. Between 31%-80% of AN patients are affected by compulsive exercise that has been associated with longer hospital stays, poor treatment outcomes, interference with refeeding strategies and body weight stabilization, and an increase risk of relapse and chronic behaviors. Common risk factors for ED and DE are further explained below.

**Common Risk Factors for Eating Disorders and Disordered Eating**

There are many risk factors of ED and DE that have been studied extensively in the literature. Some of the more common risk factors have the ability to increase one’s
risk for developing ED and DE where causes, behaviors, and outcomes may all vary due to an individual’s circumstance.

**Personality Traits**

There are three personality subtypes most commonly found among individuals with ED- over-controlled, under-controlled, and high functioning.33 These specific personality subtypes directly reflect the way an individual exercises control over their impulses and emotions.33 Both over and under-controlled personality types demonstrate a poor response to social adaptation.33 Over-controlled personality types show excessive control regarding their impulses often leading to social avoidance whereas under-control personality types show little to no control regarding their impulses.33 High functioning personalities, in contrast, display balance in managing their personality and are able to adapt to their social environment.33 Over- and under controlled personality types are often those who face greater risk in psychopathy.33 There are traits within these personality types, such as perfectionism, that may also be associated with ED and DE risk.4 Clinical perfectionism is defined as self-worth based on striving to achieve high standards despite adverse consequences.34 Perfectionism is found to be predictive of eating disorder risk and early onset of eating disorder symptoms among adolescents.34 Additionally, perfectionism is often positively associated with anxiety and depression severity and are a common co-morbidity with ED and DE.34

**Depression and Anxiety**

Perfectionist tendencies, such as overgeneralizing of failures, self-evaluation, and self-blame heavily coincide with depressive diagnostic criteria.35 Depression, or major depressive disorder, falls under the broader branch of mood disorders.17 Those who suffer
with depression often feel a sense of constant sadness, hopelessness, and a loss of interest towards activities they once enjoyed. According to the DSM-5, an individual must experience five or more symptoms within a continuous two-week period and one of the symptoms must be depressed mood or loss of interest. Other symptoms include significant weight loss or decrease in appetite, slowing down of thought and reduction of physical activity, fatigue or constant energy loss, inability to concentrate, and recurrent thoughts of death. The rigidity of self-criticism leads to an inability to properly cope when unable to reach one’s personal standard (often an unrealistic goal) leading to a cycle of negative emotions and negative behaviors.

Anxiety disorders, generally referring to generalized anxiety disorder, are one of the most common mental health conditions within the United States. It is often experienced as excessive worry regarding day-to-day situations with very little coping mechanisms. Anxiety is multidimensional and can impact and impair an individual’s mental and physical health; it may disturb an individual’s thoughts as well as cause sleep disturbance or gastrointestinal problems. DSM-5 qualifies diagnostic criteria as follows: excessive worry for at least three consecutive months, finding it difficult to cope with the worry, and that these symptoms are accompanied with restlessness, easily fatigued, difficulty concentrating, irritability, muscle tension, and sleep disturbance for at least three consecutive months. Other symptoms include worry or physical symptoms causing significant distress in other areas of function, disturbance not being attributed to substance consumption, as well as the disturbance not being better explained by another mental disorder.
Depression and anxiety often precede an ED. For example, in struggling with severe anxiety or depression being able to control other aspects in one’s life like food, weight and exercise may indirectly give them a false sense of control. This can temporarily relieve depression and anxiety symptoms while inadvertently leading to the development of ED and DE.

**Body Dissatisfaction**

Body dissatisfaction has been found to be one of the strongest risk factors for ED and DE. Body dissatisfaction can stem from a variety of factors, but is generally derived from a distorted body image. Feelings are derived based on one’s perception rather than reality. It is believed that through self-objectification women often experience their bodies through constant self-evaluation and comparison to societal standards. College-aged women are at particular risk due to the common weight gain that comes with this life stage. Body awareness and drive for thinness are often at the root of the feelings they possess; such strong feelings have shown to lead to body image distortion. Although an individual may appear a certain weight and size to those around them, the individual believes they physically see a different body type than what they may actually possess.

One study had shown that 29% of women university students of normal weight had perceived themselves as overweight where only 8% of normal-weight men students had perceived themselves in this way. Those who feel dissatisfaction with their body image have been found to be more susceptible to engage in unhealthy weight control behaviors (i.e., restrictive eating) to combat these feelings. Body (dis)satisfaction plays a large role in an individual’s perception of their appearance and body shape as well as the action one decides to take in order to change said perception.
**Family History**

DE is positively associated with emotion regulation, which is often used as a coping mechanism when dealing with negative emotions.\(^4^0\) The way an individual reacts to their emotions can be associated with their upbringing and family life. General functioning of a family, or the overall health of the family, has been shown to have an impact on DE. For example, DE is more commonly associated with dysfunctional households rather than those considered normal.\(^4^1\) Families that are not effective in their problem solving, communication, affective responsiveness and involvement, as well as their behavioral control appear to assist in facilitating DE.\(^4^1\) Lack of problem solving often results in poor adaptability regarding stressful events, possibly leading to poor management of stress and emotions. Defective problem solving skills often leads to those poor affective responsiveness; negative responses to stress may trigger an individual to go to extreme measures when attempting to handle stress.\(^4^1\) The extent of a family’s involvement, the amount of value family members place on each other’s activities and concerns, whether it be over- or under-involved, often impacts the risk and severity of DE. Families that express over involvement, or an excess concern for an individual’s personal constructs, have been associated with an increase in DE risk rather than under involvement.\(^4^1\) Family has the ability to play a large role in determining an individual’s behaviors and may lead to increased risk of ED or DE. Not all influences can be credited to those one is related to; outside factors may have just as an impact on DE risk.

**Environmental Factors**

Beyond familial difficulties, environmental factors including peer group and social media exposure, may have an impact in developing ED and DE. Both conditions
often develop as a result of societal and cultural pressures to conform to unrealistic societal appearances standards.\textsuperscript{2} Pressure from peers as well as pressure from social media are associated with psychological distress that may lead to body dissatisfaction and low self-esteem.\textsuperscript{42} Adolescents are more likely, compared to older adults, to be exposed to negative comments about their weight from peers, thus increasing their likelihood of developing an ED or DE.\textsuperscript{42} The increase in prevalence of online media allows more vulnerability to social disturbances, such as poor role models and negative personal perceptions.\textsuperscript{42} The athletic community, in particularly, may be an at-risk group for ED and DE within the healthy population\textsuperscript{2} for a variety of reasons as detailed further below.

**Prevalence and Development of Eating Disorders and Disordered Eating in Athletes**

Athletes are often regarded at higher risk for developing an ED or DE because of the pressures to achieve a sport-specific body-ideal.\textsuperscript{8} Current research has a narrowed focus on both collegiate as well as elite athletes as they face the most intense training regimens compared to recreational athletes. DE has been found to occur in about 27\% of female athletes;\textsuperscript{4} athletes show higher rates of DE and OSFED compared to ED.\textsuperscript{10} The prevalence of ED among athletes is around 5.75\% in aesthetic sports (e.g., gymnastics) and from 1.6\% to 5.9\% in non-lean sports (e.g., soccer).\textsuperscript{10}

The most common weight control behaviors demonstrated by athletes are excessive exercising and calorie restricting (i.e., dieting).\textsuperscript{10} Diet and exercising are often viewed as potentially beneficial for health reasons, such as reducing risk for illness, and even reinforced by coaches as a method to improve performance,\textsuperscript{10} which poses difficulty in diagnosing ED in athletes. Intentions behind an increase in exercise are important in considering ED and DE among athletes.\textsuperscript{43} Athletes typically participate in multiple sport
practices each day and may supplement this with exercise regimens in their off time. High levels of physical activity may be beneficial to performance. However, if high levels of physical activity are accompanied by energy deficiency or insufficient rest/recovery, it may result in negative health consequences as well as poor athletic performance. Not all caloric restriction is intentional; athletes who experience high energy expenditure may not be knowledgeable enough to properly refill their energy stores. Eating behaviors and weight loss strategies often lack supervision among college athletes where 15.7% of women athletes reported dieting >2 times within a year, 18.6% reported binge eating once per week, and 1.25% used diuretics or laxatives two times per month. These actions may go unnoticed by peers and coaches resulting in continuous DE and an increased risk of health consequences for both men and women athletes.

