AN INVESTIGATION OF EATING PATHOLOGY, EMOTION REGULATION, AND STRESS IN UNIVERSITY STUDENT ATHLETES.

by © Chris Duggan

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Abstract

Research investigating eating pathology in university student athletes tends to suggest that student athletes exhibit lower risk for eating pathology and lower levels of body dissatisfaction than their non-athlete counterparts. Given that body dissatisfaction has been shown to predict eating pathology, it is possible that student athletes exhibit lower eating pathology risk as a result of their relatively lower levels of body dissatisfaction. Given that student athletes engage in regular and intense physical activity, it is likely that their bodies more closely match the cultural ideal (lean), which would explain the relatively low levels of body dissatisfaction observed in previous studies. There is evidence to suggest that regular engagement in physical activity is an effective emotion regulation strategy. Emotion regulation involves the awareness and acceptance of emotions, the ability to behave in accordance with desired goals when experiencing negative emotions, and the ability to use situationally appropriate emotion regulation strategies. Difficulties in emotion regulation arise when one of these processes is disrupted and difficulties in emotion regulation have been associated with higher risk for eating pathology.

The current research investigated the relationships between athletic status, eating pathology, and difficulties in emotion regulation in a sample of 123 male and female student non-athletes and 85 male and female student athletes. It was hypothesized that the student athletes would report lower levels of eating pathology risk and higher levels of body satisfaction than the student non-athletes. Additionally, it was predicted that student athletes would report fewer difficulties in emotion regulation than the student non-

athletes and that difficulties in emotion regulation would mediate the relationship between athletic status and eating pathology.

In general, the results of the current study were consistent with the predictions, in that the student athletes reported significantly lower likelihood of scoring within the range of clinical concern on an eating pathology assessment. Additionally, the student athletes reported significantly higher scores on an index of body satisfaction and lower scores on an index of difficulties in emotion regulation, but the difference merely trended towards significance for difficulties in emotion regulation. Finally, the current study demonstrated that the relationship between scores on an eating pathology assessment and athletic status were mediated by difficulties in emotion regulation in a sample of male and female student athletes and student non-athletes. This suggests that student athletes reported less eating pathology as a result of fewer difficulties in emotion regulation.

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1. CHAPTER ONE

1.1 Forward

The current research was undertaken, in part, because of increasing anecdotal reports from the university counselling centre and athletics department of athletes experiencing eating pathology. Previous studies which have investigated eating pathology in student athletes have yielded somewhat mixed results; however, the data suggests that some student athletes exhibit greater risk for eating pathology than others. Hence, the current study was designed to investigate the prevalence of eating pathology risk in a sample of university student athletes from a mid-sized Atlantic Canadian University. Additionally, the current research was designed to identify potential high risk groups within a specific university population (i.e. female student athletes and non-athletes, lean sport student athletes).

While the current study results were not homogeneous, previous research tends to suggest that student athletes exhibit lower risk for eating pathology than their non-athlete peers. Additionally, researchers have reported that student athletes tend to score lower on assessments of body dissatisfaction than student non-athletes, which may explain the lower risk for eating pathology. By virtue of engaging in regular physical activity, it is likely that student athletes' bodies more closely match the culturally defined ideal, which can explain their tendency to be more satisfied with their bodies than student non-

athletes. Furthermore, regular physical activity has been associated with decreases in difficulties in emotion regulation and difficulties in emotion regulation have been shown to predict eating pathology. As such, the current study was also designed to investigate difficulties in emotion regulation in student athletes and student non-athletes as they relate to eating pathology risk. Only one study was located which investigated difficulties in emotion regulation and eating pathology in university student athletes and non-athletes (Wollenberg, Shriver, & Gates, 2015). However, the previous study included only female participants and as such, the current study expanded this line of inquiry by including male participants.

1.2 Eating Pathology in the General Population

Eating disorders are serious psychiatric conditions which are characterized by disturbed eating behaviours, pathogenic weight control behaviours, and distortions of body image which result in physical and/or psychosocial impairment (APA, 2000). At the outset of the current study the Diagnostic and Statistical Manual of Mental Disorders-IV-TR (DSM-IV-TR; APA, 2000) was the most recent version of this manual and as such, the term eating disorder will refer to one of the 3 diagnosable conditions listed in the DSM-IV-TR, anorexia nervosa (AN), bulimia nervosa (BN), and eating disorder not otherwise specified (EDNOS) (APA, 2000). The fact that the DSM-IV-TR is a categorical classification system means that individuals are classified as belonging to one of the three eating disorder categories or are considered not to have an eating disorder . The clinical criteria for each of the diagnosable eating disorders are listed in Appendix A (Table A1) and features which are typically associated with clinical presentations of

eating disorders have been listed in Appendix A (Table A.2). Simply put, AN is characterized by distorted body image and fear of gaining weight which leads to severe dietary restriction and results in significantly low body weight for the persons' sex and developmental level. BN is characterized by recurrent bingeing episodes (consuming an excessive amount of food and losing control) followed by compensatory behaviours, such as self-induced vomiting or laxative abuse, in order to avoid weight gain. Finally EDNOS is characterized by the presence of clinically significant symptoms of an eating disorder which do not meet the diagnostic threshold for an AN or BN diagnosis. The presence or absence of an eating disorder must be assessed by a qualified health professional based on the clinical criteria.

It is useful to note that eating disorder symptoms and clinical criteria, while related, are not interchangeable terms. Eating disorder symptoms refer to the thoughts, feelings, behaviours, and physiological characteristics which typify eating disorders, such as bingeing, purging, body image disturbance, and dietary restriction (Stice, Ng, & Shaw, 2010). The DSM-IV-TR lists eating disorder symptoms with the addition of frequency or intensity qualifiers, for example, purging is a symptom of eating disorders and the clinical criteria specifies the number of purging episodes per week which satisfies the criteria (APA, 2000). The qualifiers allow for a clearer delineation of the boundaries between diagnostic categories and between the presence or absence of a diagnosable eating disorder.

It might appear that making an eating disorder diagnosis is a relatively straightforward process when using the DSM-IV-TR categorical model. However,

because EDNOS is a diagnosis of exclusion, there are no clear clinical criteria with which to provide a determination of a positive "case." The manual states that "the Eating Disorder Not Otherwise Specified category is for disorders of eating that do not meet the criteria for any specific Eating Disorder", which constitutes recognition that individuals who do not meet the full criteria for AN or BN can still suffer from a clinical eating disorder. An EDNOS diagnosis is warranted when an individual suffers clinically significant distress or impairment in daily life and their presentation does not fully meet the criteria for AN or BN but clearly represents a pattern of eating disorder symptoms (APA, 2000; Schwitzer, Bergholtz, Dore, & Salimi, 1998). Indeed, research indicates that individuals with EDNOS exhibit comparable levels of disability, psychosocial impairment, and distress as those diagnosed with AN or BN (Garfinkel, Lin, Goering, Spegg, Goldbloom, Kennedy, & ... Woodside, 1996; Ricca et al., 2001; Turner & Bryant-Waugh, 2004). Additionally, there is empirical data which indicates that individuals who present with sub-threshold eating pathology can and do progress to satisfy DSM-IV-TR criteria for a diagnosable eating disorder (Stice et al., 2008a; Stice, Killen, Hayward, & Taylor, 1998). Thus, the evidence indicates that eating disorder symptoms are not simply present or absent, but rather occur on a continuum of severity and, as such, experts have suggested that eating disorder symptomology is better conceptualized from a dimensional perspective, rather than categorical perspective (Fairburn & Harrison, 2003; Wright, Krueger, Hobbs, Markon, Eaton, & Slade, 2013). Hence, it is important to consider both clinical and subclinical levels of eating pathology because both are associated with health risks, distress, and functional impairment. Furthermore, the term eating pathology will

refer to the full spectrum of thoughts, feelings, behaviours, and physical characteristics which typify disordered eating, regardless of diagnostic status.

It has been estimated that 600,000 to 990,000 Canadians may meet the diagnostic criteria for an eating disorder, at any given time (LeBlanc, 2014). With respect to specific diagnoses, the DSM-IV-TR lists the lifetime prevalence (proportion of individuals who have experienced the disorder at some point in their lifetime) of AN for females as 0.5 % and 0.05% for males and the lifetime prevalence of BN among women to be approximately 1%–3% and 0.1 – 0.3% for men (APA, 2000). The age range during which eating pathology typically manifests before or coinciding with the timing of undergraduate studies (APA, 2000; Micali, Hagberg, Petersen, & Treasure, 2013; Volpe, Tortorella, Manchia, Monteleone, Albert, & Monteleone, 2016), which suggests that university students may be at increased risk for the development of eating pathology. Further support for this idea comes from studies which have investigated eating pathology in university students and reported rates of AN and BN which were higher than would be expected based on the prevalence estimates obtained from community samples (Eisenberg, Nicklett, Roeder, & Kirz, 2011; Hoerr, Bokram, Lugo, Bivins, & Keast, 2002). For example, data from the American College Health Association's National College Health Assessment (2007) indicated a lifetime prevalence of AN as 3% for females and 0.4% for males and a lifetime prevalence of BN for 2% of females and 0.2% of males. Prevalence data also suggests that females are significantly more likely to develop an eating disorder than are males, as evidence by significantly higher rates of AN and BN reported by female participants (Eisenberg, Nicklett, Roeder, & Kirz, 2011;

Hoerr, Bokram, Lugo, Bivins, & Keast, 2002; Micali, Hagberg, Petersen, & Treasure, 2013; Volpe, Tortorella, Manchia, Monteleone, Albert, & Monteleone, 2016).

The available evidence suggests that EDNOS may be the most common diagnosis seen in outpatient settings (Fairburn & Bohn, 2005; Ricca et al., 2001; Turner & Bryant-Waugh, 2004) and it has been estimated that in samples of adults suffering from eating pathology, the EDNOS category may represent as much as 60% of eating disorder diagnoses (Fairburn & Bohn, 2005). However, as mentioned above, the exclusionary nature of the EDNOS diagnosis makes it difficult to provide a positive diagnosis without an in-depth assessment by a qualified health professional. This process is costly for researchers in terms of both time and monetary resources and many researchers have focused on investigating AN and BN. Thus, the true prevalence of even clinical levels of eating pathology are not well known but it is clear that the current data likely underestimates the real rates with which individuals suffer from clinically significant eating pathology, as evidenced by the large proportion of EDNOS diagnoses reported in clinical populations which are not being fully represented in research populations. Given this lack of clarity, it is important to continue to study the nature of eating pathology in order to provide more accurate prevalence estimates.

Understanding the actual rates with which individuals in the community are suffering from eating pathology is of concern to healthcare professionals because of the myriad of serious health consequences associated with eating pathology. Research has indicated a link between eating pathology and health problems such as, osteoporosis (Fairburn, & Harrison, 2003; Johnson, Cohen, Kasen, & Brook, 2002; Rigotti,

Nussbaum, Herzog, & Neer, 1984), cardiac dysfunction (Koschke, et al., 2010; Takimoto, et al., 2004), and premature death (Arcelus, Mitchell, Wales, & Nielsen, 2011; Wade, Wilksch, & Lee, 2012). As a result, researchers have pursued an understanding of the risk factors and pathogenic processes which lead to eating disorders in the general population. Through empirical research, experts have endeavored to develop effective interventions and proactively identify high-risk individuals with the goal of prevention and early intervention.

1.3 Eating Pathology: Etiology

The available evidence strongly suggests that the etiology of eating pathology is multifactorial in nature and most experts agree on a biopsychosocial conceptualization, which integrates risk factors from biological, psychological, and social domains in explaining the development of eating pathology (Le Grange, 2016; Leung, Geller, & Katzman, 1996). Researchers have identified a number of variables associated with the development of eating pathology which are beyond the scope of the current discussion, such as family dynamics (Minuchin, Rosman, & Baker, 1978; Shoebridge & Gowers 2000), attachment relationships (Ward et al. 2000a,b; Haworth-Hoeppner 2000), and genetics (Klump, Perkins, Burt, McGue, & Iacono, 2007; O'Connor, Burt, VanHuysse, & Klump, 2016). However, etiological models of eating pathology (Petrie & Greenleaf, 2007; Stice & Agras, 1998; Striegel-Moore, Silberstein, & Rodin, 1986) tend to emphasize four key psychosocial variables in the development and maintenance of eating pathology: 1) Pressure to achieve an ideal body, 2) Body dissatisfaction, 3) Negative affect, and 4) Emotion Regulation.

1) Pressure to achieve an ideal body. The sociocultural environment within which one lives significantly impacts the beliefs and values of the members of that society (Nasser, 1988; Xie et al., 2006) and models of sociocultural influences on the development of eating pathology emphasize the key roles played by media and peers (Petrie & Greenleaf, 2007; Stice & Agras, 1998; Striegel-Moore, Silberstein, & Rodin, 1986). In contemporary culture, individuals are inundated with media (e.g., television, advertising, social media) which communicate society's ideals surrounding the standard of beauty and how it relates to personal value. There is evidence to support the notion that the body ideal communicated in popular media tends to be unrealistic and unattainable (Brownell, 1991) and as a result many individuals internalize an impossible standard and feel pressure to achieve a body shape that is physiologically impossible (Keery, van den Berg, & Thompson, 2004; Shroff & Thompson, 2006; Stice & Whitenton, 2002). Traditionally, society's messages have targeted women (Striegel-Moore, Silberstein, & Rodin, 1986), however, men have been experiencing increased pressure to achieve an unrealistic body ideal over the past two decades as well (Petrie & Greenleaf, 2007). Researchers have provided data which indicate that individuals who experienced more pressure to achieve an ideal body also reported increased levels of body dissatisfaction (Stice, 2001a; Tylka & Subich, 2004), in addition to increased likelihood of developing future eating pathology (Stice, 2002).

2) Body dissatisfaction. Body dissatisfaction is a continuous construct, in which individuals can exhibit relative satisfaction, indifference, or relative dissatisfaction with their bodily appearance (Cash, 2000). Body dissatisfaction is defined as a discrepancy

between an individuals' perceived real and ideal body, which leads to feelings of discontent and unhappiness about one's own body. There is evidence to support the notion that, through normal diet and exercise, most individuals are not able to change their bodies to match the socially prescribed ideal (Brownell, 1991; Pope, Gruber, Choi, Olivardia, Phillips, 1997). As a result, individuals who have internalized an unrealistic and unattainable body ideal are more likely to perceive a substantial discrepancy between their actual and ideal bodies. However, the real-ideal body discrepancy does not fully characterize the construct of body dissatisfaction; individuals must also ascribe great personal value to bodily attractiveness. Indeed, individuals within contemporary western culture are continuously exposed to media communicating society's value of the ideal body and, as a result, individuals who internalize this value in addition to experiencing a significant body discrepancy are more likely to experience negative feelings about their bodies (Rodgers, McLean, & Paxton, 2015; Stice, 2002). Body dissatisfaction is thought to increase risk for eating pathology through its effect on negative affect and dieting behaviour. There is evidence to suggest that individuals who highly value physical appearance and experience a substantial real-ideal body discrepancy are more likely to experience negative affect in response to a perceived lacking in body image and attractiveness (Stice, 2001a). Additionally, studies have suggested that individuals who experience distress as a result of a real-ideal body discrepancy are more likely to engage in dieting behaviour in order to decrease or eliminate the discrepancy between their actual and ideal bodies (Stice, 2002). Support for this notion has been noted in studies which have reported that participants' initial levels of body dissatisfaction predicted later

increases in negative affect (Stice, 2001a) and eating pathology symptomology (Stice, Rohde, Butryn, Shaw, & Marti, 2015).

3) Negative affect. Negative affect can be defined as subjective distress or the tendency to react with negative emotions to stressful situations and includes such feelings as anger, weariness, shame, fear, and irritation (Watson, Clark, & Tellegen, 1988). As mentioned above, negative affect is thought to evolve in response to body dissatisfaction and lead to eating pathology through efforts to reduce the uncomfortable experience of negative affect. More specifically, it is thought that individuals initially engage in strategies, such as dieting and exercise, to reduce their real-ideal body discrepancy and dissatisfaction with their bodies and their associated experience of negative affect. Researchers have found support for this proposition from research in which samples of participants with AN were recruited and assessed for dietary restriction and negative affect. For example, a study of females previously diagnosed with AN reported that participants engaged in higher rates of dietary restriction following an increase in self-reported negative affect (Engel et al., 2013). However, there is also a tendency for individuals with eating pathology to engage in bingeing episodes, during which objectively large quantities of food are consumed, a behaviour which is unlikely to decrease a perceived real-ideal body discrepancy and subsequent body dissatisfaction and negative affect. This suggests that eating pathology behaviours mitigate the experience of negative affect by some means other than reducing body discrepancy and body dissatisfaction.

4) Emotion Regulation. As mentioned above, the experience of negative affect is subjectively uncomfortable and individuals tend to seek to reduce their experience of negative affect. When individuals use strategies to influence the intensity or duration of an emotional experience or response, such as the experience of grief, it is known as emotion regulation (Gratz & Roemer, 2004). When these strategies are ineffective or involve maladaptive behaviors it results in difficulties in emotion regulation, which is in turn associated with eating pathology (Holliday, Uher, Landau, Collier, & Treasure, 2006). There is research to suggest that individuals engage in eating pathology in response to experiences of negative affect and with the goal of down-regulating negative emotional experiences (Heatherton & Baumeister, 1991). Support for this notion is found in research which has demonstrated that negative affect is one of the most common triggers of binge eating (Deaver, Miltenberger, Smyth, Meidinger, & Crosby, 2003). Indeed, research has documented increases in negative affect in participants and found that they were associated with increased likelihood of the participants engaging in subsequent bingeing behaviour (Cooley & Toray, 2001a; Field et al., 1999; Killen et al., 1996; Stice, 2001a; Stice & Agras, 1998). Additionally, research has demonstrated a connection between emotion regulation and dietary restriction. More specifically, participants with AN diagnoses have reported higher levels of emotion regulation difficulties (Brockmeyer et al., 2012; Harrison, Sullivan, Tchanturia, & Treasure, 2010) and reduced tolerance to distress (Hambrook et al., 2011) than healthy control participants. Furthermore, researchers have found that participants with AN reported higher rates of dietary restriction following an increase in self-reported negative affect

(Engel et al., 2013). Thus, eating pathology is thought to function, at least partially, to regulate the experience of negative affect.

In summary, empirically based etiological models of eating pathology suggest that eating pathology develops, in part, as a result of sociocultural values of ideal body and attractiveness. Research suggests that an unrealistic body ideal and beauty is communicated to members of society through media and peers, and those who are unable to attain and value the ideal body develop body dissatisfaction. Given that our culture highly values bodily attractiveness (Nasser, 1988), some individuals develop negative affect in response to not meeting the culturally sanctioned ideal. Finally, individuals who are dissatisfied with their bodies turn to eating pathology behaviours in order to more closely approximate the ideal societal referent, while decreasing the experience of negative affect. Research also supports the notion that individuals engage in eating pathology as a means of down-regulating their experience of negative affect without specific efforts to reduce body dissatisfaction.

1.4 Eating Pathology: Assessment

There are a number of methods currently in use for assessing eating pathology, ranging from self-report measures (Garner, Olmsted, Bohr, & Garfinkel, 1982; Morgan et al., 1999; Garner, Olmstead, & Polivy, 1983), to semi-structured interviews (Stice, Marti, Spoor, Presnell, & Shaw, 2008; Fairburn & Cooper, 1993) and structured clinical interviews (APA, 2000). In clinical treatment settings eating pathology assessment often includes evaluations of medical status, nutrition, family, and body image. However, for

research purposes many of these options are undesirable because of the time and resources required. Additionally, structured assessments, such as the Structured Clinical Interview for DSM-IV-TR Axis I Disorders, are extremely time consuming and require training and a registered professional to administer. As such, researchers often rely on self-report instruments because they can provide some of the same information as the in-depth assessments without the same time commitment or resources required. Researchers have available to them tools which can assess for general eating pathology risk (e.g., EAT-26; Garner, Olmsted, Bohr, & Garfinkel, 1982), specific risk factors or symptoms (e.g., EDI Drive for thinness subscale; Garner, Olmstead, & Polivy, 1983), or specific eating disorders (e.g., Bulimia Test-Revised; Thelen, Farmer, Wonderlich, & Smith, 1991). Hence, with respect to research design, the assessment instrument employed largely defines the way in which the eating pathology construct is conceptualized and can greatly influence the observed prevalence rates. It is for this reason, among others, that researchers must be careful when selecting and describing the results of an eating pathology assessment instrument (Greenleaf & Petrie, 2007). Indeed, an instrument which was designed to assess for DSM-IV-TR eating disorder criteria would be expected to yield much lower rates of eating pathology when compared to the rates expected to be observed when using an instrument designed to assess for general eating pathology risk. A complete review of the currently available eating pathology assessments is beyond the scope of the current discussion. However, an understanding of the eating pathology assessment instruments which were most commonly used in previous studies is necessary in order to critically evaluate the extant literature. Thus, for the sake of clarifying the

review of student athlete eating pathology research, four frequently employed assessment instruments are reviewed in the following paragraphs.

The Eating Disorder Inventory-II (EDI-II; Garner, 1991) is a 91-item, self-report instrument which was designed to assess the attitudinal, behavioural, and psychological symptoms characteristic of eating disorders. The instrument does not provide a total score but rather yields 8 subscale scores and researchers commonly use only three: 1) Drive for Thinness subscale (desire to lose weight and fear of fat), 2) Body Dissatisfaction subscale (body image disturbance), 3) Bulimia subscale (tendencies for uncontrollable binging and self-induced vomiting). Items are answered using a six point Likert scale from never (1) to always (6) and higher scores indicate greater levels of the eating pathology symptom corresponding to the subscale (Garner, 1991).