Addressing said difficulties has led to the introduction of Anorexia Athletica (AA) within OSFED. Although it is not a clinical diagnosis, AA is specific to athletes; like AN it is defined as an intense fear of gaining weight or becoming fat even when one is underweight, resulting in weight loss that is usually accompanied by compulsive exercising. AA differs from AN by the removal of the low body weight criteria within its ‘diagnosis’. AA includes attention and obsessive control over the individual’s nutrition and exercise habits. Calorie deficit within athletes may not always be obvious; due to their massive energy expenditure it is not difficult for the athletes to under consume their calories. Knowing the intensity of their energy output, an athlete may be able to curate their diet to intentionally reduce their calories for weight loss purposes. Their diet may appear to meet standards of the general population, however, they would be considered undernourished with respect to their exercise regime and could potentially experience
extreme weight loss.\textsuperscript{46} A study of 1,259 elite athletes, 572 women and 687 men, 1.8\% of women and 0.5\% of men showed symptoms of AA.\textsuperscript{45} In this same study, ED was found in 13.5\% of the participant population; findings from this small sample of participants suggests that AA is not as common among elite athletes compared to ED and DE in the general population.\textsuperscript{45}

Low energy availability due to insufficient caloric intake, possibly as a result of ED, DE, or AA, may lead to symptoms of relative energy deficiency in sport (RED-s). RED-s is defined as “impaired physiological functioning caused by relative energy deficiency, and includes but is not limited to impairments of metabolic rate, menstrual function/hormone imbalance, bone health, immunity, protein synthesis, and cardiovascular health.”\textsuperscript{47} Among all athletes, prevalence of RED-s ranges from 22\%-58\% dependent on the type of sport as well as the athlete’s gender.\textsuperscript{48} Women in lean sports, such as aesthetic and weight dependent, have been found to be at the greatest risk for RED-s.\textsuperscript{47} However, athletes with RED-s symptoms but not a formal diagnosis of RED-s are prevalent (50\%-90\%).\textsuperscript{48}

Women are often at greater risk of RED-s which includes similar criteria as the ‘the female triad.’ The female triad was established in 1993 and is characterized by three conditions relating to low energy availability- energy availability, menstrual function, and bone mineral density.\textsuperscript{49} RED-s and the female triad differ slightly in its inclusion of sexes as well as some symptoms that are recognized.\textsuperscript{50} RED-s can be diagnosed in both sexes where the female triad is specific to just women. While the female triad only includes three symptoms, RED-s includes these same three symptoms as well as a wide variety of symptoms such as metabolic damage, endocrine changes, growth and development
problems, and psychological damage. Management of both RED-s and the female triad follow guidelines in order to assess the risk of their athletes; risk factors may include history of amenorrhea, low BMI, and history of low bone mineral density. Among athletes and athletic professionals, there are recommended optimal regulations regarding body weight and body composition in order to reduce the risk of the followed disorders. These regulations emphasize regular and frequent meal intake, high protein intake, adequate carbohydrate intake, slow rate of weight reduction (if appropriate), and moderate energy deficit.

**Risk Factors for Eating Disorders and Disordered Eating in Athletes**

Athletes face similar risk factors for ED and DE as the general population. That is, athletes are not shielded from family and environment risk factors as well as any psychological characteristics that may be apparent. However, athletes differ from the general population in terms of the sport specific factors that may affect their chances of developing an ED and DE.

**Perfectionism and Self-Esteem**

As mentioned earlier, perfectionism often dovetails with ED and DE; this trait is more common in the athletic community than in the general population. Perfectionism is often a trait that is highly desirable among athletes; the high standards and self-criticism that are attributed with this trait can lead to improved performance. It has been found that perfectionism helps an athlete achieve higher physical and motor performance due to the strive for flawlessness. Such a strong trait, however, can continue to develop in such a way that it leads to maladaptive affective responses. Perfection can become a stressor for the athlete; such stress may lead to stress and fatigue on the body, restricting the
athlete to give their optimal performance in their sport. Research has constituted a relationship between perfectionism and anxiety disorders especially in athletes due to the persistent stress of performing under high pressure. Being that this may lead to emotional disturbances, such as anxiety, it is more likely that it would lead to poor coping mechanisms such as ED and DE. Unstable emotional and psychological factors may increase the likelihood of negative evaluations of one’s body, potentially encouraging DE behaviors.

Having low self-esteem is also a risk factor for ED and DE. In athletes, self-esteem may be tied to athletic performance, and self-esteem that is dependent on an individual’s performance level has been shown to be positively correlated with negative patterns of perfectionism (e.g., self-scrutiny and unrealistic personal standards). Thus, the combination of these two traits (self-esteem and perfectionism) have been found to be predictive of ED both in the general population but specifically among the athletic population. Being that ED and DE are often multifaceted, it may be difficult to quantify how individual factors may play a role in an individual’s risk. Theories may help demonstrate the importance of these factors and how they are associated with an individual’s risk in the development of ED and DE.

Achievement Goal Theory

The Achievement Goal Theory (AGT) was developed to examine the perceptions of success or failure on an individual’s motivation. Since its development this theory has narrowed its focus on athletes due to their constant desire for achievement. According to AGT, an individual may demonstrate one of two motivational orientations- ego orientated or task- oriented. Those who are task- oriented base their personal success or
failure on their ability to achieve ‘self-mastery’ of goals.\textsuperscript{52} Ego-oriented individuals, on the other hand, determine their success and failures by comparing their performance with others.\textsuperscript{52} AGT directly impacts athletes due to the consistent ‘motivational climate’ present in the world of sport.\textsuperscript{53} Motivational climates elicits achievement established by coaches, parents, peers, and fans; the pressure that accompanies this particular climate may steer an athlete to perform behaviors in order to fulfill expectations outside of their own. ‘Mastery climate’ refers to the need for team effort in order to achieve success,\textsuperscript{53} often seen in team sports. Such motivations often encourage athletes to look for opportunities to improve their personal performance as well as their team performance.\textsuperscript{53} Research suggests there is a positive relation between mastery climate and innovative behaviors to improve performance.\textsuperscript{53} Innovative behaviors vary among athletes but are often demonstrated in order to achieve success. Passion for achievement and ego may manifest into powerful and damaging behaviors; there is a common belief among athletes that reducing their body weight will improve their personal and/or their team’s performance.\textsuperscript{4} Such thoughts and beliefs may lead to ED or DE behaviors due to their persistence and determination.\textsuperscript{53}

\textit{Type of Sport}

The type of sport an athlete plays may place them at greater risk for DE or ED. Type of sport can be categorized as lean and non-lean yet the classification of sports into these two defined categories is often times mixed in the literature.

\textit{Lean Sports}

Lean sports, also referred to as weight sensitive sports, include sports in which body weight has a great impact on performance.\textsuperscript{11} Research has consistently indicated
lean sports have greater ED and DE prevalence rates among athletes. Lean sports can be further categorized into aesthetic, weight dependent, and endurance.

Aesthetic sports include a performance of an individual or team where there is a judge or judges that curate an assessment. Aesthetic sports are generally assessed using sets of rules, and appearance is often a factor in the judgement. Such sports include gymnastics, diving, figure skating, and dancing. A study of 16 male and 35 female elite gymnasts demonstrated that 64% of female athletes and 30% of male athletes showed higher risk for eating problems compared to the general population within this age-range. There is a common belief within these sports that lower body weights result in more favorable judging. In fact, the changes that come with physical and sexual growth in maturation, such as the development of breasts, is often viewed as undesirable within women’s gymnastics.

Weight-dependent sports classify athletes into different categories based on their weight; these sports include boxing, wrestling, and judo. One systematic review has shown that athletes competing in weight-dependent sports may be at an increased risk of ED and DE compared to non-lean athletes due to their desire to achieving lower body weights while maintaining substantial muscle mass. Athletes may utilize dysfunctional eating patterns in order to accomplish rapid weight loss. Extreme weight control measures commonly employed by weight-dependent athletes include severe caloric and water restrictions, along with the vigorous exercise. These extreme behaviors may lead to poor eating behaviors, depression, and clinical ED. One cross-sectional study comparing rates of ED in weight-dependent athletes and non-lean sports athletes found
that 18% of weight class athletes met ED criteria while only 5% of ball-sport (non-leanness) athletes met ED criteria.\textsuperscript{54}

Higher level of competition in endurance sports are often associated with low body weight. Leanness is often related to optimal performance due to ‘excess’ weight potentially inhibiting a faster pace or quicker movements.\textsuperscript{55} Sports that fall into this category are cycling, rowing, cross country, and swimming.\textsuperscript{8} Endurance training differs from other lean-sport types; it often consists of repeated sessions of continuous moderate intensity exercise. Endurance sports are generally centered around speed and efficiency,\textsuperscript{55} whereas the previously discussed lean sports are often focused on a variety of moves that are performed and judged.\textsuperscript{2} Speed and efficiency are often captured by those who are slim while tone with musculature.\textsuperscript{55} DE may be utilized by those who desire to become faster and increase their performance levels to accomplish higher levels of competition.\textsuperscript{55} Due to the high aerobic training that endurance athletes face, energy expenditure is often higher than any other sport.\textsuperscript{55} The insufficient fueling, a common characteristic of DE, may be unintentional in endurance athletes due to the extreme high output of energy-the individual may not be refueling their bodies properly in order to match their expenditure.\textsuperscript{55} Intentional or unintentional, endurance athletes have been shown to be one of the greatest groups of athletes at risk for ED and DE. In a study of 1,138 adolescent elite athletes, 19.5% of boys and 35.4% of girl endurance athletes had a positive screening result for core ED symptoms.\textsuperscript{56}

\textit{Non-Lean Sports}
Non-lean sports do not emphasize low body weight and do not equate body weight with performance. There are three subcategories of non-lean sports: ball game sports, power sports, and technical sports.