The Questionnaire for Eating Disorder Diagnosis (QEDD; Mintz et al., 1997) is a 50 item diagnostic instrument which was designed to assess for DSM-IV-TR (APA, 2000) eating disorder criteria. The item responses are combined with decision rules in order to provide an implication of the presence of a diagnosable eating disorder. Respondents are classified as either 1) Eating disordered (AN, BN, EDNOS), 2) Symptomatic (extreme body-image disturbance and subclinical pathological eating behaviours), or 3) Nonsymptomatic (do not report any of the diagnostic criteria for an eating disorder). The criterion validity of the QEDD was supported by strong concordance rates between structured clinical interviews (98% accuracy) and the QEDD classification.

The Eating Attitudes Test – 26 item version (EAT-26; Garner, Olmsted, Bohr, & Garfinkel, 1982) is a self-report questionnaire which was designed to assess pathological eating attitudes. Items are scored on a 6-point Likert scale ranging from "never" to "always" and higher scores indicate a greater risk for eating disorders. The developers also provided a cutoff score greater than or equal to 20, which indicates clinical concern and individuals who score at or above this number are advised to follow-up with a professional for an in-depth eating pathology assessment. The EAT-26 has been a particularly useful screening tool to assess eating pathology risk in high school, college, and other special risk samples (Garner, Rosen & Barry, 1998). The 26-item version (Garner et al., 1989) has been shown to be a highly reliable and valid measure of eating disorder risk (Lee, Kwok, Liau, & Leung, 2002; Mintz & O'Halloran, 2000).

The SCOFF (Morgan et al., 1999). The SCOFF is a 5 item self-report questionnaire designed for use as a screening tool for AN and BN (Morgan et al., 1999). Items on the SCOFF are scored dichotomously (y/n) and individuals who answer yes to two or more questions are suspected to be suffering from AN or BN and should seek follow-up with a professional for an in-depth eating pathology assessment. The SCOFF has, in one study, demonstrated excellent concordance with DSM-IV-TR eating disorder diagnoses provided by professionals in a primary care setting (Luck, et al., 2002). In this study, the SCOFF was able to detect all true cases of AN and BN and seven of nine cases of EDNOS. As such, the SCOFF is used as a simple, five-item screening tool for AN and BN.

1.5 Eating Pathology in Athletes

Research investigating eating disturbances and body weight issues in athletes first gained momentum in the early 1980's following the death of a 22 year-old Olympic hopeful gymnast due to complications associated with Anorexia Nervosa (Beals, 2003). In the wake of this highly publicized tragedy a number of elite female gymnasts and ballet dancers came forward with their own stories of struggle with eating disorders. Thus, a tenuous but troubling connection was brought to light; female athletes may experience a high risk for eating disorders. In light of these athletes' personal accounts of suffering from eating disorders experts highlighted the idea that these individuals likely experience extreme pressure to control their body weight and shape, above and beyond that experienced by females in the general population (Garner & Garfinkel, 1980; Beals, 2003). As such, female athletes were tentatively identified as a "high-risk" group with regards to eating disorder development.

Researchers recruited samples of ballet dancers and found support for the idea that elite ballet dancers exhibit higher eating pathology than would be expected based on community prevalence estimates (Brooks-Gunn, Warren & Hamilton, 1987; Garner & Garfinkel, 1980;; Le Grange, Tibbs & Noakes, 1994; Szmukler, Eisler, Gillies, & Hayward, 1985) and it was postulated that athletes in general may represent a high risk group with respect to the development of eating pathology (Black & Burckes-Miller, 1988; Burckes-Miller & Black, 1988, 1991; Striegel-Moore, Silberstein, & Rodin, 1986; Wilkins, Boland, & Albinson, 1991). It has been argued that athletic culture is one in which great emphasis is placed on attaining and maintaining the ideal body weight and

shape in order to perform and succeed in athletics, in addition to the general societal pressures to be thin (Petrie & Greenleaf, 2007; Stice & Agras, 1998; Striegel-Moore, Silberstein, & Rodin, 1986). Subsequently investigators sought empirical support for the idea that athletes across various sports may experience eating pathology at a rate disproportionate to that of non-athletes. A number of studies have investigated eating pathology in athletes from different sports and found that, once again, the athletes sampled reported higher rates of eating pathology than would be expected based on community prevalence estimates (Calabrese et al., 1983; Clark, Nelson, & Evans, 1988; Steen, & Brownell, 1990; King & Mezey, 1987; Rosen & Hough, 1988; Rosen, McKeag, Hough, & Curley, 1986; Sykora, Grilo, Wilfley, & Brownell, 1993). The next logical step in this line of questioning was to investigate whether or not athletes differed from non-athlete controls in terms of eating pathology.

Studies which compared athletes to non-athlete controls on indices of eating pathology have yielded mixed results. There is research evidence to suggest that athletes tend to experience higher rates of eating pathology and engage in a wider range of unhealthy eating and weight control behaviours than non-athletes (Brooks-Gunn, Burrow & Warren, 1988; Hamilton, Brooks-Gunn & Warren, 1985; Pasman & Thompson, 1988; Walberg & Johnston, 1991). However, there is also research data which suggests that athletes and non-athletes do not differ in terms of the relative rates of eating pathology (DiBartolo & Shaffer, 2002; Holderness, Brooks-Gunn & Warren, 1994; Kirk, Singh & Getz, 2001; Klock & DeSouza, 1995; Reinking & Alexander, 2005; Rosendahl, Bormann, Aschenbrenner, Aschenbrenner, & Strauss, 2008). Furthermore, there are

results from additional studies which imply that athletes may be at lower risk for eating pathology than non-athletes (Kurtzman, Yager, Landsverk, Wiesmeier, & Bidarka, 1989; Rosenvinge & Vig, 1993; Wilkins, Boland & Albinson, 1991). Taken together, the results from studies comparing athletes to non-athlete controls appear to be more heterogeneous than the results from uncontrolled investigations, making it difficult to identify general trends in the data.

Hausenblaus and Carron (1999) completed a meta-analysis which included results from ninety-two studies comparing athletes to non-athletes and evaluated indices of BN, AN, and drive for thinness across studies. Overall, this meta-analysis provided modest support for the notion that athletes are at increased risk for developing eating pathology when compared to samples of non-athletes. More specifically, the results indicated that both male and female athletes tended to report higher scores on the indices of AN and BN than did male and female non-athletes, albeit, with small effect sizes and marked heterogeneity. Interestingly, the female athletes and non-athletes did not differ significantly on drive for thinness, which suggests that both female athletes and non-athletes experience similar drive for thinness but that the female athletes engage in higher rates of eating pathology in order to achieve their desired thinness.

Smolak, Murnen, and Ruble (2000) also completed a meta-analysis; however, these authors investigated the incidence of eating pathology in female athletes only. The results of this analysis indicated that female athletes reported significantly higher scores on indices of eating pathology than female non-athletes and, consistent with the results of Hausenblaus and Carron (1999) the authors reported a very small effect size. Also

consistent with the previous meta-analysis, the authors noted heterogeneity in the group differences across studies, which indicated that there was significant variability in the results of the studies analyzed. The observed heterogeneity indicated that the true effect size could be much larger or smaller than was reported. Similar trends were observed in the female athlete data analyzed by Smolak, Murnen, and Ruble (2000); These data suggested that certain groups of female athletes evidenced higher scores on the indices of eating pathology than others; female athletes who participated in dance, lean sports (appearance or weight is integral for success, e.g., gymnastics) evidenced higher levels of eating pathology than those female athletes who competed in sports other than dance or in sports which did not emphasize leanness (e.g., basketball).

Perhaps most relevant to the current research is the fact that the studies noted above provided one of the first indications that university student athletes might experience higher risk for eating pathology than their non-athletes peers. In the meta-analysis by Smolak, Murnen and Ruble (2000), it was reported that when these authors compared college-aged female athletes to female college-aged non-athletes on indices of eating pathology, the heterogeneity across studies decreased and the effect size was more than twice that observed (d=.15) when comparing athletes and non-athletes from the overall sample (d=.07). Thus, not only was there a greater difference in eating pathology observed between female athletes and non-athletes from college-aged samples than non-student samples, but the fact that the heterogeneity decreased also indicated that the difference was more consistently observed. While it may not have been central to the research designs, university student athletes were a subgroup that was being included in

studies investigating intercollegiate athletics and eating pathology (Ashley, Smith, Robinson, & Richardson, 1996; O'Connor, Lewis, & Kirchner, 1995; Wilkins, Boland & Albinson, 1991) and the findings were provoking some interest.

Researchers have suggested that an important factor which has not been largely considered in the literature investigating eating pathology in university student athletes is the uniqueness of the student athlete population. University student athletes have been identified as a unique population due to the fact that they are faced with the "dual demands of athletics and academics" (Wilson & Pritchard, 2005, p. 1). More specifically, university student athletes must contend with the challenges associated with the dual roles of being a university student and an athlete. Researchers have identified a number stressors associated with the role of university student; the transition from adolescence to adulthood, coping with university-level academic expectations, forming new work and social relationships, and being away from home (Cooley & Toray, 2001; Fitzsimmons-Craft et al., 2012). In addition to these student specific stressors, university student athletes face stressors from a number of different domains which other students do not have to endure. Examples of sources of stress for athletes which are not experienced by student non-athletes are competition, training, travel, pressure to perform, and pressure from peers and coaches to conform to ideal body shape (Etzel, 2009; Johnson & Ivarsson, 2011; Steffen, Pensgaard, & Bahr, 2009).

Assessing for stressors in student athletes may shed some light on the relationship between varsity athletics and eating pathology; however, it is important to consider student athletes' experience of stress, regardless of the number and type of stressors

reported. Lazarus and Folkman (1987) suggested that the stress response is the result of a person/environment transaction, which is itself mediated by coping processes. The four components of Lazarus' transactional stress model are as follows: 1) Stressor (causal external or internal agent), 2) Appraisal (an evaluation by a mind or physiological system that distinguishes what is noxious from what is benign), 3) Coping (processes used by the mind or body to deal with stressful demands), and 4) Stress reaction (a complex pattern of effects on the mind and body). As such, an individual experiences psychological stress when they perceive a challenge or threat for which they do not possess adequate coping resources. Cohen (1994) designed the Perceived Stress Scale-10 Item version (PSS-10) to assess for an individuals' experience of perceived stress. The PSS-10 has been used in a number of empirical investigations of stress and stress related constructs in university students. For example, Friedlander, Reid, Shupak, and Cribbie (2007) examined the joint effects of stress, social support, and self-esteem on adjustment to university in 128 first-year undergraduate students using a longitudinal design. These authors assessed students in their first semester of university and then again ten weeks later after presumably having had the opportunity to adjust to university life. These authors found that the PSS-10 scores reported by the new university students had decreased significantly between the initial and follow-up assessments. Thus, studies have provided data suggesting that the PSS-10 is appropriate for the assessment of perceived stress in university students.

Research has demonstrated that stress in university undergraduates is widespread and is associated with a number of negative consequences, such as, physical and mental health problems (Dwyer & Cummings, 2001; Fisher & Hood, 1988), decreased academic

performance (American College Health Association, 2006; Wintre & Yaffe, 2000) and drop-out (Porter, 1990). Many undergraduate students must leave their homes, families, and social support networks in order to pursue higher education, in addition to adjusting to increased academic and social demands. Given these challenges, it is not surprising that the experience of transitioning from high school to university is associated with marked distress (Pierceall & Keim 2007; Dyson & Renk, 2006; Lapsley, Rice, & Shadid, 1989). With regards to the role of "athlete", researchers have demonstrated that university student athletes face stress from a number of different domains which student non-athletes do not, as a result of their participation in intercollegiate athletics. Additionally, studies have yielded results which suggest that student athletes experience even higher levels of perceived stress than do student non-athletes, who are themselves considered to be highly stressed (Loughran & Etzel, 2008; Wilson & Pritchard, 2005). Thus, research suggests that university student athletes experience a greater number of stressors and higher levels of stress than do university student non-athletes. Additionally, there is preliminary evidence to suggest an association between stress and eating pathology. For example, Beukes, Walker, and Esterhuyse (2010) obtained a sample of 349 female university students and assessed eating pathology using a translated version of the Eating Disorder Inventory-II and reported that the drive for thinness (r=.224), bulimia (r=.303), and body dissatisfaction (r=.256) subscales were all significantly, positively associated with scores on a measure of perceived stress. Hence, there is reason to suspect that university student athletes may experience eating pathology at a rate greater than

university student non-athletes by virtue of the "dual demands" of academics and athletics and the subsequent association between stress and eating pathology.

1.6 Student Athletes and Eating Pathology: Literature Review

There are a large number of studies which have investigated eating pathology in student athletes; however, not all of these studies apply to the current research due to variability in methodology and theoretical foci. As such, a number of inclusion and exclusion criteria were developed to determine which studies to include in the current literature review. Studies which evaluated eating disorder criteria explicitly based on models other than the DSM-IV-TR (APA, 2000) were not included, because at the outset of the current study, this was the most current version of the manual. Studies which compared samples of student athletes (male or female) to samples of student non-athletes (male or female) or which compared samples of lean sport student athletes (male or female) to samples of non-lean sport student athletes (male or female) were included as were studies which compared male student athletes to female student athletes. Finally, only studies which defined "student athlete" as an individual enrolled in university courses and competing in intercollegiate athletics were included in the review.

1.6.1 Student athletes compared to student non-athletes. Studies which have compared female student athletes to female student non-athletes have revealed inconsistent results. Of the twelve studies included in the review, only one suggested that female student athletes exhibited a greater risk for eating pathology than female student non-athletes (Holm-Denoma, Scaringi, Gordon, Van Orden, & Joiner, 2009). However, this divergent result may be the result of the methodology employed by these authors. More specifically, the participants in this study were divided into groups as follows: club athlete (intercollegiate competition), recreational athlete (leisure competition), independent exerciser (no competition), and non-exerciser (sedentary). It is important to note that other studies which were reviewed defined student non-athletes as those who did not compete at the intercollegiate level, rather than inactive student non-athletes. As a result, it is possible that the difference between the groups observed in this study was magnified by comparing student athletes to a group of sedentary individuals, rather than non-athletes.

Two of the twelve studies reviewed suggested that female student athletes did not differ significantly from female student non-athletes. Skowron and Friedlander (1994) recruited a sample of female university student athletes from various sports and assessed eating pathology using the EDI-I. It was reported that there were no significant differences observed between the student athlete and student non-athlete groups on any of the EDI-I subscales. Consistent with these results Ashley, Smith, Robinson, and Richardson (1996) also reported that there were no significant differences between the student athlete group and the student non-athlete group on any of the EDI-II subscales. It

is important to note, however, that these two studies diverge from the majority in this group with respect to the design of the research. More specifically, Skowron and Friedlander (1994) sampled only female student athletes from the swim team, which makes generalizing these results to populations of athletes from different sports problematic because differences may exist between different sports in terms of the relative emphasis on leanness and the manifestation of eating pathology. Additionally, the comparison group utilized by Ashley, Smith, Robinson, and Richardson (1996) was comprised solely of students who were enrolled in an advanced program of study. These authors noted that these results should be generalized with caution due to the possibility that the students from the advanced program of study exhibit systematic differences in eating pathology risk from undergraduate students. For example, researchers have previously observed that individuals suffering from eating disorders also exhibit perfectionism and high achievement expectations (Davis & Cowles, 1989; Warren, Stanton, & Blessing, 1990) and it is logical to expect that individuals in an advanced program of study would exhibit levels of perfectionism and achievement expectation greater than would be observed in a random sample of undergraduates.

The majority of the studies reviewed (9/12) which compared female student athletes to non-athletes suggested that female student athletes exhibit lower risk for eating pathology than do their non-athlete counterparts. For example, Sanford-Martens, Davidson, Yakushko, Martens, and Hinton (2005) investigated eating pathology in student athletes using the Questionnaire for Eating Disorder Diagnosis (QEDD; Mintz et al., 1997), which is a diagnostic instrument designed to provide an indication of an

individual's likelihood of satisfying the clinical criteria for a diagnosable eating disorder. These authors found that the female student non-athletes in their sample were significantly more likely to be classified as clinical or subclinical than were the female student athletes. Additionally, Kirk, Singh, and Getz (2001) used the EAT-26, an eating pathology screening instrument, with samples of female student athletes and non-athletes and reported that the female student athletes had significantly lower total EAT-26 scores than did the female student non-athletes. Interestingly, three of the nine studies which suggested that female student athletes exhibit lower risk for eating pathology than their non-athlete counterparts showed significant differences between the two groups for body dissatisfaction only (Petrie, 1996; Reinking & Alexander, 2005; Schwarz, Aruguete, & Gold, 2005). This trend will be discussed further in a section solely dedicated to differences in body dissatisfaction between student athletes and non-athletes.

Only three studies could be located which investigated differences in eating pathology between male student athletes and non-athletes. Wilkins, Boland, and Albinson (1991) sampled male student athletes and non-athletes and assessed eating pathology using a number of instruments, including the EAT-26 and the drive for thinness subscale of the EDI-I. These authors performed a factor analysis and computed an "eating disorder index" based on the instruments included in the "eating disorder" factor and found that male student athletes evidenced lower risk for eating pathology than did the male student non-athletes. Petrie (1996) also used the EDI-I in a sample of male student athletes and student non-athletes but these authors separated the athlete sample by lean and non-lean sport athletes and compared mean scores on the EDI-I subscales across the three groups

(lean, non-lean, and non-athlete). It was reported that the male student non-athletes scored significantly higher on the body dissatisfaction subscale from both the lean and non-lean student athletes, who did not differ significantly from one another. Finally, Sanford-Martens, et al. (2005) compared a sample of male student athletes to male student non-athletes on a diagnostic instrument, the QEDD. These authors reported that the male student athletes were no more likely to be classified in the clinical category than were male student non-athletes. However, these authors then grouped the clinical and subclinical groups to create a "symptomatic of eating pathology" group and reported that the male student non-athletes were more likely than the male student athletes to be classified as symptomatic of an eating disorder. Taken together, these studies tentatively suggest that male student athletes do not differ from their non-athlete counterparts, in terms of clinical levels of eating pathology, but that male student non-athletes tend to report greater levels of subclinical eating pathology when compared to male student athletes. However, due to the limited number of studies available, this conclusion would need to be further evaluated in future studies.

1.6.2 Body dissatisfaction in student athletes and student non-athletes.

Overall, studies which have compared student athletes to student non-athletes on indices of eating pathology have tended to report that university student athletes (male and female) exhibit lower risk for eating pathology than do their non-athlete counterparts. These results suggest that some aspect of athletic participation is associated with a protective effect against eating pathology for this group of university students. Studies which have compared student athletes to student non-athletes on assessments of body

dissatisfaction imply that student athletes are somehow buffered from the effects of sociocultural pressure to achieve an ideal body. However, the direction of the relationship is not clear, such that individuals who are high in body satisfaction may tend to engage in collegiate athletics.

Studies investigating body dissatisfaction in student athletes have yielded relatively consistent results and the majority of studies located (12/15) indicated that student athletes tend to exhibit less body dissatisfaction than their non-athlete counterparts, whether male or female. For example, DiNucci, Finkenberg, McCune, McCune, and Mayo (1994) recruited a sample of female student athletes from various sports and compared them to a sample of female student non-athletes on a reliable and validated assessment of body satisfaction. These authors administered the Body Esteem Scale (Franzoi & Shields, 1986), which is a 35-item, Likert-style questionnaire designed to assess participants' attitudes on three separate dimensions: sexual attractiveness, concerns about weight, and physical conditioning. The results suggested that the student non-athletes were significantly less satisfied with their bodies than were the student athlete participants. Furthermore, Gaines and Burnett (2014) assessed body satisfaction in female student athletes and non-athletes using a very different but valid and reliable instrument, the Contour Drawing Rating Scale (CDRS: Thompson & Gray, 1991), which is a measure of body dissatisfaction using nine female figure drawings ranging from (0) very slim to (8) very overweight. Participants are asked to rate their present body type and their ideal body type using the figure drawings and an index of body dissatisfaction is computed by subtracting the value for the present body type from the value of the ideal

body type. These authors also reported that the female student athlete participants were significantly lower in body dissatisfaction than were the female student non-athletes.

The trend that student athletes tend to report lower scores on assessments of body dissatisfaction is also reflected in studies which have investigated body dissatisfaction in male student athletes and student non-athletes. For instance, Petrie (1996) compared scores between male student athletes and male student non-athletes on the body dissatisfaction subscale of the EDI-I and found that male student athletes reported significantly lower body dissatisfaction scores than did the male student non-athletes. Additionally, Hausenblas and McNally (2004) assessed body dissatisfaction in male track and field student athletes and male student non-athletes using the EDI-II. Once again, it was found that the male student athletes evidenced significantly less body dissatisfaction than did the male student non-athletes.

Only three studies out of fifteen studies reviewed diverged from the trend of student athletes exhibiting lower body dissatisfaction than student non-athletes; interestingly, these were the same three studies which diverged from the overall trend observed in studies which compared female student athletes and student non-athletes on indices of eating pathology. Firstly, Holm-Denoma, et al. (2009) assessed body dissatisfaction using the EDI-I body dissatisfaction subscale and found that the female student athlete participants reported significantly higher scores for body dissatisfaction than the female student non-athletes, which is the opposite of the overall trend. The fact that the non-athlete comparison group from this study was comprised of sedentary individuals likely influenced the data. More specifically, it is logical to expect that

individuals who do not engage in any form of physical exercise would have a different relationship with their bodies than individuals who engage in some amount of exercise. Thus, the inconsistent results reported by Holm-Denoma, et al. (2009) may have been the result of the non-athlete comparison group utilized.