Athletes involved in ball game sports often manipulate a ball by themselves or with their team in order to score points against the opposing team. These include sports such as football, soccer, volleyball, baseball, and hockey. A study comparing athletes in lean versus non-lean sports, as referenced above, found of the 529 elite ballgame athletes, 16% of women and 5% of men were found to have maladaptive eating behaviors. This finding suggests ball game athletes may have the lowest rates of ED risk compared to other athletic sports, such as technical, endurance, aesthetic, weight-dependent, and power athletes. Studies have suggested that those involved in ball-game sports are not at an increased risk for ED, however, in the last decade there has been an increased risk of ED among women ball-game players (11%). Research has not concluded if this finding is due to an increase focus on outward appearance or if it is a result of societal pressures women face.

Power sports often maximize strength and power of the athlete in order to optimize their performance. Rather than focus on their body composition, there is an emphasis on increasing strength and muscle mass. Power sports rely heavily on nutrition as a tool when increasing strength and muscle mass. Sports in this category include powerlifting, shotput, and sprinting. Research is lacking when examining risk of ED among power sport athletes. In one study of 71 power athletes, 15.2% of men and 39.5% of women had shown a positive screening result for core ED symptoms. Thus, when
compared to other non-lean sports such as technical and ball game, findings revealed a higher risk for ED and DE among power sport athletes.

Technical sports involve an athlete manipulating a specialized piece of equipment. Rather than body type impacting an athlete’s performance, it is the skill they possess using their equipment that drives performance success. Examples include golf and tennis. Research lacks exploration of ED or DE risk within this category of sport, however, of the 169 participants in a cross-sectional study, 4% of men and 17% of women had a positive screening result for core ED symptoms. The prevalence rates of technical sport athletes were very similar for both sexes when compared to ball game sports with the lowest prevalence rates among lean sports and non-lean sports.

Research suggests a significantly lower risk of ED in non-lean sports in comparison to lean sports. In fact, some studies have concluded that participating in non-lean sports may be protective from developing ED and DE. With the different types of sports comes different body ideals; these differences may impact an athlete’s body image and satisfaction.

**Internalization and Body Satisfaction**

Body image internalization is considered the incorporation of an unrealistic body shape ideal into how an individual measures their self-worth. The way an individual internalizes these feelings and what ideals they decide to endorse may in part determine the level of severity of an athlete’s body image satisfaction/dissatisfaction. Satisfaction of an individual’s body can often be negated by the comparison of themselves to someone else. Athletes, like the general population, often aspire to look like those who they admire, such as other athletes. An individual may face societal as well as personal
pressure to have a lean and/or muscular shape that their sport may promote. As mentioned above, this could be relevant for those involved in aesthetic sports where judgement often factors in the athlete’s body shape. Women, especially those in strength focused sports, may have particular difficulty achieving the ideal athletic body.

Among adolescents and college-aged individuals, appearance and perception are a large concern. These two life stages have found to have the greatest prevalence of social physique anxiety (SPA). SPA refers to an anxiety in relation to the evaluation or judgement from others of one’s physique or figure. SPA can be seen in both athletes and non-athletes; however, there is an increase in SPA prevalence among athletes due to the constant use of their bodies in performing. Research has suggested this is more common among women than men. High SPA has been repeatedly linked to low body self-esteem and a potential risk factor for ED and DE. SPA has been highly correlated with lean sports, specifically aesthetic, due to the revealing uniforms and the high-pressure regarding appearance. SPA plays a role within sport, however, it is not unlikely that these athletes take this same anxiety into their world outside of athletics.

While athletes aspire to look and perform optimally in respect to their sport, they often are influenced by social standards outside of the athletic community. Athletes are often viewed as having the “ideal” body type; however, athletes are presented with a double edge sword. The constant evaluation and objectification of women are more prominent of that of men. Research has shown former competitive female athletes often acknowledge the conflict they once felt between an ideal athletic body and social body ideals. These same athletes reported their recognition and avoidance of becoming “too muscular” during their time in sport. High pressures affiliated with SPA in female
athletes are often related to the anxiety surrounding meeting cultural body ideals (i.e. thin and lean) while simultaneously possessing beneficial qualities (i.e. musculature) in successful performance within their sport. An athletic environment supports strength and power, yet this does not translate into social norms. Due to dual pressures that athletes, women in particular, face former athletes have reported maladaptive behaviors, such as restrictive eating, as a coping mechanism for their anxiety.

While women avoid the development of excess muscle, men are often seeking it. A muscular appearance of a male suggests strength and attractiveness, while those who are thin or overweight are associated with negative traits, such as lazy. These ideations are true with both in and out of sport settings; men constantly feel the pressure to meet these ideals of strong and powerful. Maladaptive behaviors, such as restrictive eating, is often used in an attempt to meet these standards and may increase risk of ED and DE.

**Instruments Used to Assess Eating Disorder Risk**

**Eating Disorder Examination Questionnaire (EDE-Q)**

The Eating Disorder Examination Questionnaire (EDE-Q) is a tool often used to measure ED behaviors and attitude. The EDE-Q was developed in 1994 and has been considered a reliable assessment tool in both clinical and research settings ever since. The EDE-Q is used for those over the age of fourteen; for those under fourteen, another version (EDE-A) is provided. The questionnaire consists of four subscales: restraint and eating-, shape-, and weight concerns. The number of questions range per subscale but total twenty-eight items. The majority of the items involve a point scale to assess frequency of ED symptoms. The remaining items consist of point scales to assess severity as well as other items that assess the number of times an incident has occurred.
Scale scores are determined by summing individual item scores.\textsuperscript{62} Research has shown that there is a ‘norm,’ or internal consistent, coefficient between 0.78 and 0.93.\textsuperscript{63} Higher global EDE-Q scores indicate more problematic eating behaviors and attitudes.\textsuperscript{62}

**Eating Attitude Test- 26 (EAT-26)**

The Eating Attitude Test (EAT) is another questionnaire that is used as a measurement, but it is targeted for symptoms of AN and BN.\textsuperscript{64} The most current version of EAT is EAT-26; it contains 26 items. Each item is based on a six-point scale from always to never. The item scores are summed with a possible score range of 0-78.\textsuperscript{64} A score of 20 to <30 indicates a need for further investigation by a professional for ED risk whereas a score of 30 and higher suggests that the individual likely has an eating disorder.\textsuperscript{65} The EAT-26 provides a 90\% accuracy rating when screening those with an ED.\textsuperscript{64}

**Consequences of Eating Disorders and Disordered Eating in Athletes**

DE and ED are taxing to the individual’s body, especially athletes, due to the detrimental physical consequences of poor eating habits and weight loss that are characteristic of ED.\textsuperscript{2} In severe cases, ED and DE may lead to suicide and/or increased suffering long after recovery.

Among athletes, insufficient energy balance, calories consumed versus calories expended, may lead to weight loss and thus, potentially, improved performance.\textsuperscript{66} While weight loss may be encouraged in lean sports, prolonged restriction or reduction of calories may lead to negative effects on performance.\textsuperscript{66} Chronic deficiencies, such as in carbohydrates and protein, may result in chronic depletion of glycogen as well as impaired recovery of muscles post exercise.\textsuperscript{66} While energy intake may be a large
concern, deficiencies may lead to negative outcomes for athletes. Food restriction promotes micronutrient deficiency; nutrients, such as calcium, that are avoided in the diet can have adverse effects both short- and long-term. Low bone mineral density is often associated with the lack of calcium consumption. Calcium deficiency has been shown to directly relate to the development of osteoporosis; while it is more commonly found in women, it can be diagnosed in men as well. Due to decreases in bone mineral density, athletes are at more risk for bone injury due to the greater impact they force on their bodies.

**Summary**

ED and DE may vary across different classifications and standards, yet the consequences remain the same as being detrimental to an individual’s health. While anyone in the general population may be susceptible to developing an ED and DE, research suggests that athletes may be at a particularly higher risk, especially women athletes. ED & DE risk factors specific to athletes may include but not be limited to factors such as perfectionism and poor body satisfaction which may fuel endorsement of unhealthy eating and excessive exercise behaviors. The type of sport played may also predict which athletes are more at risk for ED and DE. For instance, research suggests the prevalence of ED and DE is higher among lean sports compared to non-lean sports. However, there is limited research examining ED and DE risk among certain sport classifications such as endurance and strength athletes. Thus, more research on comprehensively examining ED and DE risk among athletes from various sports is needed to create the most effective ED and DE prevention strategies for athletes.
CHAPTER THREE: METHODS

This secondary analysis aims to explore disordered eating and body satisfaction differences between lean and non-lean athletes by gender. The recruitment and data collection methods utilized in the parent study are outlined below.

Study Design

This is a secondary analysis of an online, cross-sectional study completed between April 2018 and May 2019 that examined eating behaviors, eating disorder risk, physical activity behaviors, personality traits, perceptions of weight status/body image/body composition, and psychographic characteristics of college students. The study was approved by the Rutgers University Institutional Review Board and all participants gave informed consent before completing the online survey. Details on this prior cross-sectional study can be found elsewhere.\textsuperscript{68,69} In brief, details on the study sample, recruitment and instrument development are described further below.

Sample and Recruitment

Participants were recruited to complete an online survey assessing eating behaviors and attitudes towards food. Inclusion criteria included being an enrolled college student at Rutgers University between the ages of 18 to 25 years with Internet access to complete the online survey. Recruitment emails for the study were distributed via student listserves as well as announcements in freshmen and sophomore level classes at Rutgers University. For incentive purposes, those who participated in the study were entered into a drawing of 1 of 10 $25 gift cards; some professors also offered students extra credit for completing the survey.
Given the focus of this current study on young adult college athletes, those over the age of 25 years as well as those classified as non-athletes were excluded from the total analytical sample. Additionally, those who attended high school outside of the U.S were excluded from the analysis due to potential cultural factors that may influence body image and disordered eating risk.

**Instrument**

Details on the original online survey development can be found elsewhere. In brief, this online survey focused on eating behaviors and attitudes of college students that included valid and reliable instruments that were formatted into an online survey platform, Qualtrics®. Before launching, the formatted survey was reviewed by several content experts for grammar, survey design and layout, ease of use, survey completion time, and the relevance of the questions along with being pilot tested by 118 students.

The final survey consisted of 39 constructs in four focused sections: demographics, eating behaviors, physical activity behaviors, and psychographic characteristics. For this secondary analysis, only a portion of the 39 constructs measured in the parent study were utilized as described below.

**Eating Disorder Examination Questionnaire (EDE-Q)**

The EDE-Q is a reliable and valid instrument that was used to assess disordered eating behaviors and eating disorder risk. The EDE-Q uses a series of 28 questions in which eating behaviors are assessed over the past 28 days. The four subscales of the EDE-Q include restraint, and eating, shape, and weight concerns.

The eating concern scale has questions related to preoccupation with food, eating, or calories, fear of losing control, overeating, eating in secret, social eating, and guilt.
about eating, while the weight concern scale has questions such as the importance of weight, reaction to prescribed weighing, preoccupation with weight, dissatisfaction with weight, and the desire to lose weight. The shape concern scale has questions related to preoccupation with shape, the importance of shape, fear of weight gain, and dissatisfaction with shape. The restraint scale has questions focused on restraint overeating, avoidance of eating, food avoidance, and dietary rules.

Responses to all items are on a 7-point scale of occurrence with 0 = no days, 1 = 1-5 days, 2 = 6-12 days, 3 = 13-15 days, 4 = 16-22 days, 5 = 23-27 days, and 6 = every day. Items on each subscale are averaged to create mean scores with higher scores indicating greater restraint and eating, shape and weight concerns.

**Binge Eating**

Binge eating was measured using a single item, open-ended question on the EDE-Q: “Over the past 28 days, how many days have such episodes occurred (i.e., you have eaten an unusually large among of food given the circumstances and had a sense of loss of control at the time). Higher total number of days reported indicated greater binge eating frequency over the last month.

**Compensatory Behaviors**

The compensatory behavior scale was assessed based on the frequency of vomiting, laxative use, and excessive exercise as a means of controlling weight or shape over a period of 28 days. The scale score was then calculated by averaging the scores of the three compensatory behaviors (vomiting, laxative use, excessive exercise). Scores for vomiting and laxative use were scored on a 7-point scale; a score of 1 indicates no participation in vomiting or laxative use to control weight or shape, scores from 2 to 6
indicated use of these behaviors between 1 and 5 times respectively, and a score of 7 indicates participation of the behavior 6 or more times. Excessive exercise to control weight was re-coded while also using a 7-point scale; a score of 1 indicated no participation in excessive exercise, 2 indicated participation 1 to 5 times, 3 indicated participation 6-10 times, 4 indicated 11 to 15 times, 5 indicated 16 to 20 times, 6 indicated 21-25 times, and 7 indicating more than 25 times. The scales for the use of vomiting, laxatives, and excessive exercise determine that a score of 5 (4 or more times in the past month) for vomiting and laxative use and a score of 20 times of more for excessive exercising in the past month would be considered to be the cut off score for clinically significant participation of these behaviors.

**Disturbed Eating Score Calculation**

A Disturbed Eating Score was created using the EDE-Q to further examine disordered eating behavior on a continuum. In creating the scale score, the 75th and 90th percentile scores were identified for male and female participants using each of the six eating behavior scales (i.e., Eating Concern, Weight Concern, Shape Concern, Restraint, Binge Eating, and Compensatory Behaviors). Scores below the 75th percentile were coded as 0, scores between the 75th and 90th percentile were coded as 1, and scores above the 90th percentile were coded as 2. The coded scores for all six eating behavior scales were summed to establish the Disturbed Eating score. Participants who scored 6 and scored below the 75th were categorized as “not disturbed;” a score of 6 indicated they scored the lowest possible scores on all 6 eating behavior scales. Those scoring above 6 and below the 75th percentile were classified as “mildly disturbed;” those whose scores were above the 75th percentile, but below 90th percentile were classified as “disturbed,”
and those who scored above the 90th percentile were classified as “highly disturbed”.
Thus, participants were classified as not disturbed, mildly disturbed, disturbed, and
highly disturbed based on their responses.

**Body Shape Satisfaction Scale**

To assess body satisfaction, the valid and reliable 13-item Body Shape Satisfaction Scale was used. The 13 individual items ask “how satisfied are you with your….height, weight, body shape, waist, hips, thighs, stomach, face, shoulders, chest, muscles, body build, and overall body fat?” with a 5-point Likert response scale ranging from very dissatisfied to very satisfied. All items are summed with higher scores indicating greater body satisfaction.

**Classification of Athletes by Sport Type**

All athletes reported which sport(s) they had participated in during the past year. Based on their responses, participants were classified into “lean” or a “non-lean” sport category. Lean sports, or weight sensitive sports, often included sports in which performance is impacted by the athlete’s body weight. The type of sports that classified as lean were aesthetic, endurance, and weight dependent sports. These sports included cheerleading, dance, diving, figure skating, gym, as well as cross country, swimming, boxing, wrestling, rowing, and track and field. Non-lean sports, on the other hand, do not focus on body weight nor does body weight equate to performance levels. This classification included ball game, power, and technical sports. Sports within these categories consisted of baseball, basketball, football, volleyball, lacrosse, hockey, as well as bowling, golf, tennis, and equestrians. For athletes participating in sports that did not fall into either non-lean or lean category, a separate classification was distinguished as a
‘mixed’ athlete. Mixed athletes included individuals that participated in more than one sport with conflicted classifications, such as athletes that participates in tennis (non-lean) and figure skating (lean).

**Demographic Characteristics and Weight Status**

Demographic information such as age, gender, race/ethnicity, high school and college athletic participation, as well as major and GPA were examined. Self-reported heights and weights were also calculated for body mass index (BMI) scores.