Two other studies assessed body dissatisfaction using the EDI and these two studies indicated that there was no difference between female student athletes and student non-athletes in terms of body dissatisfaction (Ashley, Smith, Robinson, & Richardson, 1996; Skowron & Friedlander, 1994). As mentioned above, Skowron and Friedlander (1994) obtained a sample of female student athletes from the swim team only. Generalizing these results to other female student athletes is problematic because swimmers may exhibit systematic differences in body dissatisfaction from other student athletes. For example, the uniforms worn by swimmers are among the most revealing in sport, which might result in this group of athletes being more conscious of their bodies than athletes whose uniforms provide more body coverage, such as soccer. Also mentioned above, the fact that the comparison group from Ashley, Smith, Robinson, and Richardson (1996) consisted of students from an advanced program of study suggests that these individuals might have been higher in perfectionism and achievement expectation than a random sample of undergraduates. Thus, it is possible that, by virtue of these personality variables, these participants sculpted their bodies to more closely match the socially prescribed ideal, thus resulting in lower levels of body dissatisfaction than would be expected to be observed in individuals lower in perfectionism and achievement expectation.

Thus far, the studies reviewed suggest that participation in athletics acts as a protective factor with respect to the development of eating pathology for both male and female student athletes. Furthermore, studies investigating body dissatisfaction in student athletes and student non-athletes imply that participation in athletics is associated with significantly reduced body dissatisfaction in student athletes. Body dissatisfaction has been identified as a key causal variable in the development of eating pathology (Petrie & Greenleaf, 2007; Stice & Agras, 1998; Striegel-Moore, Silberstein, & Rodin, 1986); hence, the available data suggests that athletic participation is associated with a reduction in the effect of sociocultural pressure to achieve an unrealistic body ideal, as evidenced by lower rates of eating pathology and body dissatisfaction in student athletes. The fact that research indicates that female student non-athletes tend to experience higher rates of eating pathology and body dissatisfaction than do male student non-athletes raises the question: What does the literature say about the differences between male and female student athletes with respect to eating pathology and body dissatisfaction?

1.6.3 Male student athletes compared to female student athletes. Of the eight studies that compared samples of male student athletes to female student athletes, only one indicated that male student athletes were at higher risk for eating pathology. Sanford-Martens, et al. (2005) assessed eating pathology in male and female student athletes using the QEDD and found that when they combined the clinical and subclinical categories to create an "eating pathology symptomatic" group, the male student athletes were significantly more likely to be considered symptomatic of eating pathology than the female student athletes. Further analysis revealed that this was due to the fact that male

student athletes were significantly more likely to engage in subclinical binge-eating behaviors. All other studies reviewed indicated that female student athletes exhibited higher risk for eating pathology when compared to male student athletes. For example, Hausenblaus and McNally (2004) also used the QEDD in addition to the EDI-II in a sample of male and female track and field athletes and found that the female student athletes evidenced a greater risk for eating pathology than the male student athletes on both instruments. Additionally, Blackmer, Russell, Searight, and Ratwik (2011) compared mean scores between male and female student athletes on the EAT-26, an eating pathology screening instrument, and found that the female student athletes scored significantly higher than did male student athletes.

Overall, research which has investigated sex differences in eating pathology in university student athletes finds that female student athletes exhibit significantly greater risk for eating pathology and higher levels of body dissatisfaction than male student athletes. The fact that female student athletes and female student non-athletes both evidence an increased risk for eating pathology when compared to their male counterparts suggests that the effect of athletic participation on eating pathology is consistent across sexs. More specifically, there is ample evidence to suggest that females, in general, develop body dissatisfaction and eating pathology at a rate disproportionate to males as a result of greater sociocultural pressure to achieve an ideal body (Rodgers, McLean, & Paxton, 2015; Stice, 2002; Stice & Agras, 1998; Stice, Rohde, Butryn, Shaw, & Marti, 2015; Striegel-Moore, Silberstein, & Rodin, 1986). The data above suggests that the potential protective effect of athletic participation is similar across male and female

student athletes based on the observation that the sex divide in eating pathology risk has been shown to be preserved in student athlete samples. Furthermore, a study which analyzed a possible statistical interaction between athletic status and sex found no significance (Sanford-Martens, et al. 2005). These authors performed a hierarchical logistic (athlete/non-athlete) regression using the QEDD as the criterion and entered the following predictors in the following order: age, sex, athletic status, and the sex by athletic status interaction. If the interaction term achieved significance, it would have indicated that either male or female student athletes experienced a greater or lesser effect of athletics on eating pathology. The fact that the interaction term was non-significant provided evidence that the main effect of athletic status on eating pathology in student athletes was equivalent across the sexes. Furthermore, these studies imply that the effect of participation in athletics by university students might ameliorate the negative effects of sociocultural pressure to achieve an ideal body but not to an extent which would overcome the disproportionate influence of society on females and their body image.

1.6.4 Lean sport student athletes compared to non-lean sport student athletes.

The research above suggests that participation in athletics is associated with a protective effect against the development of eating pathology in university students and further suggests that athletics is associated with this protective effect as a result of the relationship between athletic status and body dissatisfaction. This notion is further borne out in the research investigating differences in eating pathology and body dissatisfaction in lean sport student athletes and their non-lean sport counterparts. It has been suggested that lean sport athletes may exhibit greater risk for eating pathology because of the

emphasis placed on obtaining and maintaining an ideal body type with the goal of contributing to greater athletic success (Borgen & Corbin, 1987; Davis & Cowles, 1989; Mickalide, 1990). This notion implies that the proposed protective effect of athletics on eating pathology may be negated, to some extent, by the disproportionate emphasis on body shape and aesthetics associated with these sports. This idea is supported by the fact that four of the six studies located which compared body dissatisfaction between lean and non-lean sport student athletes indicated that the student athletes who competed in lean sports evidenced significantly greater levels of body dissatisfaction. The two studies which diverged from this trend also differed in terms of methodology, which may explain the difference in results. For example, Schwarz, Aruguete, and Gold (2005) reported that there was no significant difference between the lean and non-lean student athletes, with respect to body dissatisfaction. However, these authors operationalized the lean/non-lean dichotomy by comparing sports in which success was determined by a judge (judged sports) to those who participated in sports in which the role of officials was to ensure rule compliance (refereed sports) which may contribute to the findings.

Furthermore, these studies also tend to indicate that lean sport student athletes exhibit greater risk for eating pathology than non-lean sport student athletes. Five of the nine studies reviewed which compared female student athletes from lean and non-lean sports, indicated that female lean sport athletes exhibit a greater risk for eating pathology than do their non-lean sport counterparts. For example, Reinking and Alexander (2005) compared female student athletes from various lean and non-lean sports using the EDI-II and reported that the lean sport student athletes evidenced significantly higher risk for

eating pathology based on the recommended cutoff of 14 on the drive for thinness (DFT) subscale. Lean sport student athletes were significantly more likely to report scores within the range of clinical concern on the DFT subscale of the EDI-II (25%) than were the non-lean sport student athletes (2.9%). Interestingly, studies which used a diagnostic instrument (designed to imply an eating disorder diagnosis) to compare rates of eating pathology consistently indicated that there were no significant differences between female student athletes from lean and non-lean sports in terms of clinical levels of eating pathology. For instance, Zucker, Womble, Mlliamson, and Perrin (1999) compared a group of female student athletes from judged sports and compared them to their counterparts from refereed sports using data from the Interview for the Diagnosis of Eating Disorders, 4th edition, which was developed based on the DSM-IV eating disorder criteria (AN, BN, and EDNOS). The student athletes were divided into these groups because it was thought that the athletic success of student athletes who competed in judged sports would be far more dependent on the athletes' body shape and body aesthetics than for those athletes who competed in refereed sports. These authors found that there were no significant differences between the two groups in terms of the relative likelihood of being classified as eating disordered. However, it is important to note that the judged sport student athletes scored significantly higher on the drive for thinness and body dissatisfaction subscales of the EDI-II than did the refereed sport student athletes, suggesting that judged sport student athletes exhibit higher levels of subclinical eating pathology than refereed sport student athletes.

Only two studies were located which investigated differences in eating pathology between male student athletes who compete in lean sports as compared to those who compete in non-lean sports. Stoutjesdyk and Jevne (1993) used the EAT-40 (an older version of the EAT-26) to compare rates of eating pathology risk between male student athletes who competed in various lean and non-lean sports and found that there was no significant difference between the two groups in terms of eating pathology risk. Additionally, Sanford-Martens, et al. (2005) used the QEDD to assess differences in clinical and subclinical levels of eating pathology between male student athletes from lean and non-lean sports. Consistent with the first study, it was reported that male student athletes from lean and non-lean sports did not differ from one another in terms of clinical or subclinical levels of eating pathology. Interestingly, both of these studies also assessed differences between female student athletes from lean and non-lean sports. The results from Sanford-Martens, et al. (2005) were consistent for both male and female student athletes, whether the participants competed in lean or non-lean sports and indicated that female student athletes who competed in lean sports were no more likely to be classified as clinical or subclinical when compared to male student athletes who competed in lean sports. However, the results of Stoutjesdyk and Jevne (1993) suggest that female student athletes who compete in lean sports exhibit a greater risk of eating pathology than do male student athletes who compete in lean sports. While these authors did not directly compare the two groups (male and female lean sport student athletes) the results for the female lean sport athletes compared to the female non-lean sport athletes revealed significant differences in eating pathology risk, whereas the comparison between male

student athletes who compete in lean sports to those who compete in non-lean sports indicated that no significant differences were observed. Thus, the research suggests that female student athletes who compete in lean sports may exhibit a greater risk for sub-clinical levels of eating pathology, but not clinical eating disorders. It is important to note, however, that the propositions above are based on the results of a small number of studies, and thus, must be interpreted with caution until they are further supported with empirical data.

Overall, the studies investigating differences in eating pathology between student athletes who compete in lean and non-lean sports have revealed more inconsistencies in methodology and results than the other groups of studies reviewed. For example, while the majority of these studies (Picard, 1999; Reinking & Alexander, 2005; Stoutjesdyk & Jevne, 1993; Warren, Stanton, & Blessing, 1990; Zucker, Womble, Williamson, & Perrin, 1999) suggest that lean sport student athletes exhibit increased risk for eating pathology as compared to non-lean sport student athletes, the findings are less robust than those observed comparing student athletes and student non-athletes. Furthermore, there were inconsistent operational definitions of "lean sport athlete" used across these studies. Some studies relied on previous classification schemes used in research (e.g., Petrie, 1996) and other researchers appear to have arbitrarily assigned sports to either lean or non-lean categories based on their own perceptions of the relative emphasis on leanness and aesthetics inherent in each sport (e.g., Reinking & Alexander, 2005). Furthermore, there is preliminary evidence to suggest that sports which have been classified as "lean" in past research may actually exhibit systematic differences from one another in terms of

their associated lean emphasis and rates of eating pathology. For example, Warren, Stanton, and Blessing (1990) analyzed differences in eating pathology between female student athletes who competed in gymnastics and cross-country running (both considered lean sports) and found that significant differences were observed between the two groups, with the female student gymnasts reporting higher drive for thinness and body dissatisfaction subscale scores than the cross-country runners, who themselves evidenced no significant differences in eating pathology from the female non-lean student athletes. As such, this is a factor which must be taken into consideration in interpreting the results of studies investigating differences between the so-called "lean sports".

In summary, the research investigating the proposed link between eating pathology and athletic participation in university students has yielded a number of trends. Firstly, studies which have compared the rates of eating pathology between student athletes and student non-athletes (male or female) tend to suggest that student athletes exhibit lower risk for eating pathology than do student non-athletes. It is important to note, however, that researchers have reported variability in eating pathology risk across athletes who participate in different sports (Reinking & Alexander, 2005). Nevertheless, studies tend to be consistent in the finding that university student athletes exhibit less body dissatisfaction than do university student non-athletes. Studies investigating body dissatisfaction suggest that this variable is an important causal risk factor for the development and maintenance of eating pathology. Research has shown that body dissatisfaction has significantly predicted increases in other eating pathology risk factors, such as dieting (Cooley & Toray, 2001a; Stice, 2001a; Stice, Mazotti, Krebs, & Martin,

1998; Wertheimet, Koerner, & Paxton, 2001) and negative affect (Stice, 2001; Stice & Bearman, 2001; Stice, Hayward, Cameron, Killen, & Taylor, 2000). Additionally research has demonstrated that body dissatisfaction has significantly predicted the onset of eating pathology (Field et al., 1999; Killen et al., 1994, 1996; Stice & Agras, 1998). Hence, the results of studies investigating eating pathology in university student athletes suggest that athletic participation in university students acts as a protective factor against the development of eating pathology, in addition to the implication that athletics exerts this protective effect by way of its association with decreased body dissatisfaction. The fact that research also tends to report that female student athletes evidence greater levels of body dissatisfaction and greater risk for eating pathology than do male student athletes further suggests that the effect of athletics on body dissatisfaction may partially negate the disproportionate influence of sociocultural pressures to achieve the ideal body on female university students. This notion is further supported by the fact that student athletes who compete in sports which require a lean body and focus on aesthetics for success tend to report greater levels of body dissatisfaction and eating pathology risk than those student athletes who compete in non-lean sports. However, the mechanism by which athletic participation in university students might exert an effect on body dissatisfaction remains somewhat unclear.

Highlighting salient differences between student athletes and student non-athletes may help elucidate an explanation for the differences in eating pathology risk and body dissatisfaction observed between these two groups. One of the most obvious differences between student athletes and student non-athletes is that student athletes engage in

regular, mandated physical activity. Thus, it is possible that student athletes are able to alter their bodies to more closely approximate the socially prescribed ideal. As noted in the eating pathology etiology section above, an ideal-real body discrepancy is thought to lead to body dissatisfaction and subsequent eating pathology. Hence, it may be that athletes perceive lower levels of this body discrepancy - which is protective against eating pathology - as a result of their engagement in regular physical activity and the subsequent effects on their body composition. Indeed, Wilkins, Boland and Albinson (1991) reported that female student athletes evidenced lower real-ideal body discrepancies and body dissatisfaction than did their non-athlete counterparts. Interestingly, even though the male student athletes from the same study evidenced lower body dissatisfaction than did the male student non-athletes, there was no significant difference between the two groups in terms of real-ideal body discrepancies. This result may reflect the disproportionate effect of sociocultural pressure on females (athlete or non-athlete) to achieve the ideal body.

So, it may be that student athletes, by virtue of their engagement in regular physical activity, achieve body compositions which more closely match the ideal communicated by society and thus, experience lower levels of body dissatisfaction leading to lower levels of eating pathology. However, it is important to note that, engagement in physical activity has also been demonstrated to be an effective emotion regulation strategy (Bernstein, & McNally, 2017; Edwards, Rhodes, & Loprinzi, 2017; Thayer, Newman, & McClain, 1994) and difficulty in emotion regulation has been shown to be a powerful predictor of eating pathology in other populations (Hubert, Sian, &

Birtchnell, 1986; Slade, 1982; Stice, 1994; Whiteside, Chen, Neighbors, Hunter, Lo, & Larimer, 2007). Thus, participation in athletics by university students may exert an alternative protective effect against eating pathology because student athletes are mandated to engage regularly in effective emotion regulation strategies and learn to adapt to situations where emotions fluctuate quite regularly through tasks related to practice, training and competing.

1.7 Emotion regulation and difficulties in emotion regulation

In order to understand the construct of emotion regulation it is necessary to appreciate that emotions serve adaptive functions, such as, aiding individuals to meet situational demands, guiding decision-making, promoting learning, and facilitating interpersonal interactions (Gross & Thompson, 2007). Emotions are psychological states that can be examined and modified (Teasdale, 1999) and when individuals influence the occurrence, experience, intensity, and/or expression of emotion it is known as emotion regulation (Barlow, 2004; Gross & Thompson, 2007). Emotion regulation involves a number of component processes: 1) the awareness and understanding of emotions, 2) the acceptance of emotions, 3) the ability to control impulsive behaviours and behave in accordance with desired goals when experiencing negative emotions, and 4) the ability to use situationally appropriate emotion regulation strategies flexibly to modulate emotional responses as desired in order to meet individual goals and situational demands (Gratz & Roemer, 2004). Emotion regulation strategies may be readily observable (e.g., exercising in response to stress), or they may be internal cognitions (e.g., re-evaluating an emotional response). Also, emotion regulation strategies may be relatively automatic, occurring

outside of awareness, or they may be conscious, purposeful behaviours (Gross, 1998). For example, individuals often avoid painful emotions without being aware they are doing so (Gross & John, 2003); conversely, individuals who exercise in response to stress often do so with the expressed goal of stress reduction (Edwards, Rhodes, & Loprinzi, 2017; Thayer, Newman, & McClain, 1994). Emotion regulation strategies enable individuals to alter their subjective experience of an emotion and modulate their associated behavioural responses.

Increasing interest in the area of emotion regulation has highlighted the fact that humans often have difficulties regulating their emotional states, as well as regulating emotionally motivated behaviours (Barlow, Allen, & Choate, 2016; Rottenberg & Gross, 2003; Carver, Lawrence, & Scheier, 1996). Difficulties in emotion regulation can result from the breakdown of any one of the component processes described above (Gratz & Roemer, 2004). Researchers have emphasized the transdiagnostic nature of emotion regulation skills (Aldao, Nolen-Hoeksema, & Schweizer, 2010) and empirical data have implicated difficulties in emotion regulation in a wide range of clinical disorders, including substance abuse (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996) generalized anxiety disorder (Mennin, Heimberg, Turk, & Fresco, 2002), intimate partner violence (Jakupcak, Lisak, & Roemer, 2002), borderline personality disorder (Lieb, Zanarini, Schmahl, Linehan, & Bohus, 2004), and eating disorders (Holliday, Uher, Landau, Collier, & Treasure, 2006).

It has been suggested that individuals engage in pathological eating behaviour in response to experiences of negative affect and with the goal of down-regulating the

negative emotional experience (Heatherton & Baumeister, 1991; Polivy & Herman, 1993). According to models of eating pathology etiology, body dissatisfaction can lead to the experience of negative affect and then individuals engage in eating pathology as a means of regulating the experience of negative affect (Stice, 2002). This idea is supported by research which has shown that significant increases in negative affect often precede bingeing episodes (Crosby et al., 2009; Haedt-Matt & Keel, 2011; Smyth et al., 2007), which are often followed by immediate decreases in negative affect (Deaver, Miltenberger, Smyth, Meidinger, & Crosby, 2003; Smyth et al., 2007). The majority of research into the role of difficulties in emotion regulation as it relates to eating pathology has focused on the relationship between emotion dysregulation and bingeing and purging symptoms (Greeno, Wing, & Shiffman, 2000; Heatherton & Baumeister, 1991; McManus & Waller, 1995; Steinberg, Tobin, & Johnson, 1990). However, more recently researchers have found support for a relationship between difficulties in emotion regulation and characteristics of AN as well (Haynos & Fruzzetti, 2011; Lavender, Wonderlich, Engel, Gordon, Kaye, & Mitchell, 2015). For example, Gilboa- Schechtman, Avnon, Zubery, and Jeczmien (2006) reported that of a sample of women who had been diagnosed with any one of the three DSM-IV-TR eating disorders reported lower awareness of and greater difficulties regulating their emotions in general than women who did not have an eating disorder diagnosis. Given that females have been overrepresented in the research on eating pathology, Lavender and Anderson (2010) sought to investigate the link between difficulties in emotion regulation and eating pathology in males. These authors used the Difficulties in Emotion Regulation Scale

(Gratz & Roemer, 2004), a reliable and valid self-report measure of difficulties in emotion regulation, and found that male participant scores were predictive of eating pathology, above and beyond the variance accounted for by BMI and negative affect.

Only one study was located which investigated difficulties in emotion regulation and eating pathology in a sample of university student athletes. In fact, only one study investigating difficulties in emotion regulation and eating pathology in any population of athletes was located in the extant literature. Wollenberg, Shriver, and Gates (2015) obtained a sample of 540 female college students (389 non-athletes; 151athletes) from an NCAA Division I university in a mid-western state of the U.S. These authors administered the EAT-26 to assess eating pathology and used the DERS to measure difficulties in emotion regulation. It was postulated that participation in athletics and greater emotion regulation difficulties would predict higher levels of eating pathology in the sample of female student athletes and non-athletes. It was also predicted that difficulties in emotion regulation would mediate the relationship between athletic status (athlete vs. non-athlete) and eating pathology. The results indicated that the student non-athletes scored significantly higher on the EAT-26 and were significantly more likely to score within the range of clinical concern on the EAT-26 than were the student athletes. This is consistent with the trend observed in the literature review above, providing further support for the notion that athletic participation by university students is associated with a protective effect from eating pathology. The data also showed that the student athletes reported significantly lower scores on the DERS than did the student non-athletes, which further supports the proposition that participation in athletics by university students is

associated with fewer difficulties in emotion regulation. Additionally, the authors found that scores on the EAT-26 were positively associated with total DERS scores (r=.29) which provides preliminary support for the suggestion that difficulties in emotion regulation are causally involved in the proposed protective effect of athletics against eating pathology in university student athletes. Further research investigating the mechanisms which underpin the protective effect of athletic participation on eating pathology risk in university students will help inform effective prevention and treatment interventions for eating pathology in other populations.