**Data Analysis**

Descriptive statistics of all variables and stratified by lean, non-lean, and mixed athletes and gender were performed. Internal consistency of scales, as applicable, were conducted using Cronbach’s alpha coefficient. Independent t-tests for continuous variables and chi-square tests for categorical variables were performed to determine significant demographic, weight status, disordered eating behaviors and body satisfaction differences between lean and non-lean athletes by gender. For any significant (p<0.05) differences, effect sizes were conducted using Cohen’s $d$ for continuous variables and Cramer’s $V$ for categorical variables. Analysis of Variance (ANOVA) with Tukey post-hoc follow-up tests examined significant body satisfaction and disordered eating behavior differences among and between athlete classification by gender. Partial ETA-squared were considered small ($\eta^2= 0.01$), medium ($\eta^2= 0.06$) and large ($\eta^2= 0.14$) in effect size. Analysis of Covariance (ANCOVA) controlling for BMI with Tukey post-hoc follow-up tests examined significant body satisfaction and disordered eating behavior differences among and between athlete classification by gender. All analyses were conducted in the
Statistical Package for Social Sciences (SPSS) version 27.0 (SPSS Inc., Chicago, IL) with significance level set \textit{a priori} at $p < 0.05$. 
CHAPTER FOUR: RESULTS

Table 1 reveals that participants (N=1279) were mostly women college students (n=781, 61%) and in their early-20’s (20.4±1.3SD years). The majority of participants also identified as White (42%) followed by Asian Indian (20%), Asian (e.g., Japanese, Chinese, Korean) (16%), Hispanic, Latino, or Spanish (13%), Black or African American (6%), mixed (3%) and American Indian or Alaskan Native (<1%). Chi-Square tests showed significant race/ethnic differences between men and women. That is, a higher percentage of women (45.1%) identified as White compared to men (37.6%). On average, mean Body Mass Index (BMI) was within the normal weight status range (23.7 ±4.26SD). However, men had a significantly (p<0.001) higher mean BMI (24.4±3.91SD) than women (23.3±4.41SD) with a small effect size (d=0.264).
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total Sample (N=1279)</th>
<th>Men (n=498)</th>
<th>Women (n=781)</th>
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<th>P</th>
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<td><strong>Body Mass Index†</strong></td>
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<td><strong>Age (years)</strong></td>
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<td>0.181</td>
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*Independent sample t-tests for continuous variables or Chi-Square test for categorical values examining demographic and health differences by sex.
†Body Mass Index (wt[kg]/ht[m²])
§ Effect sizes are considered small (d=0.2), medium (d=0.5), and large (d=0.80).
Internal consistency of all measures were primarily good with Cronbach alpha coefficients ranging from 0.78 to 0.93 (Table 2). Overall, participants were neither satisfied nor dissatisfied with their body shape (3.07±0.82SD) when measured on a 5-point Likert Scale. On average, participants reported within the last 28 days, they experienced between 1 and 5 days of eating, shape and weight concerns. Based on a 7-point frequency scale, participants also reported average restraint eating between 6 and 12 days in the last 28 days. In terms of disordered eating behaviors, binge eating was the most common behavior reported; on average, participants reported binge eating 3 times in the last 28 days. Unlike binge eating, purging behaviors remained low with participants reporting using excessive exercise (1.75±1.33), laxative use (1.14±0.79) and self-induced vomiting (1.11±0.70) around 1 to 2 times in the last 28 days in the effort to control their body weight.

Independent t-tests revealed men had significantly (p<0.001) higher mean scores for body shape satisfaction than women, while women had significantly higher mean shape, weight, and eating concern scores compared to men (Table 2). Mean restraint eating did not differ significantly by gender. Independent t-tests also showed women were significantly (p=0.043) more likely to use laxatives to control their weight compared to men, while men were significantly more likely to exercise excessively (p<0.001) to control their weight compared to women. There were no significant gender differences in binge eating or self-induced vomiting. All effect sizes ranged from small to medium.
Table 2. College Students’ Body Shape Satisfaction, Weight and Eating Concern, and Eating Disorder Patterns (N=1279)

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<th>Characteristic</th>
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<th>Total Sample (N=1279) Mean±SD</th>
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<th>Women (n=781) Mean±SD</th>
<th>t-test*</th>
<th>P</th>
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<tr>
<td>Body Shape Satisfaction(^1)</td>
<td>0.93</td>
<td>3.07±0.82</td>
<td>3.21±0.83</td>
<td>2.97±0.79</td>
<td>5.10</td>
<td>&lt;0.001</td>
<td>0.296</td>
</tr>
<tr>
<td>Shape Concern (EDE-Q)(^2)</td>
<td>0.91</td>
<td>2.70±1.27</td>
<td>2.32±1.16</td>
<td>2.95±1.28</td>
<td>-8.93</td>
<td>&lt;0.001</td>
<td>0.516</td>
</tr>
<tr>
<td>Weight Concern (EDE-Q)(^2)</td>
<td>0.85</td>
<td>2.90±1.64</td>
<td>2.42±1.37</td>
<td>3.20±1.72</td>
<td>-8.61</td>
<td>&lt;0.001</td>
<td>0.502</td>
</tr>
<tr>
<td>Eating Concern (EDE-Q)(^2)</td>
<td>0.78</td>
<td>2.09±1.32</td>
<td>1.79±1.04</td>
<td>2.28±1.43</td>
<td>-6.58</td>
<td>&lt;0.001</td>
<td>0.391</td>
</tr>
<tr>
<td>Restraint Eating (^\hat{_})</td>
<td>0.78</td>
<td>2.72±1.48</td>
<td>2.78±1.57</td>
<td>2.68±1.42</td>
<td>1.11</td>
<td>0.266</td>
<td>0.067</td>
</tr>
<tr>
<td><strong>Disordered Eating Behaviors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Binge Eating Behavior (EDE-Q)(^2)</td>
<td>-</td>
<td>3.14±4.04</td>
<td>2.95±4.11</td>
<td>3.26±3.99</td>
<td>-1.31</td>
<td>0.188</td>
<td>0.077</td>
</tr>
<tr>
<td>Purging Behaviors (EDE-Q)(^2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vomiting</td>
<td>-</td>
<td>1.11±0.70</td>
<td>1.10±0.65</td>
<td>1.12±0.74</td>
<td>-0.61</td>
<td>0.557</td>
<td>0.029</td>
</tr>
<tr>
<td>Laxative Use</td>
<td>-</td>
<td>1.14±0.79</td>
<td>1.08±0.62</td>
<td>1.17±0.88</td>
<td>-2.02</td>
<td>0.043</td>
<td>0.118</td>
</tr>
<tr>
<td>Excessive Exercise</td>
<td>-</td>
<td>1.75±1.33</td>
<td>1.98±1.54</td>
<td>1.60±1.16</td>
<td>4.98</td>
<td>&lt;0.001</td>
<td>0.279</td>
</tr>
</tbody>
</table>

\(^{*}\) Independent sample t-tests examining variable differences by sex.

\(^{\\hat{\_}}\) Effect sizes are considered small (d=0.2), medium (d=0.5), and large (d=0.80).

\(^{2}\) Scored on a 5-point Likert Scale (1=very dissatisfied 2=dissatisfied 3=neither dissatisfied nor satisfied 4=satisfied 5=very satisfied)

\(^{2}\) Scored on a 7-point Likert Scale (1= no days, 2= 1-5 days, 3=6-12 days, 4= 13-15 days, 5= 16-22 days, 6= 23-27 days, 7= everyday).

\(^{\hat{\_}}\) Scored on a 7-point scale (0 = no days, 1= 1-5 days, 2= 6-12 days, 3= 13-15 days, 4= 16-22 days, 5= 23-27 days, and 6= every day).

\(^{2}\) Answer choices ranged from 1= 0 times to 41= 40 or more times
Analysis of variance tests examining demographic and health characteristic in both men and women, revealed significant mean body mass index (BMI) differences among athlete classification groups (non-lean, lean, and mixed athlete) with large effect sizes (Table 3). Tukey post-hoc tests revealed lean athletes had a significantly lower mean BMI than non-lean and mixed athletes. All athlete classification groups had an average BMI in the normal weight range. Age for both men and women did not differ significantly among athlete classification groups.
### Table 3. Comparison of College Students’ Demographic and Health Characteristics by Athlete Classification (N=1279)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Men (n= 498)</th>
<th>Women (n=781)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non- Lean Athlete (n=345)</td>
<td>Lean Athlete (n=52)</td>
</tr>
<tr>
<td>Body Mass Index†</td>
<td>24.4±3.95ᴬ</td>
<td>23.1±2.93ᴬᴬ</td>
</tr>
<tr>
<td>Age (years)</td>
<td>20.4±1.36</td>
<td>20.4±1.11</td>
</tr>
</tbody>
</table>

*ANOVA with Tukey post-hoc follow-up tests conducted for variables with a significant main effect (p<0.01) for all pairwise comparisons. Values within cells that contain the same letter represent significant difference between those two groups.

§Partial eta-squared effect sizes were considered small = 0.01; medium = 0.06; and large = 0.14.

†Body Mass Index (wt[kg]/ht[m²])
Analysis of variance by gender revealed no significant body shape satisfaction, and eating, shape and weight concern differences among athlete classification groups (non-lean, lean, and mixed athlete) (Table 4). However, there was a significant restraint eating difference among athlete classification for men but not women. That is, Tukey post-hoc tests showed that mixed athletes had significantly greater eating restraint compared to non-lean and lean athletes in men with large effect sizes.

In men, there were no significant disordered eating behavior differences among athlete classification groups; however, binge eating approached significance (p=0.06) with lean athletes tending to have more frequent binge eating episodes compared non-lean and mixed athletes. In women, there were no significant disordered eating behavior differences among athlete classification group, except for self-induced vomiting. Tukey post-hoc tests showed that lean athletes were significantly less likely to report using self-induced vomiting to control their weight compared to non-lean and mixed athletes with a medium effect size.