It is important to note, however, that research suggests that university student athletes also exhibit elevated levels of perceived stress as compared to university student non-athletes (Richards & Aries, 1999; Wilson & Pritchard, 2005). Thus, while student athletes regularly engage in the effective emotion regulation strategy of physical activity, there is reason to suspect that they would have a greater need to engage in emotion regulation strategies due to their experience of elevated perceived stress. Furthermore, it is possible that the elevated levels of perceived stress experienced by university student athletes may negate the beneficial emotion regulatory effects associated with regular physical activity. As such, further investigation into the levels of perceived stress experienced by university student athletes and the ways in which they cope with this stress will aid in a more complete understanding of the complex relationships between stress, emotion regulation, and eating pathology in university student athletes.

1.8 The Current Study: Purpose and Hypotheses

The current study was designed with the main goal of investigating the prevalence of eating pathology in a sample of university student athletes from a mid-sized Atlantic Canadian University. A second central objective of the current study was to investigate body satisfaction, eating pathology, and emotion regulation in a sample of male and female university student athletes from a mid-sized Atlantic Canadian University. Research investigating eating pathology in university student athletes indicated that university student athletes tend to report lower scores on indices of eating pathology than did their non-athlete counterparts. Furthermore, the literature review revealed that student athletes also tend to report lower scores on assessments of body dissatisfaction than student non-athletes. Given that student athletes engage in regular physical activity, it was logical to suspect that this might result in student athletes being more satisfied with their bodies than student non-athletes. Indeed, there is research to suggest that student athletes experience less of a real-ideal body discrepancy than do student non-athletes (Wilkins, Boland & Albinson, 1991), which in turn suggests that student athletes experience lower levels of body dissatisfaction than student non-athletes because their bodies more closely match the socially prescribed ideal. Given that research points to body dissatisfaction as a causal risk factor for the development of eating pathology, it is possible that student athletes are protected from eating pathology by way of low levels of body dissatisfaction, which is likely the result of engagement in regular physical activity.

Physical activity has been shown to be an effective emotion regulation strategy and research suggests that difficulties in emotion regulation also play an important causal

role in the development of eating pathology. As such, it is possible that student athletes are protected from eating pathology by way of access to and engagement in the emotion regulation behavior of physical exercise. One study was located which investigated eating pathology and difficulties in emotion regulation in a sample of female university student athletes (Wollenberg, Shriver, & Gates, 2015). These authors reported that the student athlete participants scored significantly lower on both an index of eating disorder risk and difficulties in emotion regulation than did the student non-athlete participants. It was also reported that the relationship between athletic status and eating pathology was mediated by difficulties in emotion regulation. Although based on limited research and thus not conclusive, these results taken together, suggested that student athletes experience fewer difficulties in emotion regulation than student non-athletes, which partially accounted for the fact that the student athletes reported lower eating pathology risk than did the student non-athletes. No studies could be located which investigated eating pathology and difficulties in emotion regulation in a sample of male and female student athletes. It is important to note, however, that student athletes tend to exhibit higher levels of perceived stress than do student non-athletes (Richards & Aries, 1999; Wilson & Pritchard, 2005). Thus, it is possible that the emotion regulatory benefits associated with athletic participation in university students are negated by high levels of perceived stress.

The current research was designed to address the following specific questions:

1. How does eating pathology differ in student athletes compared to student non-athletes? Based on the literature review, it was hypothesized that:

   a. Student non-athlete participants will report significantly higher risk for eating pathology than will student athlete participants.
   b. Student athlete participants will report significantly higher body satisfaction than will student athlete participants.

2. How does eating pathology differ in lean sport student athletes compared to non-lean sport student athletes? Based on the literature review it was predicted that:
   a. Lean sport student athletes will report significantly higher risk for eating pathology than will non-lean sport student athletes.
   b. Lean sport student athletes will report significantly lower body satisfaction than will non-lean sport student athletes.
3. Does sex impact eating pathology risk? Based on the literature review it was hypothesized that:
   a. Female participants (student athletes and student non-athletes) will report significantly higher risk for eating pathology than will male participants.
   b. Female participants (student athletes and student non-athletes) will report significantly lower body satisfaction than will male participants.
4. Are student athletes more stressed than student non-athletes? Based on the literature review, it was predicted that:
   a. Student non-athletes will report significantly lower perceived stress than will student athletes.
5. Does the ability to regulate emotion differ between student athletes and student non-athletes? Based on the literature review it was predicted that:

   a. Student athletes will report significantly fewer difficulties in emotion regulation than will student non-athletes.

6. What are the relationships between athletic status, eating pathology, body satisfaction, and difficulties in emotion regulation?
   a. Difficulties in emotion regulation will mediate the relationship between athletic status and eating pathology risk in student athletes and non-athletes.
   b. Body satisfaction will mediate the relationship between athletic status and eating pathology risk in student athletes and non-athletes.

2. CHAPTER TWO

Method

2.1 Design

The current study was part of a program of research, which was designed to assess stress and coping in university students. The comparison sample of university student non-athletes consisted of the sample of undergraduates from the original study (HIC ethics approved study, Dysfunctional Coping Mechanisms in Students Dealing with Stress, collected Fall 2009). The data and analyses for the original project are beyond the scope of the current research and will be not be discussed. The student athlete participants for the current study were recruited following the approval of research procedures by the Human Investigations Committee (Amendment approved 08/30/2011 to study student athletes). The current study was designed using a cross-sectional methodology and all participants completed a battery of self-report instruments at one point in time.

2.3 Assessment

Due to the fact that the current research was part of a program of research there were a number of constructs which were under investigation and as a result, the research team was cognizant of the number of total items in the assessment batteries. Efforts were made to choose valid and reliable assessment instruments which were also relatively brief. For example, while there was data demonstrating that both the QEDD and the SCOFF correlate strongly with DSM-IV-TR eating disorder diagnosis, the SCOFF consists of far fewer items and, thus, was chosen to assess clinical levels of eating

pathology. All self-report questionnaires and consent forms are included in Appendices B - I.

Demographics Form. (Appendix C). In order to assess athletes' demographic characteristics a 24-item demographic form was designed and included in the battery. The demographic form assessed age, sex, sexual orientation, country of origin, academic load, training volume and perceptions about the importance of athletics. Student non-athlete participants provided only age, sex, country of origin, sexual orientation, and year in school as part of the How I Deal with Stress Scale (Ross & Heath, 2002, adapted by Heath, 2008) due to time constraints for data collection. Given the focus on the student athlete population, this group was provided with a separate, more detailed demographics questionnaire.

How I Deal with Stress Scale (HIDS; Ross & Heath, 2002, adapted by Heath, 2008). (Appendix D). This questionnaire was adapted from the first section of the two part How I Cope with Stress questionnaire developed by Ross and Heath (2002) and demographic questions were added. The adapted version was comprised of a list of 24 strategies for coping with stress commonly reported by students and for each of the coping strategies participants were asked to indicate whether they have engaged in the behaviour never, once, a few times, or frequently. These items were germane to the original research project; however, they were not analyzed in the current study. The final item on this instrument provides participants with the opportunity to rate their level of experienced stress over the past two weeks on a 10-point scale (from 1 = no stress to 10 = the most stressed I have ever felt). This instrument was used to assess perceived stress in

order to investigate its utility as a brief index of perceived stress. This modified version of the measure has been used in other research and acceptable internal consistency was found, with a Cronbach's alpha of .65 (Duggan, Button, & Heath, 2010). The original How I Cope with Stress questionnaire has been found to have a Cronbach's alpha of .78, indicating reasonable internal consistency (Heath, Ross, Toste, Charlebois, & Nedecheva, 2009). A Pearson product-moment correlation coefficient was calculated between the PSS-10 total scores and the HIDS stress item scores reported by the student athletes, which evidenced a strong, positive correlation between the two instruments (r =.68, n = 82, p < .000). This is consistent with previous research with health professional students in which a Pearson product-moment correlation coefficient between these two measures of stress of .68 was also reported (Button, 2014). As such, there is evidence to suggest that the HIDS stress item is an efficient means of assessing perceived stress in university students.

Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). (Appendix E). The DERS is a 36-item, self-report questionnaire designed to assess multiple dimensions of emotion regulation. Participants were asked to rate the extent to which they have felt a certain way (e.g., "I am confused about how I feel") during the past few weeks on a five-point likert scale (one = almost never, five = almost always). Total scores on the DERS can range from 36 to 180, with higher scores indicating greater difficulties in emotion regulation. There is currently no standardized cutoff score for identifying individuals as "at risk" for emotion regulation difficulties and so the total score on the DERS was analyzed as a continuous variable. The DERS has been found to

have high internal consistency, with respect to the total score; Gratz and Roemer (2004) reported a Cronbach's alpha of α=.93 for the DERS total score and Salters, Roemer, Tull, Rucker, & Mennin (2006) reported an alpha of α=.89 for total DERS scores. The internal consistency for DERS in the current data set was α=.92. The DERS has also demonstrated good test-retest reliability (α=.88) in sample of participants tested four and eight weeks apart (Gratz & Roemer, 2004).

Empirical investigation has also indicated that the DERS is a valid instrument for the assessment of difficulties in emotion regulation. Evidence of the construct validity of the DERS is demonstrated by studies in which the DERS total and subscale scores were significantly correlated with instruments designed to assess similar constructs to that of difficulties in emotion regulation, such as the Generalized Expectancy for Negative Mood Regulation Scale (Catanzaro & Mearns, 1990) and the Acceptance and Action Questionnaire (Hayes et al., 2004). The content validity of the DERS is demonstrated by the process used for item development. The items for the initial version of the instrument were based on consultations with experts in the field of emotion regulation and were chosen to capture the following dimensions of emotion regulation: a) awareness and understanding of emotions; b) acceptance of emotions; c) the ability to engage in goal-directed behavior, and refrain from impulsive behavior, when experiencing negative emotions; and d) access to emotion regulation strategies perceived as effective. Additionally, items from the Generalized Expectancy for Negative Mood Regulation Scale (Catanzaro, & Mearns, 1990) served as a guide for the item structure. Finally, these items were further refined using factor analysis and items which loaded on multiple

factors or which failed to load above .50 on any factor were eliminated. Finally, in a study designed to assess treatment response to an intervention designed to target emotion regulation difficulties in women with borderline personality disorder it was found that the DERS was sensitive to change (Gratz & Gunderson, 2006). More specifically, it was reported that women who received the emotion regulation intervention reported significantly lower DERS total score following treatment when compared to women who received treatment as usual.

Eating Attitudes Test – 26 Item Version (EAT-26; Garner, Olmsted, Bohr, & Garfinkel, 1982). (Appendix F). This instrument is a 26-item, self-report questionnaire which was designed to assess symptoms of eating pathology and is one of the most widely used instruments for the assessment of eating pathology symptoms in college-aged samples (Fortes et al., 2014; Shriver, Betts, & Payton, 2009). The original scoring rubric for the EAT-26 recommends that items be scored such that the responses "never", "rarely", and "sometimes" are scored as zero and the responses "often", "usually", and "always" are scored one, two, and three, respectively. However, this scoring rubric creates a positively skewed distribution in the data and as such, the EAT-26 was scored using the full 6-point Likert scale when performing inferential tests. When comparing the current data to previous research the original rubric was used and higher scores indicate a greater degree of eating disturbance. The EAT-26 has been widely used as a screening tool since a high proportion of persons scoring over 20 show clinically diagnosable eating disorders (Garner, Olmsted, Bohr, & Garfinkel, 1982). While the EAT-26 was not designed to diagnose eating disorders, it has demonstrated utility as a screening

instrument to assess "eating disorder risk" in high school (Buddeberg-Fischer & Reed, 2001), college (Nelson, Hughes, Katz, & Searight, 1999) and populations of clinically diagnosed eating disorder patients (Hoyt & Ross, 2003). A total score of 20 or more on the EAT-26 identifies an individual as “at risk” for developing an eating disorder. Evidence of the internal consistency of the EAT-26 has been reported in previous research. For example, Garner, Olmsted, Bohr, and Garfinkel (1982) reported a Cronbach’s alpha of (α=.83) in a sample of female university student and (α=.90) in a sample of patients who had been diagnosed with AN. More recently, Sira and White (2010) reported EAT-26 data for a sample of male and female undergraduates and the internal consistency of the instrument was (α=.98). The internal consistency of the EAT-26 in the current data set was α=.86. Additionally, the EAT-26 has demonstrated good test-retest reliability (α=.86) in a sample of participants tested three weeks apart (Mazzeo, 1999). The validity of the EAT-26 has also been demonstrated in a number of different studies. For instance, the construct validity of the EAT-26 has been shown in studies which have reported that scores on the EAT-26 were able to differentiate between individuals who had been diagnosed with an eating disorder and those who were not (Garner, Olmsted, Bohr, & Garfinkel, 1982; Mintz & O’Halloran, 2000). Additionally, the concurrent validity of the EAT-26 has been demonstrated by the fact that the instrument has been shown to correlate with other eating pathology assessments, such as the Bulimia Test-Revised (Kelly, et al., 2012), the SCOFF (Noma, et al., 2006), and the Eating Disorders Inventory II (Doninger, Enders, & Burnett, 2005).

Multidimensional Body-Self Relations Questionnaire - Body Areas Satisfaction Subscale (BASS; Cash, 2000). (Appendix G). The BASS is a 9 item subscale of the Multidimensional Body-Self Relations Questionnaire self- report instrument and the BASS subscale was designed to assess individuals' satisfaction with various body areas (Cash, 2000). Given that body satisfaction-dissatisfaction is a continuous construct, the BASS can be thought of as a reverse-coded assessment of body dissatisfaction, such that low scores on the BASS represent relative dissatisfaction with bodily appearance. Participants are asked to rate each of 9 areas (i.e., face, hair, height, weight, upper torso, mid-torso, lower torso, muscularity, and overall appearance) on a five-point scale indicating their relative satisfaction with that attribute. Scores can range from 9 – 45 and higher scores indicate greater relative body satisfaction. The BASS has demonstrated good internal consistency with Cronbach's alphas of .77 and .73, for males and females, respectively (Cash, 2000). The internal consistency of the BASS in the current data set was α=.84. Additionally, the test-retest reliability has been reported for a one month testing interval at .86 for males and .74 for females (Cash, 2000). The BASS subscale of the MBSRQ demonstrated good convergent validity (Cash, 2000) in studies which reported that scores on the BASS were significantly correlated with other validated assessments of body satisfaction, such as, the Body Cathexis Scale (Secord & Jourard, 1953), the Body Parts Satisfaction Scale (Berscheid, Walster, & Bohrnstedt, 1973), and the Body Esteem Scale (Franzoi & Shields, 1984)

Perceived Stress Scale (PSS-10; Cohen, Kamarck, & Mermelstein, 1994). (Appendix H). The PSS-10 is a 10 item self-report questionnaire which was designed to

assess an individual's subjective experience of stress (Cohen, Kamarck, & Mermelstein, 1994). The PSS-10 is one of the most widely used assessment instrument for evaluating perception of stress. The PSS-10 measures the degree to which individuals appraise the situations in their life as stressful and the items were designed to assess the extent to which participants experience their lives as unpredictable, uncontrollable, or overwhelming. The PSS-10 was designed for use in community samples with at least a junior high school reading level. The PSS-10 is comprised of ten items (e.g., "how often have you been upset because of something that happened unexpectedly?" and "how often have you felt nervous and "stressed?") and participants rate the frequency with which they have experienced certain thoughts and feelings over the course of the previous month on a five-point Likert scale, from 0 ("never") to 4 ("very often"). Total scores on the PSS-10 can range from 0 – 40 and are obtained by reverse scoring the positively worded items and summing the ten item scores. Higher scores on the PSS-10 indicate higher levels of perceived stress and higher PSS-10 scores have been shown to be associated with failure to quit smoking (Cohen & Lichtenstein, 1990) , failure among diabetics to control blood sugar levels (Surwit, et al., 2002), and immune suppression (O'Leary, 1990). The authors of the PSS-10 did not provide cutoff scores to aid in the interpretation of the PSS-10, however, Kelly and Percival (2006) developed an interpretation guideline with regards to level of perceived stress and level of health concern. These authors suggested that PSS-10 total scores between 0 – 7 are representative of individuals who have a "much lower than average" level of stress and "very low" health concern; scores between 8 -11 indicate a stress level that is "slightly

lower than average" and "low" health concern; scores between 12 – 15 are representative of individuals who experience "average" levels of stress and "average" health concern; scores between 16 – 20 indicate a "slightly higher than average" level of perceived stress and a "high" level of health concern; finally, a score of 21 or higher indicates "much higher than average" levels of perceived stress and "very high" health concern. The PSS-10 has been demonstrated to be a reliable instrument for the assessment of perceived stress in university students. For example, Roberti, Harrington, and Storch (2006) reported a Cronbach's alpha of .89 for the PSS-10 in a sample of college students. The internal consistency of the PSS-10 in the current data set was α=.90.

SCOFF - (Morgan, Reid, & Lacey, 1999). (Appendix I). The SCOFF is a 5 item self-report eating disorder screening tool. The SCOFF is comprised of five questions: 1) Do you make yourself SICK (vomit) because you feel uncomfortably full? 2) Do you worry that you have lost CONTROL over how much you eat? 3) Have you recently lost more than ONE stone (15 pounds) in a 3-month period? 4) Do you believe yourself to be FAT when others say you are thin? 5) Would you say that FOOD dominates your life? A score greater than or equal to 2 is meant to "raise the index of suspicion" of an eating disorder, such that individuals who score in this range may have a diagnosable eating disorder. However, an eating disorder diagnosis would require further assessment by a trained professional. The SCOFF has demonstrated good validity with respect the DSM-IV-TR eating disorder criteria, as evidenced by the fact that, when compared to eating disorder cases identified through the administration of the DSM-IV-TR clinical interview to participants in a primary care setting, the SCOFF demonstrated a

sensitivity of 84.6% and a specificity of 89.6%, where all true cases of AN and BN were identified and seven of nine true cases of EDNOS were identified (Morgan, Reid, & Lacey, 1999). The SCOFF was demonstrated to have good convergent validity in a previous study which recruited a sample of university males and females. Hill, Reid, Morgan, and Lacey (2010) reported that the SCOFF was strongly correlated with the subscales of the EDI (e.g., Drive for thinness r=.78, Body dissatisfaction r=.72, and Bulimia r=.61). Due to the fact that the SCOFF was markedly shorter than the EDI, it was used to limit testing burden on participants.

Researchers have examined how the EAT-26 and SCOFF relate to each other in terms of eating pathology assessment in a sample of patients who had been previously diagnosed with an eating disorder (Noma, et al., 2006). These authors endeavored to examine the clinical utility of the SCOFF as a screening instrument and, more specifically, sought to evaluate the ability of the SCOFF to identify cases of EDNOS. The results of this investigation replicated previous results, in that the SCOFF proved able to identify cases of AN and BN in 96.2% of cases. Consistent with the authors' hypothesis, the data revealed that SCOFF scores identified EDNOS patients with low body weight in only 10% of cases. The SCOFF has been demonstrated to be useful in detecting clinical cases of AN and BN but not cases of EDNOS and the EAT-26 has been demonstrated to be more sensitive for detecting subclinical levels of eating pathology. Hence, both the EAT-26 and the SCOFF were employed for the current research in order to assess a wider range of the eating pathology continuum while providing an indication of the

clinical levels of eating pathology which were likely present in the student athlete population sampled.

2.4 Participant Recruitment

The student non-athlete data for the current research were obtained from a previous study which was completed in two phases. Phase I of the original study was designed to screen for participants who reported eating pathology and/or self-injury as strategies for coping with stress. Phase II was designed to provide a more in-depth assessment of psychosocial variables in these individuals. In Phase I of the original study, student non-athletes were recruited through brief presentations to the first-year English classes. Of the 2413 surveys that were distributed, 1666 (69.0%) participants returned completed surveys in Phase I and 665 (39.9%) of these individuals provided their email address, which indicated their consent to be contacted for Phase II. Of those individuals who provided contact information, 126 (18.9%) completed the battery of assessment instruments in phase II and these participants were entered into a draw for an iPod Nano.

Student athletes were recruited through presentations to the six official varsity teams at the same mid-sized Atlantic Canadian University from which the student non-athlete participants were recruited. All of the 167 student athletes who competed in intercollegiate athletics were considered eligible to participate and of those, 85 (50.9%) agreed to participate in the research. All twelve coaches of the male and female teams were contacted in order to arrange times for the research presentations when the coaches would be absent to ensure that the athletes would not experience pressure to participate

based on their coach's knowledge of participation. Eleven coaches responded (91.7%) and agreed to allow a presentation to their teams about the opportunity to participate in the current research and presentations were made to nine teams. Due to logistical difficulties, the research team was unable to present the research opportunity to the male and female volleyball teams and the female basketball team. Surveys were distributed after the presentations and all 78 surveys were returned (100%). In order to maximize the number of athletes provided with the opportunity to participate in the current research an email was circulated to the members of the teams who had not been present for the research presentations which provided them with the opportunity to participate in the research by completing the battery of instruments online. Seven athletes responded to the online survey (2 males and 5 females) bringing the total number of participating athletes to 85 (50 males and 35 females).

2.5 Procedure

Student non-athletes. Participants were recruited through brief presentations to introductory English Literature classes. The research team liaised with the Student Services Division of the university in order to access the population of undergraduates. Student Services presents to introductory English classes because English is a required course and the vast majority of undergraduates enroll in the required English courses in their first semester. The research team "piggybacked" on the student services presentations to introduce the first phase of the research and offer the students the opportunity to participate. Classes were entered before the lecture period began and before the professor arrived, in order to ensure confidentiality of participation. Following

the Student Services presentation, a member of the research team introduced the study's purpose and procedures and invited the students to participate. In order to limit the demand characteristics, envelopes containing an information letter, consent form, and the How I Deal with Stress scale (HIDS) were distributed to each student. It was explained to the students that participation was completely voluntary and no penalties would be incurred for lack of participation and that they were able to withdraw at any time. The students were then instructed to either complete the forms or not and regardless of participation to enclose the HIDS scale in the envelope provided, which was marked only with participant numbers and the class from which the participants were recruited. The students were also instructed to place all complete and incomplete consent forms in a separate box, once again to ensure confidentiality. At the end of the HIDS scale, the students were invited to provide their email address so that they could be contacted by the research team to participate in Phase II of the research.

The data for Phase I and II of the student non-athlete data collection was to be linked based on a unique code. In Phase I of data collection, participants were given explicit instructions on how to create their own unique code to link the data from Phase I and II of data collection. The codes were not identifying of the participants and were based on the day of the month in which they were born and the last four digits of their student number. Students who provided their email addresses were then contacted to provide them with the opportunity to participate in the second phase of the research. The students were provided with a hyperlink which directed them to a secure and encrypted webpage which provided them with an information letter describing the Phase II purpose

and procedures. The students were informed that completion of the survey battery indicated their consent to participate. Once again the students were provided with same explicit instructions for re-generating their unique code and they were directed to complete the EAT-26, the DERS, and the BASS, among other instruments not related to the current research. The data was then stored on the university servers until such time that it was downloaded to the PI's computer and deleted from the server.

Student athletes. Following a brief presentation describing confidentiality and the purpose of the study (approximately 5 minutes) athletes were provided with the opportunity to complete a battery of instruments. Envelopes with only participant numbers were distributed to every student who attended the presentation and the envelopes contained an information letter, consent form, and the HIDS, PSS-10, BASS, EAT-26, SCOFF, DERS and a detailed demographic form. The student athletes were informed that participation was completely voluntary and that no academic or athletic consequences would result from lack of participation. The student athletes were also informed that they were free to withdraw from the study at any time. The student athletes were then instructed to either complete the consent form and the test battery or leave the forms blank and then regardless of participation, to enclose the battery in the envelope provided and seal it. The student athletes were also instructed to place all complete or incomplete consent forms in a separate box from the surveys, in order to ensure confidentiality for those athletes who decided not to participate.

As mentioned above, in order to maximize the number of student athletes who were provided with the opportunity to participate in the current research the pencil and

paper battery was converted into an online form, accessible through hyperlink. The athletics director then emailed a brief description of the research and the hyperlink with an invitation to participate to members of any team which was not yet represented in the sample or who had been unable to attend the research session. Athletes who accessed the hyperlink were directed to a webpage which contained the information letter for the study and indicated to the students that by completing the survey they were indicating their consent to participate in the study. Student athlete responses were stored and de-identified, on the university servers until such time as the PI downloaded the data and it was deleted from the server.

The data collection process proved to be extremely difficult to coordinate for a number of reasons, partly because student athletes have relatively little free time outside of athletics and academics. Additionally, the necessity of coordinating with the coaches, while desirable, added another element to coordinate. As such, the possible times to schedule data collection were very limited and likely contributed to the lack of representation from each official team. Sanford-Martens, et al. (2005) experienced similar difficulties with participant recruitment which resulted in uneven numbers of participants recruited from each team. These authors cited scheduling conflicts and time constraints as contributing to the data collection difficulties. No incentive was provided to the student athletes for participation in the current research, however, the PI agreed to present the results of the current study for the athletes and athletics department in order to disseminate the information within the community from which it was obtained.

2.6 Statistical Analyses

The statistical analyses for this study were conducted using IBM SPSS Statistics 23, a statistical software program. First, data were screened for missing values, outliers, and normality. Next, descriptive statistics for the student athlete and student non-athlete phase I and phase II samples were calculated. The variables assessed included demographic variables (e.g., age, sex, country of origin, sexual orientation, year in school), eating pathology, body satisfaction, perceived stress, and difficulties in emotion regulation. In order to investigate age as a possible covariate t-tests were conducted between the student athlete group and the student non-athlete groups. Next, four multiple regressions were conducted using age to predict EAT-26, BASS, DERS, and HIDS stress item scores to determine if age would need to be considered as a covariate in subsequent analyses.

In order to examine the main effects of sex and athletic status, in addition to their interaction, on eating pathology risk, a 2 x 2 factorial ANOVA was conducted which compared EAT-26 total scores across sex (male/female) and athletic status (athlete/non-athlete) variables. Chi square tests of independence were conducted to examine sex differences with respect to the frequency of scoring within the range of clinical concern on the EAT-26 (student athletes and student non-athletes) and on the SCOFF (Student athletes only). Another Chi square test of independence compared student athletes and student non-athletes with respect to scoring with in the range of clinical concern on the EAT-26

The main and interaction effects of sex and athletic status on body satisfaction were investigated using a 2 x 2 factorial ANOVA using total scores on the BSS and comparing them across the sex and athletic status variables.

The student athletes were divided into two groups based on the extent to which their sport emphasized a lean physique or not (lean emphasis); lean sport student athletes (n=34; wrestling, cross-country running, and swimming) and non-lean sport student athletes (n=50; soccer, basketball, volleyball). Sports were classified as lean or non-lean based on the categorization used by (Sanford-Martens, et al., 2005). In order to investigate the main and interaction effects of sex and lean emphasis on eating pathology risk in the student athlete sample a 2 x 2 factorial ANOVA was calculated comparing EAT-26 total scores across the sex and lean emphasis variables. The effect of lean emphasis was further investigated using a Chi Square test of independence with the lean emphasis variable and the frequency of scoring within the range of clinical concern on the EAT-26. A Chi Square test of independence was also used to provide insight into the effect of lean emphasis on clinical levels of eating pathology using the frequency of scoring within the range of clinical concern on the SCOFF.

In order to investigate the main and interaction effects of sex and lean emphasis on body satisfaction in the student athlete sample a 2 x 2 factorial ANOVA was calculated comparing EAT-26 total scores across the sex and lean emphasis variables. Similarly, the main and interaction effects of sex and athletic status on difficulties in emotion regulation was investigated using a 2 x 2 factorial ANOVA which compared DERS total scores across the sex and athletic status variables. Once again, the main and

interaction effects of sex and athletic status on perceived stress, using a 2 x 2 factorial ANOVA, was calculated comparing HIDS stress item scores across the sex and lean emphasis variables.

Finally, the hypothesis that the relationship between athletic status and eating pathology risk would be mediated by difficulties in emotion regulation was tested using Baron and Kenny's (1986) steps for mediation analysis. Firstly, a linear regression was performed using athletic status as the predictor and total scores on the EAT-26 as the criterion (testing the effect to be mediated). Secondly, another linear regression was performed using athletic status as a predictor and total scores on the DERS as the criterion variable (testing that the predictor is related to the proposed mediator). Finally, a third univariate regression was performed with athletic status and total scores on the DERS entered as predictors and total scores on the EAT-26 as the criterion (evaluating the independent effect of the proposed mediator on the outcome variable).

3. CHAPTER THREE

Results

3.1 Recruitment and Retention

A summary of participant recruitment for the current study is presented in Figure 3.1.

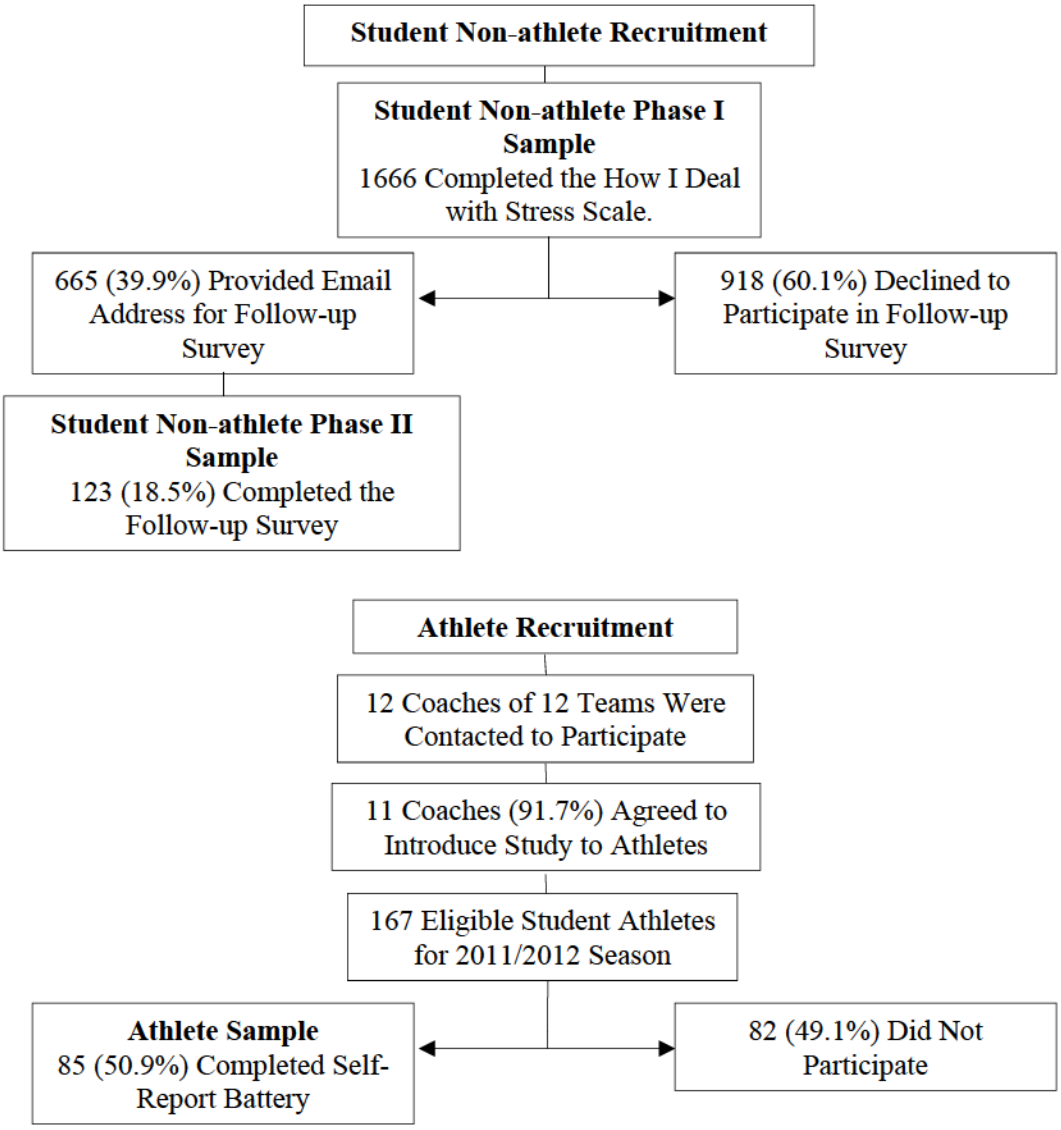

Figure 3. 1 Study Recruitment

Recruitment. With respect to the Student non-athlete Phase I Sample, 1666 student non-athletes completed the screening instrument (How I Deal with Stress Scale). Of those, 665 provided an email address indicating consent to be contacted to participate in a follow-up survey and 123 of those contacted provided data for the follow-up survey (Student non-athlete Phase II Sample). Of the 167 eligible varsity athletes enrolled in the university for the 2011/2012 season, 85 (50.9%) completed the battery of self-report instruments. The frequencies of participating athletes from each team are listed in Table 3.1. Due to logistical difficulties, we were unable to meet with two of the eleven teams for which the coaches agreed to introduce the study. In order to give these student athletes the opportunity to participate every member of the teams who could not meet with the research team was emailed a hyperlink where they could participate in the study via online questionnaires.

Table 3. 1

Distribution of Participants From Athletic Teams Sampled.

Team	Total	Males	Females
XC Running	17	8	9
Basketball	20	19	1
Volleyball	1	0	1
Soccer	30	14	16
Swimming	7	4	3
Wrestling	10	5	5

3.2 Data Screening

The data were first screened for missing values, outliers, normality, skewness, and kurtosis.

Missing Values. Information regarding the identification and treatment of missing data values can be found in Appendix J. Briefly, the visual analysis of missing values in the current data set indicated that little data was missing and suggested that the data was missing at random. Hence, missing data points were managed using the method of person mean substitution (Downey & King, 1998), such that missing items were imputed using the mean response for the other non-missing items on that subscale, where the alpha value for that subscale was > .70. However, data for the HIDS Stress Item was not imputed due to the fact that no other data for the individual participant could be used to estimate the missing values for that item. Additionally, the data for one of the student athletes was deleted due to a large number (>50%) of missing responses.

The difficulties experienced during the student non-athlete data collection resulted in a disconnect between the sexual orientation data and the other assessment instruments and as a result the data for sexual orientation was not analyzed. All eighty-four student athletes reported a heterosexual orientation. Interestingly, the student athlete whose data was deleted due to missing responses also left the sexual orientation item blank, suggesting the possibility of heteronormative influences inherent in the current research or the athletic community.

Outliers. The data were screened for extreme data points by calculating z-scores from the self-report instruments. The criteria of a Z-score outside of the range -3.29 to

3.29, $p < .001$ was used based on the recommendation of Tabachnick and Fidell (2007). There were a number of univariate outliers on the age variable. In order to approximate matching the athlete and non-athletes samples in terms of age all data from non-athlete participants who were older than the oldest athlete were deleted (4 cases). These cases were thought to diverge from the intended population from which the sampling procedure was aimed. This procedure resulted in all scores above 4 standard deviations being deleted from the data set. A number of additional univariate outliers were identified in participants' EAT-26 Total scores (4 outliers). In order to account for the undue influence of extreme scores all analyses were completed including and excluding univariate outliers and no significant differences in the results between the two analyses were observed.

These cases do not necessarily represent spurious data due to the fact that extreme scores for some participants were expected based on previous research, which sampled male and female college students and reported a mean EAT-26 total score of 11.3 (*S.D.*=11.1) and a range of 0-61 (Nelson, Hughes, Katz, & Searight, 1999). The most extreme score in this range represents a z-score of 4.48, which is similar to the current data, in which the most extreme score represents a z-score of 4.98. In addition, the current research employed a community sample and the data from community samples has reported lifetime prevalence rates as low as 0.3% for AN (Hoek & van Hoeken, 2003) and 1% for BN (APA, 2000). Thus, when the prevalence rates of eating pathology are considered in general, it is clear that in these samples a relatively low proportion of individuals exhibit a large number of eating pathology symptoms. This indicates that the

current data do not depart from the trend observed in other community samples investigating eating pathology.

Normality. The data were assessed for normality, skewness, and kurtosis for each psychological measure. First, histograms were evaluated and the distributions for the EAT-26 and DERS appeared to be significantly, positively skewed. Table 3.2 presents the results of the data screening analyses.

Table 3. 2

Skewness, Kurtosis, and Z-Scores

	Skew	*SkewSE*	*SkewZ*	*Kurtosis*	*KurtosisSE*	*KurtosisZ*
DERS-TOTAL	0.515	0.167	3.0838	0.009	0.333	0.027027
EAT-TOTAL	1.204	0.169	7.12	1.698	0.337	5.04
BASS-TOTAL	-0.065	0.167	-0.389	-0.397	0.333	-1.192192

Note. Outliers included. DERS-TOTAL = Difficulties in Emotion Regulation Scale Total Score; EAT-TOTAL = EAT-26 Total Score; BASS-TOTAL = Body Areas Satisfaction Subscale Total Score.

The table above shows that there were significant departures from normality for the DERS Total Scores and the EAT-26 Total Scores, based on Z-scores outside of the acceptable range of -3.29 to 3.29. This pattern in the data distribution was not unexpected in light of the discussion above regarding outliers. More specifically, the distribution of eating disorder symptomatology or any psychopathology in community samples would be expected to exhibit a natural positive skew in light of the fact that abnormal behaviour is defined by significant deviation from the norm. Thus, the current data, including outliers, does not represent sampling error but rather reflects the ecological reality of the

distribution of these traits within community samples. However, in order for the subsequent analysis to be meaningful the departures from normality noted above need to be accounted for in some way. For grouped data using ANOVA, hypotheses are tested with respect to the sampling distribution of means, which is a distribution of means computed from random samples of a given size taken repeatedly from a population, and the Central Limit Theorem states that sampling distributions of means are normally distributed regardless of the distributions of the variables (Tabachnick & Fidell, 2007). Thus, the departures from normality noted above do not violate the underlying assumption of normality.

3.3 Sample Characteristics

Demographics. All data were analyzed using the *Statistical Package for the Social Sciences 21.0 (SPSS 21.0)*. Demographic information for the student non-athlete I and II, and student athlete samples is provided in Table 3.3.

Table 3.3. *Demographic Characteristics of the Student Athlete and Student Non-athlete Samples.*

		Student Non-athlete I			Student Non-athlete II			Student Athletes		
		n	Range in years	*M*(*S.D.*)	n	Range in years	*M*(*S.D.*)	n	Range in years	*M*(*S.D.*)
Age		1619	16-29	18.50 (1.71)	122	18-27	19.00 (1.87)	82	18-29	20.34 (2.15)
			n	%		n	%		n	%
Gender										
	Male		608	37.3		25	20.5		50	58.8
	Female		1022	62.7		97	79.5		35	41.2
Country of Origin	Canada		1563	97.3		-	-		76	90.5
	USA		6	0.4		-	-		0	0
	Other		37	2.3		-	-		8	9.5
Sexual Orientation	Heterosexual		1452	94.0		-	-		84	100.0
	Gay/Lesbian		38	2.5		-	-		0	0
	Bi-sexual		39	2.5		-	-		0	0
	Questioning		12	0.8		-	-		0	0
	Transgender		3	0.2		-	-		0	0
Year in School	1st		673	64.8		-	-		30	37.5
	2nd		62	6.0		-	-		19	23.8
	3rd		275	26.5		-	-		13	16.3
	4th		29	2.9		-	-		18	22.6

An independent samples t-test revealed that the student non-athlete I sample (M =18.50, $S.D.$ = 1.71) was significantly younger than the student athlete sample (M =20.34, $S.D.$ = 2.15), $t(1698)$=-9.33, $p < .000$, with a large effect size (d=0.937). Another independent samples t-test showed that the student non-athlete II sample (M =19.00, $S.D.$ = 1.87) was also significantly younger than the student athlete sample (M =20.34, $S.D.$ = 2.15), $t(203)$=-4.73, $p < .000$, with a medium effect size (d=0.665). As such, four multiple regressions were conducted using age to predict EAT-26, BASS, DERS, and HIDS stress item scores to determine which, if any, would need to be considered covariates in subsequent analyses. Age significantly predicted BASS (r=.161, p=.021) and HIDS stress item scores (r=.081, p<.00) and thus age was entered in the appropriate analyses as a covariate. Height and weight data was available for the student athlete participants and BMI scores were calculated using the formula: weight (kg) / [height (m)]^2. BMI scores were then entered as a covariate in subsequent analyses which included only the student athletes (i.e. lean vs. non-lean sport student athletes).

3.4 Descriptive Statistics

A summary of all descriptive statistics for the self-report instruments is presented in Table 3.4.

Table 3. 4

Descriptive Statistics for the Student Athlete and Student Non-athlete Samples.

	Student Athletes			
	n	*Mean*	*Standard Dev.*	*Range*
HIDS Stress Item	82	6.19	2.20	1-10
EAT-TOTAL[a]	84	5.61	6.41	0-42
DERS-TOTAL	84	45.72	16.62	15-97
BASS-TOTAL (Mean)	84	3.73	0.59	2.33-5
PSS-TOTAL	84	17.65	7.61	2-31
	Undergraduates			
	n	*Mean*	*Standard Dev.*	*Range*
HIDS Stress Item	1595	5.79	2.16	1-10
EAT-TOTAL	123	8.75	9.56	0-50
DERS-TOTAL	123	51.63	18.58	12-102
BASS-TOTAL (Mean)	123	3.22	0.66	1.67-4.67

[a] Original scoring rubric

Eating Attitudes Test – 26 Item Version (EAT-26). The student athlete and student non-athlete II samples completed the EAT-26. The data analysis indicated that the mean total EAT-26 scores reported in the current study were consistent with previous research which investigated eating pathology in student athletes (Blackmer, Russell Searight, and Ratwik, 2011; DiBartolo & Shaffer, 2002; Kirk, Singh, & Getz, 2001; Wilkins, Boland & Albinson, 1991; Wollenberg, Shriver, & Gates, 2015), except for the male student non-athletes. The mean EAT-26 total scores reported by the male participants from the student non-athlete II sample were much lower than those reported by other researchers who have reported EAT-26 data for male undergraduate populations (Sira & White, 2010; Makino, Hashizume, Tsuboi, Yasushi, & Dennerstein, 2006; Wilkins, Boland & Albinson, 1991). Results for the current study are presented in Figure 3.2.