Both men and women averaged a score of two when determining the Disordered Eating Severity Score suggesting that most of the screened athletes would be considered “mildly disturbed.” However, there were no disordered eating severity score differences by athlete classification in men and women.

After controlling for BMI using ANCOVA, there was no longer any significant disordered eating behavior differences among athlete classification groups in men or women (see Appendix A).
Table 4. Comparison of College Students’ Body Shape Satisfaction/Concern, Weight and Eating Concern and Eating Disorder Patterns by Athlete Classification (N=1279)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Men (n=498)</th>
<th>Women (n=781)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Lean Athlete (n=345) Mean±SD</td>
<td>Lean Athlete (n=52) Mean±SD</td>
</tr>
<tr>
<td>Body Shape Satisfaction</td>
<td>3.19±0.82</td>
<td>3.16±0.88</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shape Concern (EDE-Q)</td>
<td>2.30±1.74</td>
<td>2.26±1.18</td>
</tr>
<tr>
<td>Weight Concern (EDE-Q)</td>
<td>2.43±1.37</td>
<td>2.32±1.36</td>
</tr>
<tr>
<td>Eating Concern (EDE-Q)</td>
<td>1.74±1.00</td>
<td>1.79±1.00</td>
</tr>
<tr>
<td>Restraint Eating</td>
<td>2.68±1.56B</td>
<td>2.58±1.48C</td>
</tr>
<tr>
<td>Behaviors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Binge Eating Behavior (EDE-Q)</td>
<td>2.82±3.47</td>
<td>4.23±7.06</td>
</tr>
<tr>
<td>Purging Behaviors (EDE-Q)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excessive Exercise</td>
<td>1.96±1.47</td>
<td>1.75±1.45</td>
</tr>
<tr>
<td>Self-Induced Vomiting</td>
<td>1.07±0.51</td>
<td>1.10±0.45</td>
</tr>
<tr>
<td>Laxative Use</td>
<td>1.06±0.54</td>
<td>1.10±0.50</td>
</tr>
<tr>
<td>Disordered Eating Severity</td>
<td>1.97±0.92</td>
<td>1.92±0.64</td>
</tr>
</tbody>
</table>

*ANOVA with Tukey post-hoc follow-up tests conducted for variables with significant main effect (p<0.01) for all pairwise comparisons. Values within cells that contain the same letter represent significant difference between those two groups.

§Partial eta-squared effect sizes were considered small = 0.01; medium = 0.06; and large = 0.14.

†Scored on a 5-point Likert Scale (1=very dissatisfied 2=dissatisfied 3= neither dissatisfied nor satisfied 4=satisfied 5=very satisfied)

‡Scored on a 7-point Likert Scale (1= no days, 2= 1-5 days, 3=6-12 days, 4= 13-15 days, 5= 16-22 days, 6= 23-27 days, 7= everyday).

ˆScored on a 7-point scale (0 = no days, 1= 1-5 days, 2= 6-12 days, 3= 13-15 days, 4= 16-22 days, 5= 23-27 days, and 6= every day).

¥Answer choices ranged from 1= 0 times to 41= 40 or more times

The coded scores for all six eating behavior scales (Eating Concern, Weight Concern, Shape Concern, Restraint, Binge Eating, and Compensatory Behaviors) were calculated. Scores below the 75th percentile (calculated separately for males and females) were coded as 0, scores between the 75th and 90th percentile were coded as 1, scores above the 90th percentile were coded as 2. The percentile scores were summed to establish the disturbed eating score. Disturbed eating scores below 6 AND below the 75th percentile (calculated separately for males and females) were scored as 1 ("not disturbed), scores above 6 but below the 75th percentile was scored as 2 ("mildly disturbed"), a score above the 75th but below the 90th percentile was scored as 3 ("disturbed"), scored above the 90th percentile were scored as 4 ("highly disturbed"). Higher scores indicate greater disturbed eating severity.
CHAPTER FIVE DISCUSSION

In this discussion, findings from our two research questions and hypotheses will be summarized and discussed as it relates to the literature. This will then be followed by strengths, limitations, and conclusions of the study along with recommendations for future research.

**Research Question #1: What is the prevalence of body satisfaction and disordered eating patterns among athletes by gender?**

As hypothesized, women college athletes had significantly less body satisfaction, compared to men college athletes in this current study with small effect sizes. These findings are similar to both athletic and the general populations. Body dissatisfaction, opposite of body satisfaction, can be defined as a negative perception of one’s physical appearance; often times it is due to the comparison of an individual’s appearance versus society’s standard of ‘attractive.’ Body dissatisfaction is a strong predictor of disordered eating patterns. In the general population, the prevalence of body dissatisfaction has been shown to effect around 13.4% to 31.8% of women and 9.0% to 28.4% in men.

While all athletes may fall at risk of body dissatisfaction due to the high physical demands of their sport, women athletes have been shown to have greater body dissatisfaction compared to men athletes, similar to that of the general population. For example, 24.2% of Division I and 30.7% of Division III collegiate women athletes (N=118) were found to suffer from body dissatisfaction, while only 14.7% of men athletes in a separate cross-sectional study (N=165) experienced body dissatisfaction. Prior literature has shown that female athletes are very conscious regarding their weight, shape,
and appearance; they are not only impacted by the social standards that the general population creates, but are also influenced by the physical demands of their sport. The gender intensification hypothesis states that as adolescents transition through puberty, individuals often identify as their gender role stereotype defines them. Women face the gender role stereotype that emphasizes physical appearance and attractiveness as it relates to their bodies; the current body ideal in the media relate the level of attractiveness of women to being thin. Body dissatisfaction, in turn, may develop in light of not achieving the level of ‘attractiveness’ one might be striving for.

Female athletes may also fall victim to certain stigmas. One of the most common stigmas being that the leaner an athlete is, the better their performance levels. This feeling of dissatisfaction may be highlighted when paired with the pubertal changes that occur to women during the transition from adolescents into young adulthood. While the general population may be nearly complete in their pubertal development by the age in which they attend college (usually around 18 years old); women who compete in intensive physical training during their adolescent years may show a delay in their physical development in young adulthood.

As hypothesized, women athletes, for the most part in this study, had significantly greater disordered eating behaviors compared to men athletes. Disordered eating behaviors include unhealthy eating behaviors like binge eating and purging behaviors such as fasting, vomiting, laxative use, and excessive exercise, while eating disorders must meet specific clinical criteria for a diagnosis. Similar to disordered eating, eating disorders (ED) are associated with intentional behaviors focused on controlling one’s body weight and body shape. Overtime, disordered eating behaviors may develop into a
more severe mental health clinical diagnosis of an ED as defined by the Diagnostic and Statistical Manual for Mental Disorders (DSM-5). Some of the most common being anorexia nervosa, bulimia nervosa, and binge eating disorder. While EDs are not the topic of discussion of this study, it is important to note the risk of development as it relates to disordered eating patterns. Our study findings are consistent with prior literature where women in both the general and athlete population have been found to be at greater risk for developing disordered eating behaviors compared to men. Disordered eating, unlike ED, is not easily identified nor can be diagnosed due to the variability of its appearance; the ambiguity of a standard diagnosis may present a challenge in identification of disordered eating. Unlike the general population, the risk and impact of disordered eating is greater for those in the athletic population. 

According to several studies conducted by the National Collegiate Athletic Association (NCAA), 84 percent of collegiate athletes admit to utilizing disordered eating patterns. When comparing women athletes to non-athletes in a review of multiple studies (N=4,675), women athletes demonstrated a range of 0 to 27 percent endorsement of disordered eating behaviors while 0 to 21 percent of women in the general population endorsed these same behaviors. These studies have suggested that the physical demands required of a student athlete may heavily contribute to the development of eating pathology and compensatory behaviors. Disordered eating is often higher among women, for both athletic and non-athletic populations with limited research in men. Prior research suggests either no significant differences between men athletes and men non-athletes while other research has found that men athletes have lower rates of disordered eating. For example, Fogelhom et. al investigated factors associated with
eating disorders in men (n=190) and women (n=173) athletes and their ‘untrained’ controls (n= 61, n=79), respectively. Findings suggest men, on average, were less likely to report wanting to lose weight compared to women athletes; and therefore, men were less likely to practice disordered eating behaviors focused on controlling their body weight compared to women athletes.