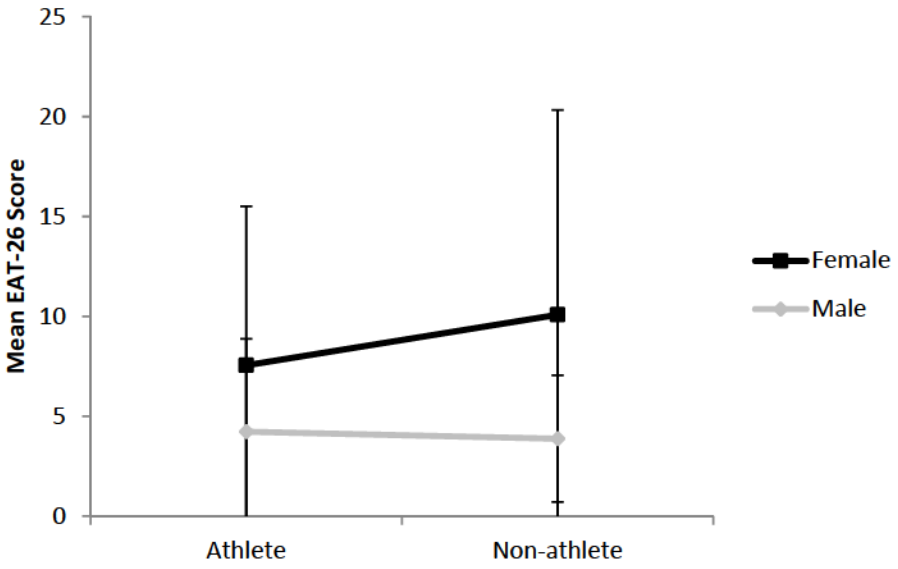

Figure 3. 2. Male and Female Participants' Total EAT-26 Scores and Standard Deviations (Divided by Sample).

As mentioned in the methods section, the developers of the EAT-26 provided a cutoff score (≥ 20) which is indicative of the presence of clinical concern for eating pathology and individuals who score within this range are advised to seek follow-up with a health professional. Within the student non-athlete II sample, sixteen females (16.5%) and no males reported total scores on the EAT-26 greater than or equal to 20 and one male (2.0%) and three female (8.6%) student athletes reported EAT-26 total scores within the same range. With respect to female student athletes and female student non-athletes, the current data are consistent with previous results (Kirk, Singh, & Getz, 2001; Schwarz, Aruguete, & Gold, 2005). Unfortunately, no data regarding EAT-26 clinical cutoff scores could be located for male student athletes. However, the rate with which the male student non-athletes reported EAT-26 scores within the range of clinical concern was lower than

that reported in previous studies of male undergraduates (Sira & White, 2010; Makino, Hashizume, Tsuboi, Yasushi, & Dennerstein, 2006). The data from the current study is presented in Figure 3.3.

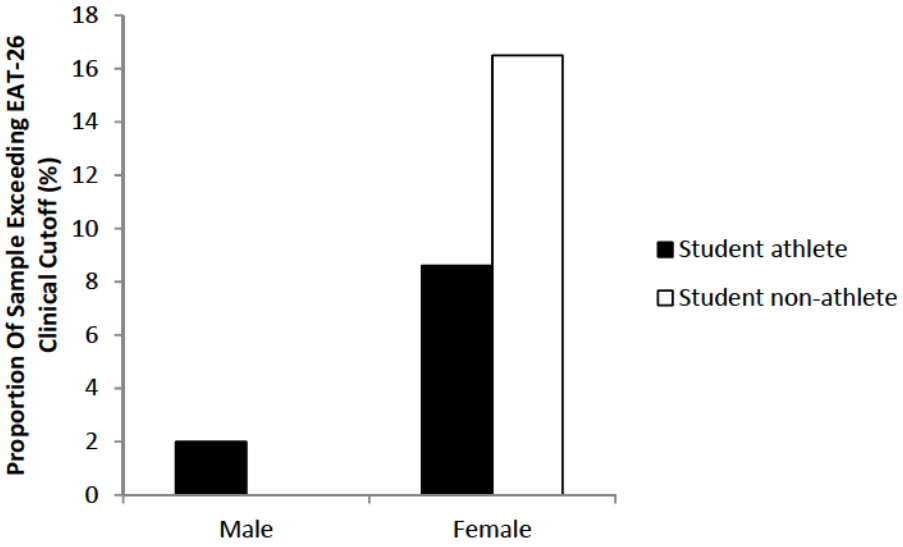

Figure 3. 3. Proportion of Student Athletes and Student Non-athletes Scoring within the Range of Clinical Concern on the EAT-26 (Divided by Sex).

SCOFF. Eighty-four student athletes responded to the SCOFF and the item response frequencies are listed in Figure 3.4. Additionally, the proportion of individuals who met criteria indicative eating pathology behavior (endorsed two or more responses) are listed in Figure 3.5. Three male (6.1%) and five female (14.3%) student athletes reported scores on the SCOFF within the range of clinical concern. Unfortunately, no data could be located in the extant literature regarding the relative rates of clinical concern on the SCOFF in student athletes. However, researchers have previously studied eating pathology in undergraduate populations and the current data is consistent with this previous research (Eisenberg, Nicklett, Roeder, & Kirz, 2011). Interestingly, the rates of

clinical concern observed in the student athlete sample are slightly lower than Button (2014), who sampled a population of health professional students (Medicine, nursing, and pharmacy) from the same university from which the current samples were recruited and reported that 22.0% of females and 7.9% of males had SCOFF scores within the range of clinical concern.

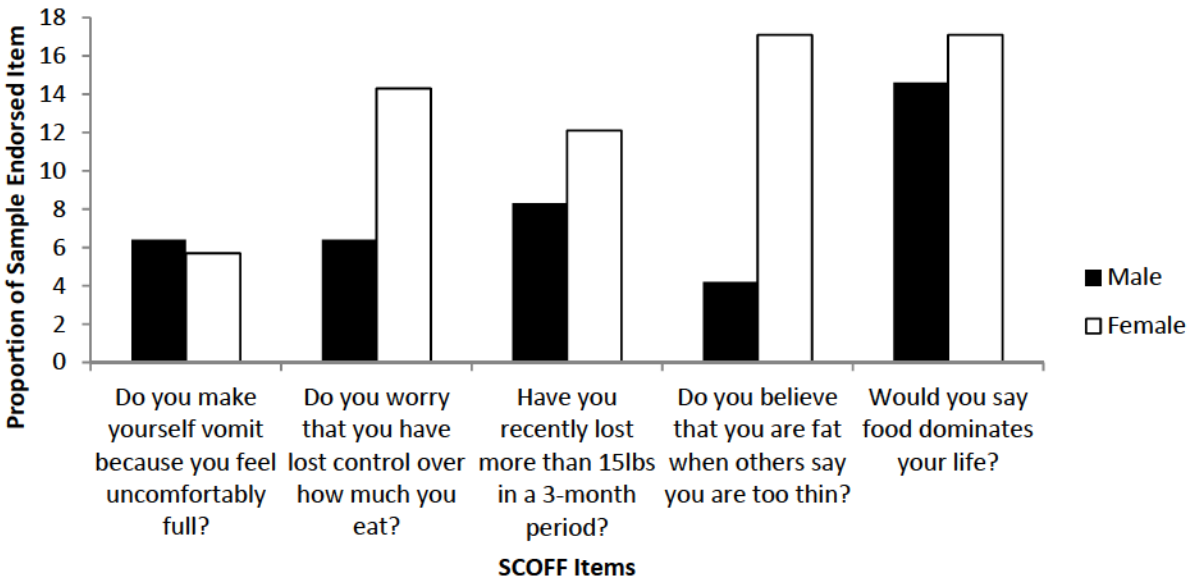

Figure 3. 4. Proportion of Male and Female Student Athletes Endorsing Eating Pathology Behaviors on the SCOFF.

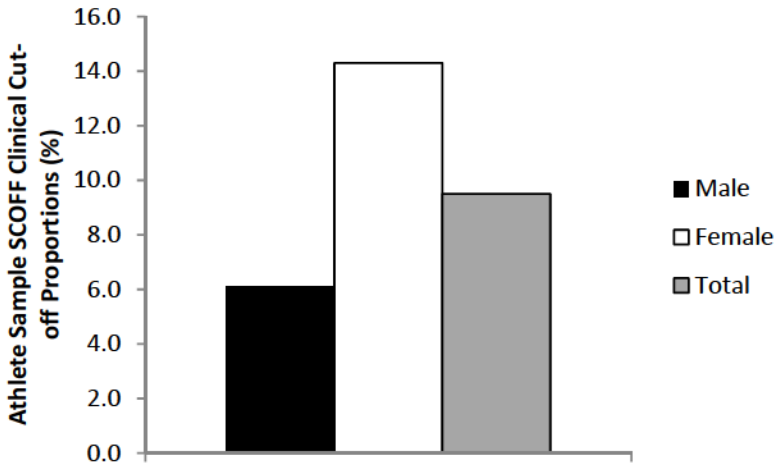

Figure 3. 5. Proportion of Male and Female Student Athletes Scoring within the Range of Clinical Concern on the SCOFF

Body Areas Satisfaction Subscale (BASS). The student athlete and student non-athlete II samples completed the BASS subscale of the MBSRQ. Unfortunately, no studies which employed the MBSRQ in samples of student athletes could be located. However, the authors of this instrument reported adult norms for the MBSRQ subscales by using data from a large national sample and the data from current study were consistent with these norms. Additionally, the BASS has been used with samples of male and female university students and the current data are consistent with the previous studies as well. The data for the current study are presented graphically in Figures 3.6.

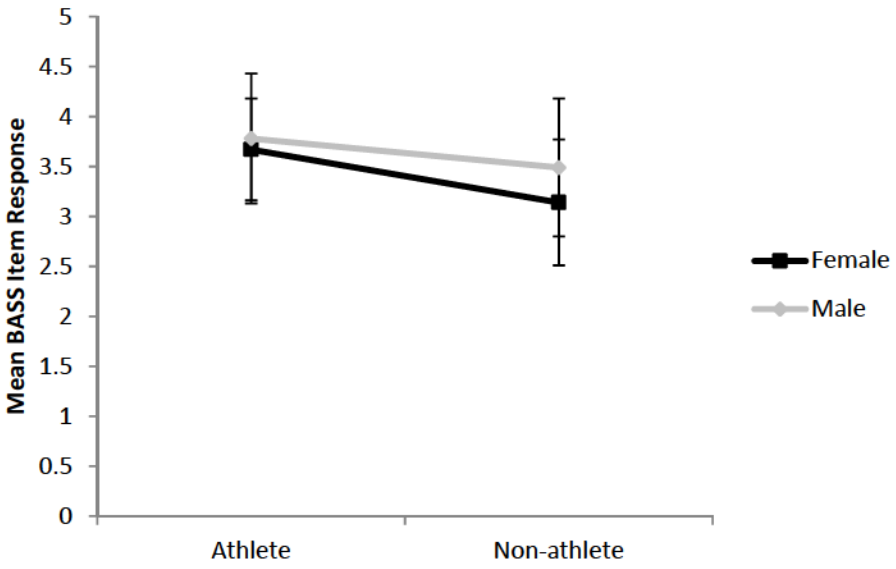

Figure 3. 6. Male and Female Participants' Mean BASS Item Response and Standard Deviations (Divided by Sample).

Difficulties in Emotion Regulation Scale (DERS). The student non-athlete II and student athlete samples completed the DERS. The mean total scores from the current research were lower than those reported in a sample of female student athletes and female student non-athletes (Wollenberg, Shriver, & Gates, 2015). Additionally, the developers of the DERS reported data for a sample of student non-athletes and the current data indicated that mean DERS total scores were lower than those reported by Gratz and Roemer (2005). Thus, the level of self-reported difficulties in emotion regulation in the student athlete and student non-athlete II samples was lower than that found in other research using the DERS. Results from the current study are presented in Figure 3.7.

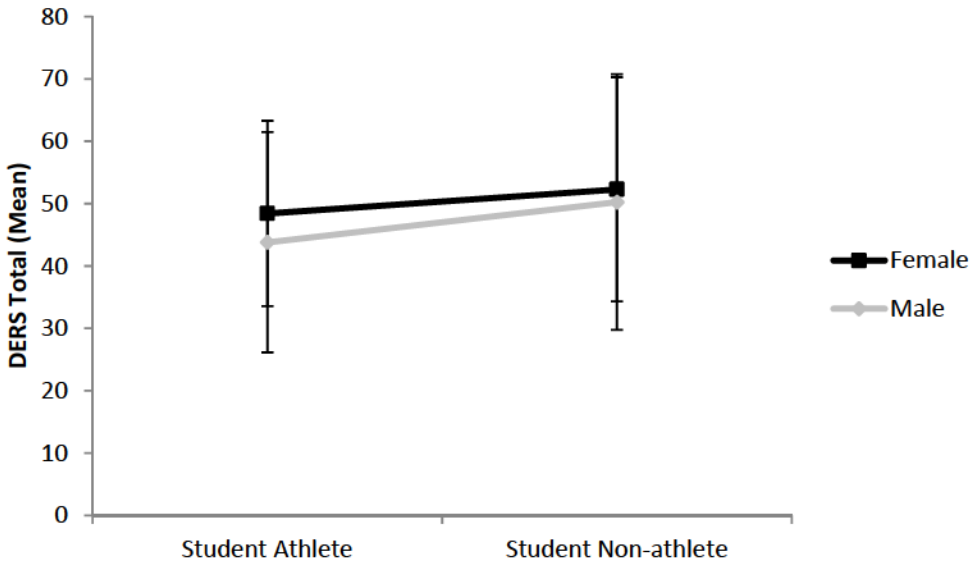

Figure 3. 7. Male and Female Participants' Mean DERS Scores and Standard Deviations (Divided by Sample).

How I Deal with Stress Scale (HIDS Stress Item). The student non-athlete I and student athlete samples completed the HIDS and provided a rating of their level of perceived stress over the past two weeks. The HIDS stress item has only been used in one previous study (Button, 2014) and the current data indicated that the student athletes (*M*=6.19, *S.D.*=2.20) and the student non-athlete I sample (*M*=5.79, *S.D.*=2.16) reported lower scores on the HIDS stress item than did a sample of health professional students (n=117). Similarly, when split by sex, the male (*M*=5.34, *S.D.*=2.28) and female (*M*=6.09, *S.D.*=2.02) participants from the current study reported lower scores on the HIDS stress item than did the male and female participants from the previous study. It is worth noting, however, that the sample from the Button study was obtained from

sampling students of highly competitive health professional programs and was described to be "high stress". The current data are presented in Figure 3.8.

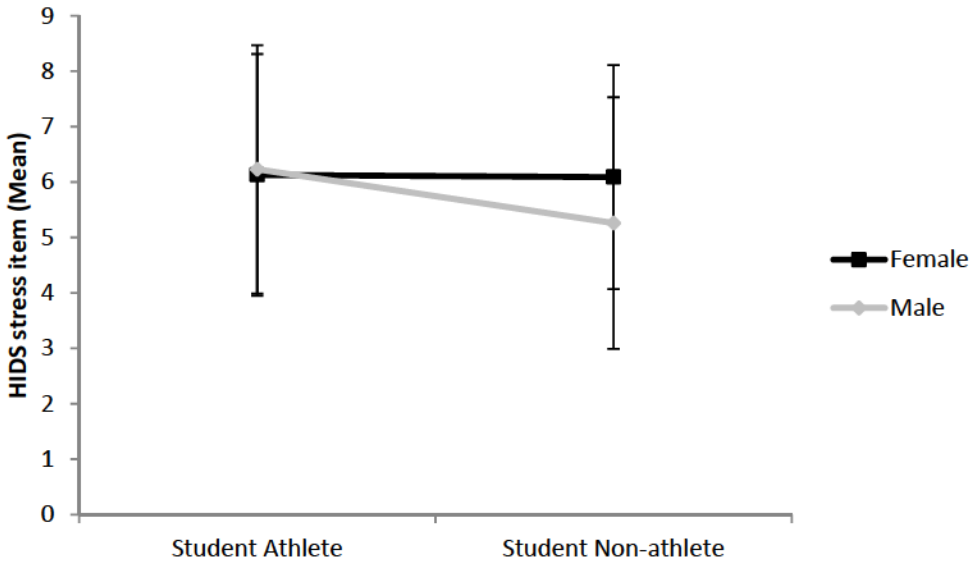

Figure 3. 8. Male and Female Participants' HIDS Stress Item Scores and Standard Deviations (divided by sample).

Perceived Stress Scale (PSS-10). Only the student athlete sample completed the PSS-10. Based on the rubric of Kelly and Percival (2006), the male (*M*=17.26, *S.D.*=7.41) and female (*M=18.20*, *S.D.*=7.95) student athletes reported mean PSS-10 scores within the "slightly higher than average" range, which reflects a "high" level of health concern related to the negative physiological and psychological effects of elevated levels of perceived stress. Asberg, Bowers, Renk, and McKinney (2008) reported PSS-10 total scores for 122 college males (*M*=23.76, *S.D.*=7.01) and 117 college females (*M*=27.01, *S.D.*=6.58), which are notably higher than the mean reported for current study. The data from the current study are more consistent with Button (2014), who

provided data on a sample of health professional students and reported a mean of 19.72 (*S.D.*=7.04). Results for the current study are presented in Figure 3.9.

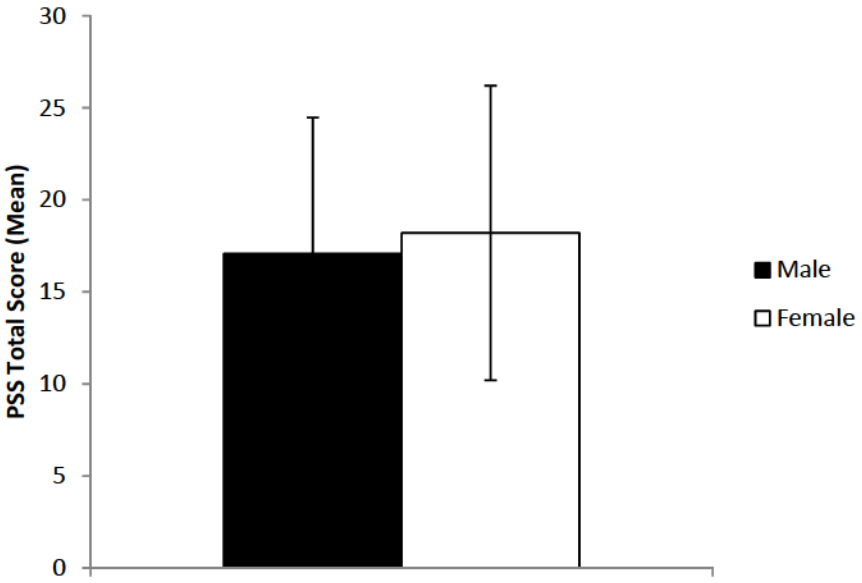

Figure 3. 9. Mean PSS-10 Scores and Standard Deviations for Male and Female Student Athletes.

3.5 Eating Pathology

3.5.1 Athletic Status. In order to investigate eating pathology risk in student athletes and student non-athletes, the EAT-26 was administered to both groups. A 2 x 2 factorial ANOVA – sample (student athlete vs student non-athlete) by sex (male vs female) - was performed using EAT-26 total scores as the dependent variable. The sample main effect of this ANOVA provided a test of hypothesis 1a, " Student non-athlete participants will report significantly higher risk for eating pathology than will student athlete participants". The analysis revealed that the student athletes (*M*=52.31, *S.D.*=14.43) reported a lower mean total score on the EAT-26 than did the student non-

athlete II participants (M=60.29, $S.D.$=19.42), however, contrary to expectations, the difference did not reach significance, $F(1,202)=1.323$, $p=.251$, with a partial $\eta^2=.007$. These results are presented in Figure 3.10.

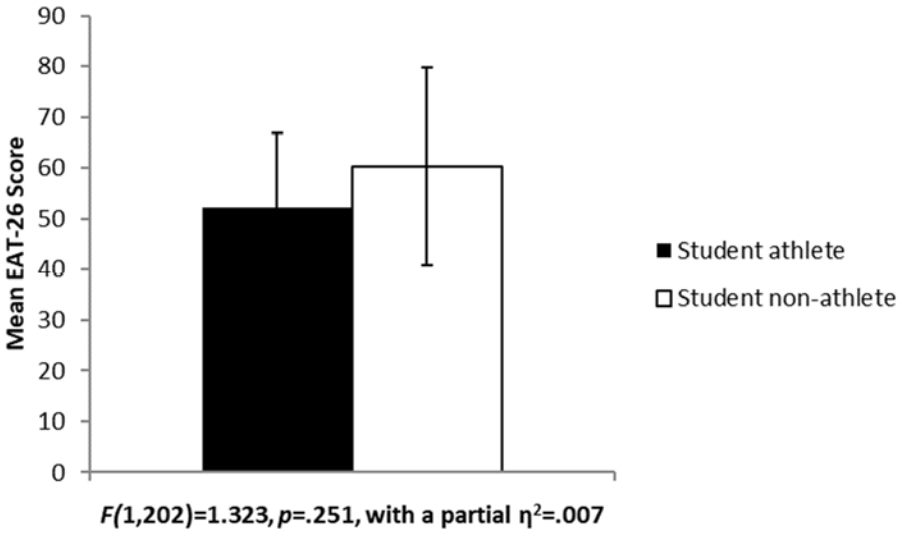

Figure 3. 10. Student Athletes and Student Non-athletes Total EAT-26 Scores and Standard Deviations.