Disordered eating in women athletes, oftentimes, is driven by the concept that the smaller one’s body size an athlete, the better an athlete. On the other hand, disordered eating, specifically as it pertains to men, may be facilitated through the desire to become more muscular. A commonly endorsed compensatory behavior among athletes is excessive exercising for weight reduction and muscle growth. Although excessive exercise is not identified as an ‘eating pattern’, high levels of compulsive exercise is associated with increased levels of disordered eating psychopathology. While excessive exercise is utilized in both the athletic and the general population, it may be easily disguised and overlooked due to an athlete’s already intense training regimen. A longitudinal study (N=8,251) among college-aged young adults found that 11 percent of men and 17 percent of women non-athletes reported compulsively exercising, whereas 40 percent of athletes (N=325) engaged in at least two hours of daily exercise. Similarly, in another cross-sectional study among athletes (N=204), 25 percent reported exercising at least two hours per day; however, this was reported in addition to their scheduled sport-related training, with the focus being to burn calories and control their weight.

As hypothesized, men were significantly more likely to participate in excessive exercise to control their weight compared to women athletes although the effect size was small. Unlike a women’s desire to adhere to the ideal thin social standard, men tend to be
effected by the social standard of being physically fit and masculine. Endorsing excessive exercise may be a method in which men athletes use to promote muscle growth and develop their ‘ideal’ body shape as well as increase their performance levels. According to Petrie et. al (N=203), the use of the Questionnaire for Eating Disorder Diagnoses (QEDD) demonstrated that over one-third (37%) of the men athletes reported to be exercising at least two hours per day in addition to the sport-required exercise. It was determined that exercise was the primary tactic in controlling their weight.

Excessive exercise is often utilized by both men and women athletes; increased amounts of exercise is often celebrated as it suggests a greater commitment to athletic success. The support athletes receive as well as the availability of exercise equipment both promote this type of inappropriate compensatory behavior. Unlike excessive exercise, other compensatory actions are often not so encouraged; methods such as laxative use may not be so evident in an athlete’s regimen and may not be fully disclosed to their peers or their coaches.

As hypothesized, women athletes were significantly more likely to utilize laxatives to control their weight and shape compared to men athletes. The use of laxatives to reduce an individual’s body weight is an inappropriate compensatory behavior that promotes the production and excretion of stool and, when done in excess, can lead to dehydration. Those who endorse laxative misuse often believe that they can flush the food out of their body before their body can ‘absorb the calories’ and therefore, they will not gain the weight. Men often do not share the same societal pressures as women in which attractiveness is associated with being thin; thus, men may be more likely to endorse excessive exercise rather than laxative misuse. The use of dehydration tactics,
such as misusing laxatives, was found to be the most common method in controlling weight in a German study of elite adolescent athletes (N=1,138). While laxative use is not gender specific, the National Center on Addiction and Substance Abuse determined that, of their study sample of the general adolescent population, 7.8% of girls vomited or took laxatives to lose or avoid gaining weight whereas only 2.9% of the boys did the same.

Unlike laxative use, the hypothesis was not supported for significant gender differences in binge eating, restraint eating, and self-induced vomiting. Binge eating is often described as consuming an abnormally large amount of food and having a lack of self-control. A variety of studies have shown inconsistent findings when examining binge eating behaviors by gender in athletes. Johnson et.al. (N=1,445) performed a survey on Division 1 collegiate athletes and determined men (4.42%) were significantly more likely to engage in daily episodes of binge eating compared to women (2.49%); however, women athletes were more likely (16.19%) to binge eat monthly versus men athletes (12.57%). Two additional separate studies examined athletes and the prevalence of binge eating in athletes. In another cross sectional survey of Division 1 collegiate women athletes (N=204), 18.63 percent reported having engaged in binge eating at least one time per week as well as 15.2 percent reported binge eating for three months or longer. Similarly, in a cross sectional survey utilizing the EDE-Q among Division 1 collegiate men athletes (N=186), binge eating occurred in 42 percent of the men athlete population in which the athletes reported episodes of binge eating for two or more days in the past twenty eight days. Converse to binge eating, restraint eating can be defined as limiting food intake in terms of quantity and type of food. Restraint eating
is a common practice used by the general and the athletic populations to reduce their body weight or size. Restricting one’s food intake for purposes of weight loss is particularly concerning for athletes given the high volume of physical training that their bodies demand more calories to perform in their sport. Prior research has identified the relationship of binge eating and restraint eating where restraint eating is often thought to be a mediator between binge eating and bulimia. That is, strict dietary restrictions as well as limited food intake over a period of time has been linked to the occurrence of overeating in the form of binge episodes. Binge episodes have been linked to the development of other compensatory behaviors such as self-induced vomiting. Like binge eating and restraint eating, self-induced vomiting displays wide variability in the literature.

In the prior research studies mentioned above, Johnson et al. examined the prevalence of self-induced vomiting in men and women athletes (N=1,445). Women were more likely to utilize self-induced vomiting monthly (6.41%), weekly (3.20%), as well as daily (1.42%) compared to men (2.04%, 1.13%, 0.34% respectively). Dimitrova et al. found that of the men athlete population (n=138), 4.3% reported utilizing self-induced vomiting more than two times within the previous month. Similarly, Greenleaf et al. found self-induced vomiting impacted between 0.5 percent and 2.9 percent of women athletes depending on the reported frequency. The variability among the studies in the literature may be related to several factors with one of them being lack of self-reporting their behaviors. Poor disclosure of said behaviors may be due to their inability to recognize their personal disordered eating patterns. For those who may not be aware of said behaviors or do not view their behaviors as ‘disordered’ may be less likely to
disclose this information. While some may be unaware of their patterns and behaviors, others may be aware of their actions but too ashamed to admit on self-reported surveys. Both men and women may be subjected to these conditions and left pertinent information undetected, potentially impacting study results. Given there were significant gender differences in body dissatisfaction and most disordered eating behaviors, it was hypothesized that there may be significant differences by classifications of sport.

Research Question 2: Are there significant body satisfaction and disordered eating behavior differences among and between athletes related to their sport-specific classifications (non-lean, lean, and mixed classifications)?

Lean sport athletes were hypothesized to experience greater body dissatisfaction than those of non-lean and mixed sport athletes since the focus is thought to be more on body shape and size. Constant exposure to elevated standards, both aesthetic and functional, may lead to poor body image if an individual feels as though the standards are not being met. Contrary to our hypothesis, there was no significant body satisfaction differences found among lean, non-lean, and mixed athletes of men and women in this study, which is inconsistent with prior work. For instance, in a cross-sectional study among women Division I athletes (N=146), lean athletes demonstrated a higher body dissatisfaction than non-lean sport athletes. However, research has also suggested that athletes may be protected from body dissatisfaction; in this same cross-sectional study, women athletes showed lower body dissatisfaction scores compared to non-athletes. Similarly, when comparing aesthetic and ballgame sports, aesthetic sport athletes had greater body dissatisfaction than ballgame sport athletes in a cross-sectional study conducted in Germany; adolescents in this study were selected from elite sports schools.
as well as Olympic training centers. The findings of the current study may not align with prior research due to differences in sports classification among studies. For instance, those in the ‘aesthetic’ category do not always encompass the same sports. In our current study cross country was categorized as being an ‘aesthetic’ or ‘lean’ sport, but this sport was not classified as such in the Krentz et. al. study. Additionally, Krentz et. al included roller-skate figure skating while our current study only classified ice figure skating in the ‘lean’ sport category. The lack of consistency in sport classifications of lean versus non-lean athletes makes comparisons difficult. The non-significant findings of body satisfaction among athlete classification may also suggest that body (dis)satisfaction does not discriminate by athlete type. As discussed earlier, body dissatisfaction is very common among adolescents and young adults of the general population; the current study findings may demonstrate a similar proportion of body dissatisfaction among the athletic population within this age group.

Our hypothesis predicted that lean sport athletes would have significantly greater restraint eating as well as shape, weight, and eating concerns compared to non-lean and mixed athletes was not supported. This hypothesis was established under the guise that lean sports emphasis on the size of one’s body; thus, weight control behaviors, such as restraint eating, may be endorsed to control one’s body weight. Specifically, in lean sport athletes where there is a belief that a smaller body will increase performance ability disordered eating behaviors like restraint eating are commonly endorsed. Interestingly, restraint eating in men was found to be significantly higher in mixed athletes compared to non-lean and lean athletes in this current study. Based on the current study’s classification method, those who were classified as mixed athletes selected more than one
sport that they participated in that had classifications as both lean and non-lean sports. It is possible that participation in both lean and non-lean sports may have conflicting ideal body weight pressures for athletes, which might help to explain this inconsistent finding in the literature.