In order to further examine eating pathology risk in these samples, scores on the EAT-26 were converted to a dichotomous variable representing the presence or absence of clinical concern and a Chi Square test of independence was performed. The results indicated that student non-athlete participants (n=16, 13.0%) were significantly more likely than the student athletes (n=4, 4.80%) to have reported EAT-26 scores within the range of clinical concern, $\chi 2$ (1, n = 207) = 3.889, p = .049, phi = - .137 (small effect size). These results are presented in Figure 3.11.

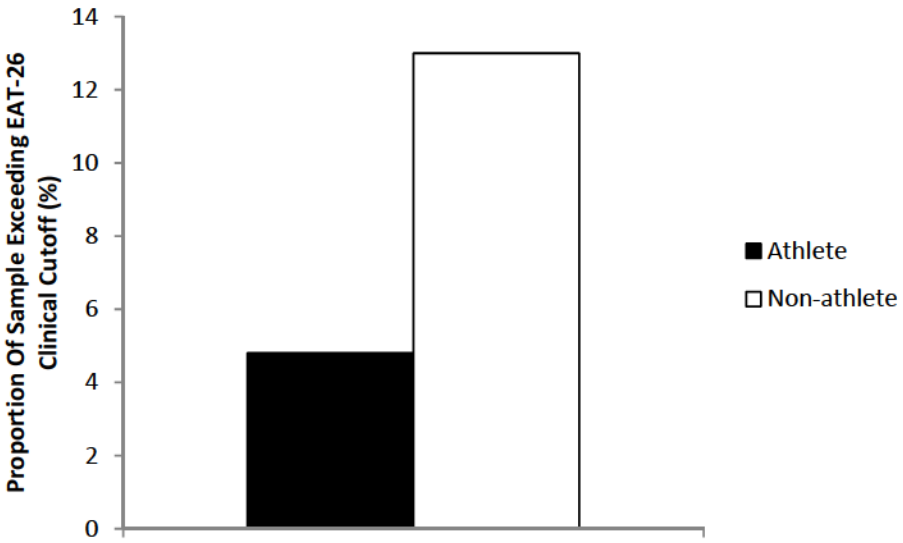

Figure 3. 11. Proportion of Student Athletes and Student Non-athletes Scoring within the Range of Clinical Concern on the EAT-26.

3.5.2 Sex Differences. The sex main effect of the above ANOVA provided a test of hypothesis 3a, "Female participants (student athletes and student non-athletes) will report significantly higher risk for eating pathology than will male participants". The analysis revealed that the male participants (M=48.11, $S.D.$=11.23) reported a lower mean total score on the EAT-26 than did the female participants (M=62.04, $S.D.$=19.08) and consistent with expectations, the difference was significant, $F(1,202)=23.163$, $p<.00$, partial $\eta 2=.103$. These results are presented in Figure 3.12.

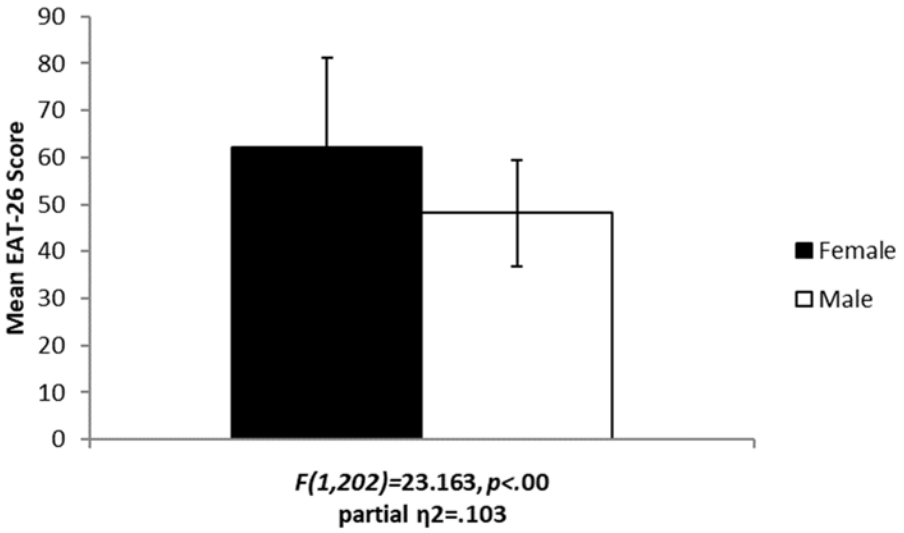

Figure 3. 12. Male and Female Participants' Total EAT-26 Scores and Standard Deviations.

In order to further examine sex differences in eating pathology in the student athlete sample, the SCOFF data was converted into a dichotomous variable (positive vs negative) for the presence of clinical concern. A Chi-square test for independence was conducted on the new SCOFF variable and sex which provided a test of hypothesis 3b, "Female student athletes will be significantly more likely to score within the range of clinical concern on an index of clinical levels of eating pathology (SCOFF) than will male student athletes". The results indicated that more female student athletes (n=5, 14.3%) exceeded the clinical cutoff on the SCOFF than did male student athletes (n=3, 6.12%). Contrary to expectations, the results indicated that the difference between male and female student athletes in terms of the relative likelihood of reporting SCOFF scores

within the range of clinical concern was non-significant, $\chi 2(1, n=84)=1.579$, $p=.209$, phi=.137. These results are presented in Figure 3.13.

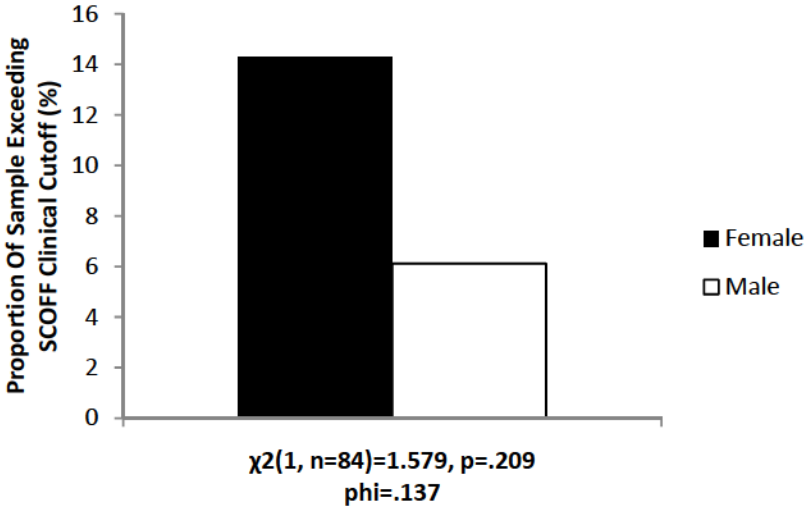

Figure 3. 13. Proportion of Male and Female Student Athletes Scoring within the Range of Clinical Concern on the SCOFF.

3.5.3 Athletic status by sex interaction. The fact that the interaction term was non-significant, $F(1,202)=0.074$, $p=.786$, indicated that female participants scored significantly higher than males on the EAT-26, regardless of whether the females were student athletes or student non-athletes.

3.6 Body Satisfaction

3.6.1 Athletic Status. Another 2 x 2 factorial ANOVA – sample (student athlete vs student non-athlete) by sex (male vs female) – was performed using the mean items responses on the BASS as the dependent variable. Age was entered in the ANOVA as a covariate due to the fact that the student athletes were shown to be significantly older than the student non-athletes and age was also shown to significantly predict mean BASS

item responses. The sample main effect of this ANOVA provided a test of hypothesis 1b," Student non-athlete participants will report significantly lower scores on an assessment of body satisfaction (BASS) than will student athlete participants". Consistent with the hypothesis, the analysis revealed that the student non-athlete II participants (M=3.21, $S.D.$=0.66) reported significantly lower BASS scores than did the student athletes (M=3.73, $S.D.$=0.59), $F(1,204)=14.037$, $p<.00$, with a partial $\eta^2=.066$, indicating a small effect size. These results are presented in Figure 3.14.

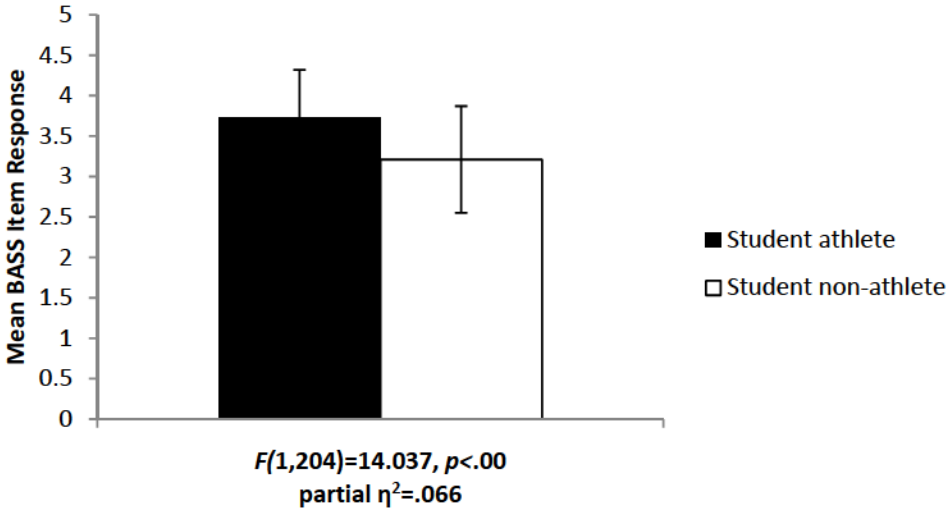

Figure 3. 14. Student Athletes and Student Non-athletes Mean BASS Item Responses and Standard Deviations.

3.6.2 Sex Differences. The sex main effect of the above ANOVA provided a test of hypothesis 3b, "Female participants (student athletes and student non-athletes) will report significantly lower body satisfaction than will male participants". The analysis revealed that the male participants (M=3.68, $S.D.$=0.67) reported a higher mean item score on the BASS than did the female participants (M=3.27, $S.D.$=0.64) and consistent

with expectations, the difference was significant, $F(1,204)=5.911$, $p=.016$, with a partial $\eta^2=.029$. These results are presented in Figure 3.15.

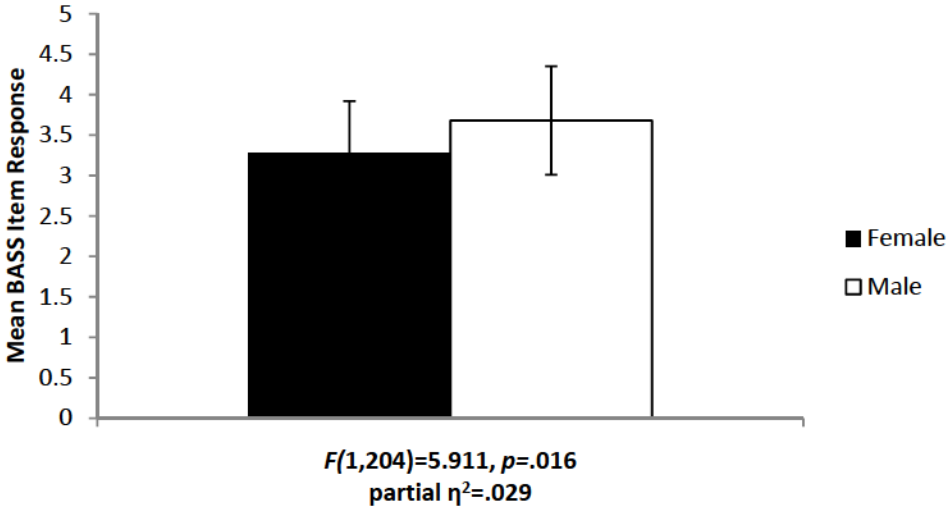

Figure 3. 15. Male and Female Participants' Mean BASS Item Responses and Standard Deviations.

3.6.3 Athletic Status by sex interaction. The fact that the interaction term was non-significant, $F(1,202)=1.654$, $p=.200$, suggested that male participants reported significantly higher mean item responses than females on the BASS, regardless of if the females were student athletes or student non-athletes.

3.7 Lean and Non-lean sport student athletes

It was planned to compare scores on the EAT-26 and the BASS across participants from each sports team. Unfortunately, not enough participants were able to be recruited from each team to satisfy the underlying assumptions for null hypothesis significance testing. As such, the student athlete sample was divided into two groups, 34 lean sport student athletes (wrestling, cross-country running, and swimming) and 50 non-

lean sport student athletes (soccer, basketball, volleyball) based on the categorization used by (Sanford-Martens, et al., 2005).

3.7.1 Eating pathology and relative lean emphasis. A 2 x 2 factorial ANOVA – relative lean emphasis (lean sport vs non-lean sport) by sex (male vs female) – was performed using mean total scores on the EAT-26 as the dependent variable. The sample main effect of this ANOVA provided an evaluation of hypothesis 2a," Lean sport student athletes will report significantly higher risk for eating pathology than will non-lean sport student athletes". The results indicated that the lean sport student athletes (*M*=55.16, *S.D.*=14.14) reported higher EAT-26 total scores than did the non-lean sport student athletes (*M*=49.56, *S.D.*=12.18), however, contrary to the hypothesis, the difference did not achieve significance, $F(1,72)=0.419$, $p=.486$, phi = .007. These results are presented in Figure 3.16.

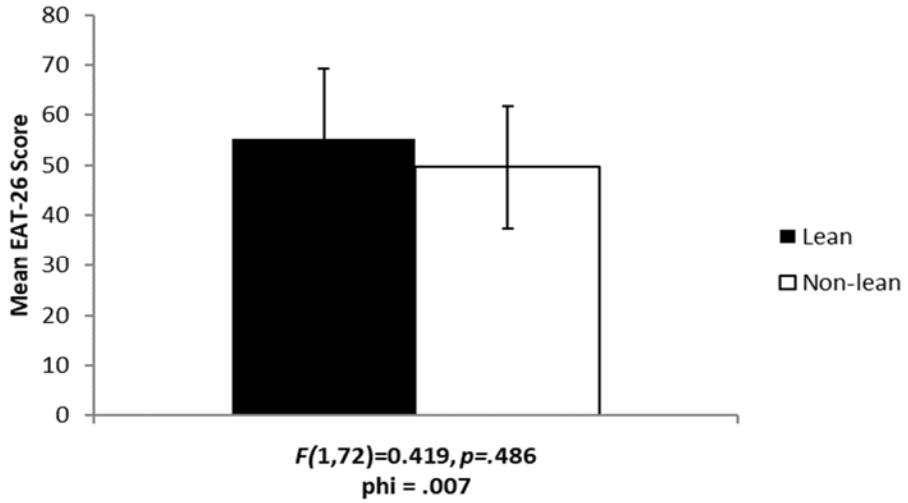

Figure 3. 16. Lean sport and non-lean sport student athletes' Total EAT-26 scores and standard deviations.

In order to further investigate eating pathology risk in lean and non-lean sport student athletes, scores on the EAT-26 were once again converted to a dichotomous variable representing the presence or absence of clinical concern and a Chi Square test of independence was performed. The results indicated that lean sport student athletes (n=2, 5.88%) were not significantly more likely than non-lean sport student athletes (n=2, 1.00%) to have reported EAT-26 scores within the range of clinical concern, $\chi 2$ (1, n = 84) = 0.158, p = .691, phi = .043, (small effect size). These data are presented in Figure 3.17.

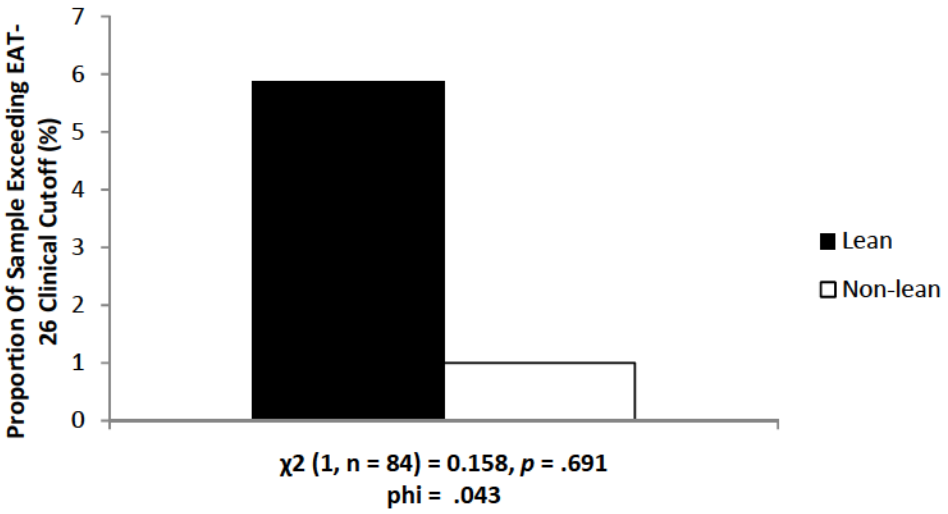

Figure 3. 17. Proportion of Lean and Non-lean Student Athletes Scoring within the Range of Clinical Concern on the EAT-26.

The items on the SCOFF were used to create a dichotomous variable (positive/negative) for student athlete participants to reflect scoring within the range of clinical concern on the instrument. The results indicated that lean sport athletes (n=5, 17.2%) scored within the range of clinical concern more frequently than did non-lean

(n=3, 6.0%) student athletes. In order to further evaluate hypothesis 2a, a Chi Square test of independence was performed using SCOFF clinical cutoff frequencies (clinical concern vs no clinical concern) and relative lean emphasis (lean vs non-lean). The results indicated that there was no significant difference between lean and non-lean student athletes, in terms of the relative likelihood of scoring within the range of clinical concern on the SCOFF, $\chi 2$ (1, n = 76) = 1.78, p = .182, phi = .146, (small effect size). These results are presented in Figure 3.18.

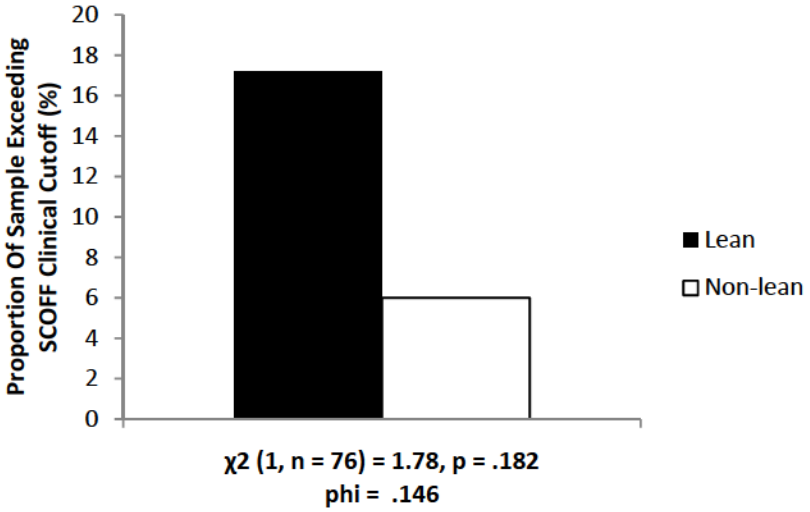

Figure 3. 18. Proportion of Lean and Non-lean Student Athletes Scoring within the Range of Clinical Concern on the SCOFF.

3.7.2 Eating pathology and sex in lean and non-lean sport student athletes.

With the purpose of investigating sex differences in eating pathology risk between lean and non-lean sport student athletes a 2 x 2 factorial ANOVA – relative lean emphasis (lean sport vs non-lean sport) by sex (male vs female) - was performed using EAT-26 total scores as the dependent variable. The sex main effect of this ANOVA provided

further evaluation of hypothesis 3a, "Female participants (student athletes and student non-athletes) will report significantly higher risk for eating pathology than will male participants". The analysis revealed that the female participants (M=57.09, $S.D.$=12.40) reported a higher mean total score on the EAT-26 than did the male participants(M=47.09, $S.D.$=11.96) and, consistent with expectations, the difference was significant, $F(1,72)$=14.143, p<.00, partial η2=.164. These results are presented in Figure 3.19.

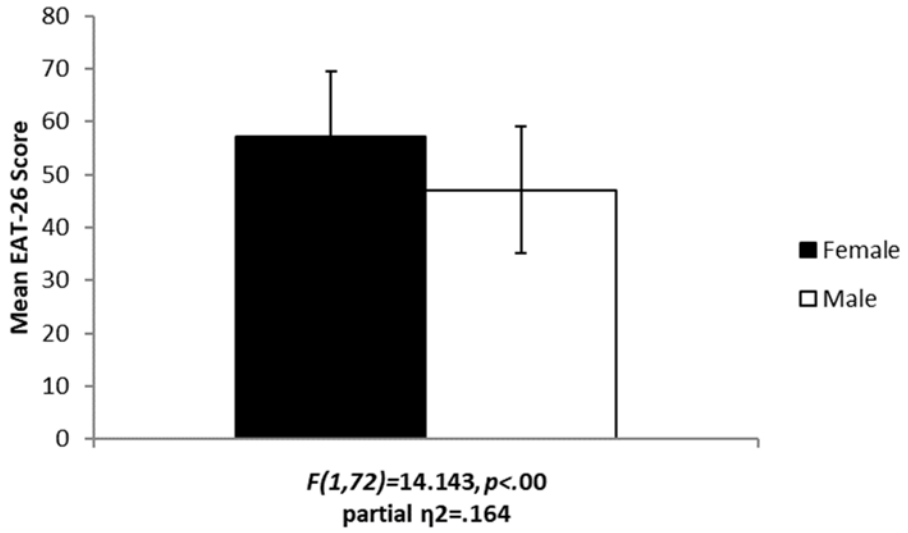

Figure 3. 19. Male and Female Student Athletes Total EAT-26 Scores and Standard Deviations.