In contrast to the current study, a cross-sectional study focused on body image concern and eating disordered symptoms in athletes (N=2,500) found that eating restraint was significantly higher in ‘fitness’ sports, categorized as lean, versus ‘ball- sports,’ categorized as non-lean. The prior study also found eating restraint to be significantly higher in men athletes compared to women athletes, which conflicts with our current study findings of non-significant gender differences in restraint eating. Perhaps there are no discernable restraint eating differences among sport type classifications of athletes. Disordered eating patterns, such as restraint eating, may also not be specific to sport type. It is also difficult to make comparisons with prior studies that had different participant eligibility criteria and sport type classifications. For instance, the Kristjansdottir et. al. study was conducted in Iceland where participants had to be Icelandic, at least 18 years old, and compete at the highest possible level for their specific sport, while in our current study participants had to be enrolled as a college student at Rutgers University (located in New Jersey) and be between the ages of 18-25 years old. Thus, variation as it relates to eating patterns and location of the study as well as culture differences may explain inconsistencies in the literature. The difference in the type of athlete may also have impacted findings; unlike the current study, Kristjansdottir et. al. only allowed athletes who competed at the highest possible level to participate or elite athletes. The current study did not discriminate between the level of competition in which athletes are
involved; those who are at a higher competitive level may differ in their eating patterns and behaviors when compared to recreational athletes.

Shape, weight, and eating concern differences among the classification of athletes in men and women in the current study was non-significant. It is possible that the sample sizes for each athlete classification group were limited in power. The group sizes of the classified athletes were considerably different; of the total sample (N=1,279), non-lean comprised almost two-thirds of the sample. However, similarly to body dissatisfaction, it is also possible that there is no discernable shape, weight and eating concern differences among athletes since it is already rampant in society.

There were no significant disordered eating behavior differences among athlete classification groups in this current study, which is consistent with previous research. For instance, a cross-sectional study in men athletes (N=186) using the EDE-Q, similar to our current study, found no significant binge eating or purging behavior (i.e., laxative use) differences between lean and non-lean sport athletes. A systematic review examining weight control methods endorsed among elite athletes under the age of 25 years old found that there was no significant differences in weight control behaviors, such as self-induced vomiting, between lean and non-lean sport types. While the current results support prior research, it is important to note that self-induced vomiting may be underreported. Self-induced vomiting is often considered as a purging behavior as well as a pathogenic weight control method; within the category, vomiting is often referred to alongside diuretic use, laxative use, and diet pills. When measuring purging behaviors and/or pathogenic weight control methods, the grouping is often measured as a whole
rather than independently. Additionally, there is limited research investigating purging behavior differences among athlete classification making comparisons difficult.

Like disordered eating patterns mentioned above, it may be likely that disordered eating patterns may not be sport-specific. Research has concluded that athletes as an entire population are at increased risk of participating in such behaviors; the type of sport may not have a direct impact the desire to utilize weight control behaviors. Rather, the competitive nature of sports themselves may have the greatest influence.

**Strengths and Limitations**

The current study includes several strengths. One of the strengths include the large and diverse sample. The diversity of the sports examined is in another study strength as it included athletes from a variety of sports (e.g., equestrians). Another strength of the study includes the participants ability to complete the survey online which provided participants the ability to answer honestly as they may have been more comfortable in a private setting. Finally, the use of reliable and valid instruments (i.e., EDE-Q and Body Shape Satisfaction Scale) that were comprehensive in nature at assessing disordered eating and body dissatisfaction is a study strength.

Although the strengths contributed to the utilization of the data collected, study limitations must also be considered when interpreting the findings. One limitation is the cross-sectional nature of this study as temporal associations cannot be determined. A second study limitation is that participants were recruited only from Rutgers University which limits the generalizability to other college students. When determining the classification, the athletes (lean, non-lean, mixed), there was limited data pertaining to the definition of each category in prior work, so it is possible that our sport classification
categories led to biased results. Another limitation is self-report bias as found in most survey-based research. Finally, as a secondary data analysis of a cross-sectional study, there were limitations in being able to stratify athletes into competitive vs. recreational as well as determine their sport level intensity and level of competition.

**Future Research**

The current study revealed several areas of interest that may be beneficial to consider in future research. One of the main areas being the categorization of lean and non-lean athletes. Creating a framework that assists in defining what is a ‘lean’ sport and what is a ‘non-lean’ sport would heavily impact the quality of future research in this topic. It will provide consistency and encourage more studies to be done revolving around this area as well as open opportunities in other focuses of research. If the current study were to be duplicated, it would be important to distinguish between competitive and recreational athletes through questions in the survey. Perhaps creating future studies that separately focus on competitive and recreational; comparing the results to one another may allow more information to be discovered.

While the current study concentrated on addressing college athletes themselves, future research may have different findings if they examined college-aged elite athletes. As mentioned earlier, the level of difficulty of the sport can have a great impact on their behaviors and attitudes. Finally, the creation of a longitudinal study that follows athletes through their college career and assesses their eating attitudes and behaviors may reveal additional data that other research designs may not.

**Conclusions**
In summary, the current study suggests that men had significantly (p<0.001) higher body shape satisfaction than women, while women had significantly higher shape, weight, and eating concern scores. The following results coincide with prior research, indicating that women are at an increased risk of concerns related to their body, weight and shape, along with their eating. This is not only consistent with research pertaining to the athletic population, but also parallel with that of the general population. This may be attributed to the high social standards and pressures related to body image that women face both in and out of the athletic population. The social ideals often include women being thin and slim; for those who may not feel they have achieved this standard; they may become subject to increased body dissatisfaction and increase the concerns related to their body shape. Gender differences were not as impactful as it related to most disordered eating and purging behaviors; excessive exercise and laxative use were the exceptions. Men were more likely to endorse excessive exercising compared to women, while women were more likely to endorse laxative use compared to men as a means to control their body weight. Excessive exercise may represent the pressure men face to maintain a very muscular build; while they may not use to reduce their body shape and size, they may use it to increase it to reach a certain standard.

When comparing classification of athletes, there were no discernable differences in body shape satisfaction. Lean sport athletes have consistently been found to demonstrate lower body satisfaction when compared to other classifications; the differences in the study could be impacted by the classification methods of the sports included. Eating, shape and weight athlete classification exposed no significant differences in either men or women athletes; this may be attributed to the, already,
increasingly common body image concerns that are established within all adolescent and young adult populations. No significant differences in disordered eating behaviors among sport type classifications were found.

Thus, findings in this current study suggest there may be no discernable differences in disordered eating and body satisfaction among sport type classification of athletes. The inconsistencies between the current study and prior research highlight the need for further investigation. Our study provided a basis for future research to reference; determining the standard classification method to separate sports will be necessary to further the understanding of the topic. By furthering research in this topic area, risk factors can be identified and further utilized as a prevention tool in order to avoid the development of disordered eating patterns in such a high-risk population such as athletes.
REFERENCES


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APPENDIX A: TABLE 5

Comparison of College Students’ Disordered Eating Behaviors by Athlete Classification (N=1279)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Men (n=498)</th>
<th>Women (n=781)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Lean Athlete (n=345)</td>
<td>Lean Athlete (n=52)</td>
</tr>
<tr>
<td></td>
<td>Mean±SD</td>
<td>Mean±SD</td>
</tr>
<tr>
<td>Binge Eating Behavior (EDE-Q)§</td>
<td>5.99±6.06</td>
<td>6.37±8.25</td>
</tr>
<tr>
<td>Purging Behaviors (EDE-Q)§</td>
<td>1.96±1.47</td>
<td>1.75±1.45</td>
</tr>
<tr>
<td>Excessive Exercise</td>
<td>1.06±0.49</td>
<td>1.10±0.45</td>
</tr>
<tr>
<td>Self-Induced Vomiting</td>
<td>1.05±0.47</td>
<td>1.10±0.50</td>
</tr>
<tr>
<td>Laxative Use</td>
<td>1.97±0.92</td>
<td>1.92±0.90</td>
</tr>
</tbody>
</table>

* ANCOVA controlling for BMI with Tukey post-hoc tests conducted for variables with significant main effect (p<0.01) for all pairwise comparisons. Values within cells that contain the same letter represent significant difference between those two groups.

§Partial eta-squared effect sizes were considered small = 0.01; medium = 0.06; and large = 0.14.

†Answer choices ranged from 1 = 0 times to 41 = 40 or more times

‡ The coded scores for all six eating behavior scales (Eating Concern, Weight Concern, Shape Concern, Restraint, Binge Eating, and Compensatory Behaviors) were summed to establish the Disturbed Eating score. Scores below the 75th percentile (calculated separately for males and females) were coded as 0, scores between the 75th and 90th percentile were coded as 1, scores above the 90th percentile were coded as 2. The percentile scores were the summed to establish the disturbed eating score. Disturbed eating scores below 6 AND below the 90th percentile (calculated separately for males and females) were scored as 1 (“not disturbed”), scores above 6 but below the 75th percentile was scored as 2 (“mildly disturbed”), a score above the 75th but below the 90th percentile was scored as 3 (“disturbed”), scored above the 90th percentile were scored as 4 (“highly disturbed”).