3.7.3 Relative lean emphasis and sex interaction. The fact that the interaction term was non-significant, $F(1,72)$=0.0.935, p=.337, with a partial η^2=.013, indicated that female student athletes scored significantly higher than males student athletes on the EAT-26, regardless of whether they were lean or non-lean sport student athletes.

3.7.4 Body satisfaction in lean and non-lean sport student athletes. Another 2 x 2 factorial ANOVA – relative lean emphasis (lean sport vs non-lean sport) by sex (male vs female) – was performed using the mean items responses on the BASS as the dependent variable. The relative lean emphasis main effect of this ANOVA provided a test of hypothesis 2b, "Lean sport student athletes will report significantly lower body satisfaction than will non-lean sport student athletes". However, contrary to the hypothesis, the results indicated that the lean sport student athletes (M=3.92, $S.D.$=0.60) reported significantly higher mean BASS item responses than did the non-lean sport student athletes (M=3.61, $S.D.$=0.56), $F(1,80)=6.199$, $p=.015$, with a partial $\eta^2=.072$, indicating a small effect size. These results are presented in Figure 3.20.

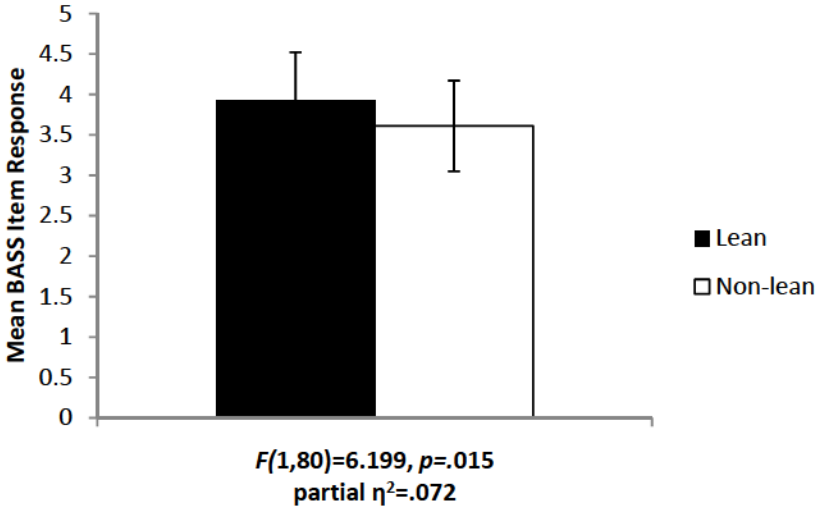

Figure 3.20. Lean and Non-lean Sport Student Athletes' Mean BASS Item Responses and Standard Deviations.

The sex main effect of the above ANOVA provided a test of hypothesis 3b, "Female participants (student athletes and student non-athletes) will report significantly

lower body satisfaction than will male participants". The analysis revealed that the female student athletes (M=3.67, $S.D.$=*0.51*) reported a lower mean item response on the BASS than did the male student athletes (M=3.78, $S.D.$=0.65) and, contrary to expectations, the difference was non-significant, F(1,80)=1.388, p=.242, with a partial η^2=.017. This result was not only contrary to the hypothesis but it was also contradictory of the results of the sample x sex ANOVA comparing mean BASS item responses. More specifically, the sex main effect from the sample x sex ANOVA was shown to be significant and the interaction term was shown to be non-significant, which suggested that males reported higher mean BASS item responses, regardless of if they were athletes or non-athletes. However, as was noted above, the sex main effect from the lean emphasis x sex ANOVA comparing mean BASS item responses indicated that male and female student athletes did not differ significantly in terms of mean BASS item responses. Closer inspection of the data revealed the observed power estimate (.21) for the interaction term in the sample x sex ANOVA comparing mean BASS item responses was quite low. Thus, the current data suggests that there was not sufficient power to detect the interaction effect in the sample x sex ANOVA comparing mean BASS item responses and that males reported significantly higher mean BASS item responses than did females, but only for the student non-athlete group. The results for the sex main effect are presented in Figure 3.21.

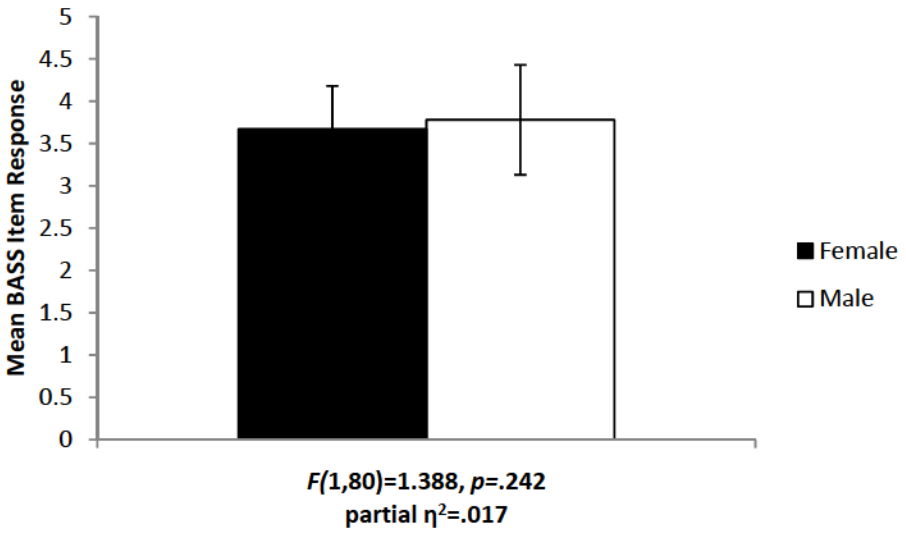

Figure 3. 21. Male and Female Student Athletes Mean BASS Item Responses and Standard Deviations.

The fact that the interaction term was non-significant, $F(1,80)=0.011$, $p=.916$, with a partial $\eta^2=.000$, indicated that female student athletes reported significantly lower mean item responses on the BASS than male student athletes, whether or not they were lean or non-lean sport student athletes.

3.8 Perceived Stress in Student athletes and Student non-athletes

With the purpose of investigating differences in perceived stress, the HIDS stress item was completed by the student non-athlete and student athlete samples. A 2 x 2 factorial ANOVA – sample (student athlete vs student non-athlete) by sex (male vs female) - was performed using HIDS stress item score as the dependent variable. Age was entered in the ANOVA as a covariate due to the fact that the student athletes were shown to be significantly older than the student non-athletes and age was also shown to

significantly predict HIDS stress item responses. The sample main effect of this ANOVA provided a test of hypothesis 4a, "Student non-athletes will report significantly lower perceived stress than will student athletes". The analysis revealed that, consistent with expectations, participants from the student non-athlete sample (M=5.78, $S.D.$=2.16) reported significantly lower stress than did the student athletes (M=6.19, $S.D.$=2.20), $F(1,1625)=7.084$, $p<.00$, with a partial $\eta^2=.004$, indicating a small effect size. These results are presented in Figure 3.22.

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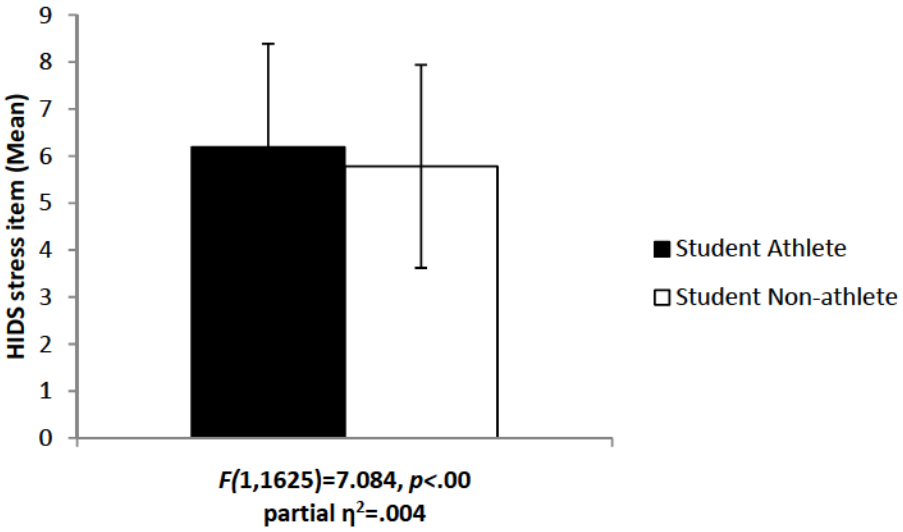

Figure 3. 22. Student Athlete and Student Non-athlete Participants' Mean HIDS Stress Item Scores and Standard Deviations.

The ANOVA above indicated that there was no significant main effect of sex, $F(1,1625)=1.892$, $p=.169$, with a partial $\eta^2=.001$, thus there was no significant difference between the male (M=5.75, $S.D.$=0.16) and female (M=6.11, $S.D.$=0.18) groups on the HIDS Stress Item. These results are presented in Figure 3.23.

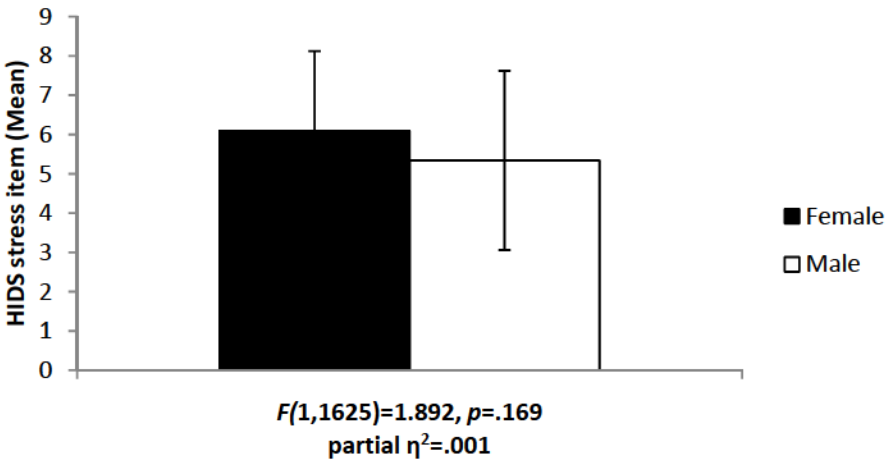

Figure 3. 23. Male and Female Participants' HIDS Stress Item Scores and Standard Deviations.

The interaction term approached significance, $F(1,1625)=3.472$, $p=.063$, with a partial $\eta^2=.002$, nevertheless, the effect of sample was consistent across sexes, such that both male and female student athletes reported higher scores on the HIDS Stress Item than did both male and female participants from the student non-athlete II sample. These data are displayed in Figure 3.24.

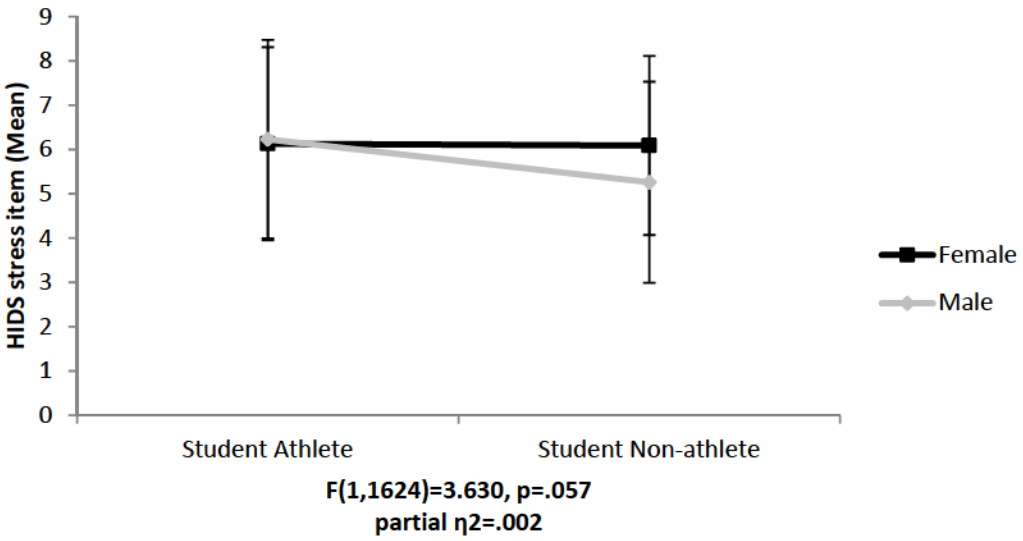

Figure 3. 24. Male and Female Participants' HIDS Stress Item Scores (Divided by Sample) and Standard Deviations.

3.9 Difficulties in Emotion Regulation in Student athletes and Student non-athletes

In order to examine differences in difficulties in emotion regulation, the DERS was completed by the student non-athlete II and student athlete samples. A 2 x 2 factorial ANOVA – sample (student athlete vs student non-athlete) by sex (male vs female) - was performed using total DERS scores as the dependent variable. The sample effect of this ANOVA provided a test of hypothesis 5a, "Student athletes will report significantly fewer difficulties in emotion regulation than will student non-athletes". Supporting the hypothesis, the analysis revealed that the student non-athlete participants reported higher total scores on the DERS (M=51.87, $S.D.$=18.46) than did the student athletes (M=45.72, $S.D.$=16.62). However, inconsistent with the hypothesis, the difference merely

approached significance, $F(1,202)=3.405$, $p=.066$, and the partial $\eta^2=.017$ indicated a small effect size. These results are presented in Figure 3.25.

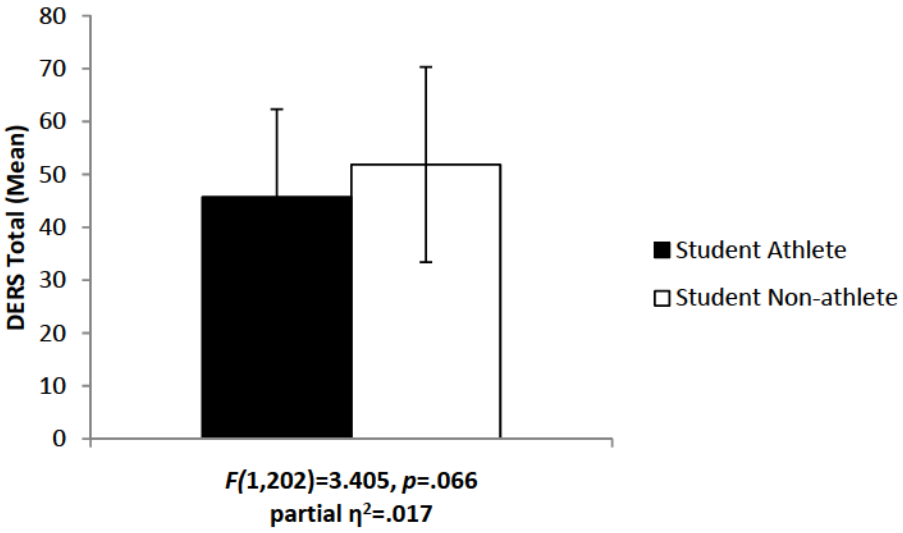

Figure 3. 25. Student Athlete and Student Non-athlete Participants' Mean DERS Scores and Standard Deviations.

The ANOVA above indicated that there was no significant main effect of sex, $F(1,202)=1.424$, p=.234, with a partial η2=.007, thus there was no significant difference between the male ($M=45.97$, $S.D.=18.79$) and female ($M=51.27$, $S.D.=17.24$) groups on the DERS. These results are presented in Figure 3.26.

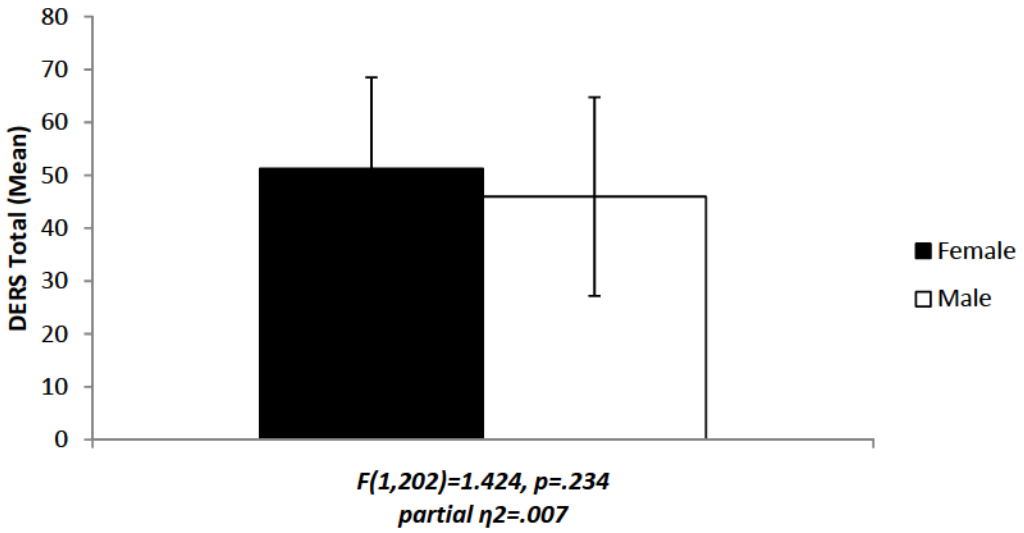

Figure 3. 26. Male and Female Participants' Mean DERS Scores and Standard Deviations.

Finally, the interaction term was non-significant, $F(1,202)=0.213$, $p=.645$ with a partial $\eta 2=.001$, thus no significant differences in difficulties in emotion regulation were observed across males and females or across student athletes and student non-athletes . These data are displayed in Figure 3.27

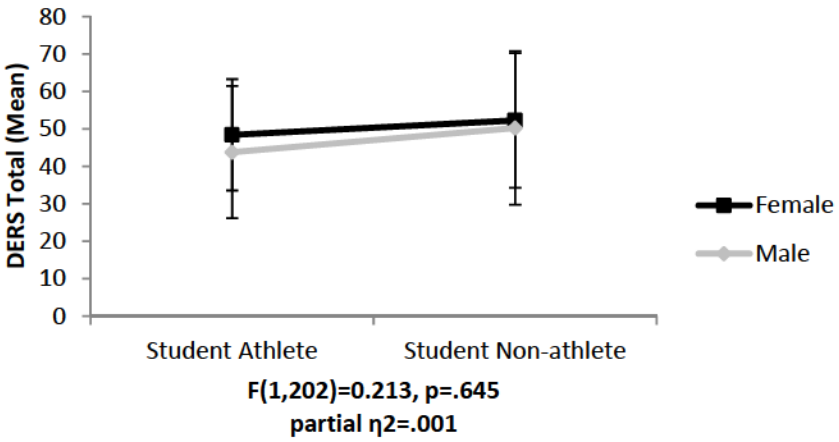

Figure 3. 27. Male and Female Participants' Mean DERS Scores (Divided by Sample) and Standard Deviations.

3.10 Eating Pathology, Body Satisfaction and Difficulties in Emotion Regulation: Mediational Models

Based on the research investigating the role of difficulties in emotion regulation in the development and maintenance of eating pathology it was predicted that the relationship between athletic status (athlete/non-athlete) and eating pathology (EAT-26 total) would be significantly mediated by total scores on the DERS (hypothesis 6a). In order to test this prediction Baron and Kenny's (1986) steps for mediation analysis were employed. Performing these steps established that zero-order relationships existed between the variables comprising the meditational model. If one of these steps was not significant, the mediational model would have been presumed inadequate (Tabachnick & Fidell, 2007).

Results from the regression analyses supported the proposed mediational model and are presented in Table 3.5 and Figure 3.28. The independent variable (athletic status) significantly predicted both the dependent variable (EAT-26 total scores: R = .181, $F(1,205)=6.911$, $p<.00$) and the proposed mediator (DERS total scores: R = .297, $F(1,205)=19.855$, $p<.00$). Additionally, the proposed mediator (DERS total scores) significantly predicted the dependent variable (EAT-26 total scores: R = .326, $F(1,205)=6.911$, $p<.00$). Finally Sobel's test was used to evaluate the significance of the mediation effect, which was significant, z = -2.034, p=.042. However, the fact that the relationship between the independent variable (athletic status) and dependent variable (EAT-26 total scores) remained significant when the effect of the mediator was controlled for indicates that the proposed mediator (DERS total scores) only partially mediated the relationship between athletic status and EAT-26 total scores.

Table 3. 5

Summary of Regression Analysis for Sobel's Test of Mediation (DERS).

Variable		*B*	*SE B*	β	*t*	*R*	R^2
Regression 1						.181**	0.033
	Athletic status	-3.135	1.193	-0.181	-2.629**		
Regression 2						.161**	0.026
	Athletic status	-5.907	2.521	-0.161	-2.343**		
Regression 3						.326**	0.106
	Athletic status	-2.364	1.164	-.136	-2.030*		
	DERS Total	0.131	0.032	0.275	4.103**		

* $p < .05$, ** $p < .01$ Note. Outliers included. Regression 1 (predictor = athletic status; criterion = EAT-26 total), Regression 2 (predictor = athletic status; criterion = DERS total), Regression 3 (predictors = athletic status and DERS total; criterion = EAT-26 total). EAT-26 Total = Eating Attitudes Test-26 Total Score; Athletic Status=athlete/non-athlete; DERS-TOTAL = Difficulties in Emotion Regulation Scale Total Score.

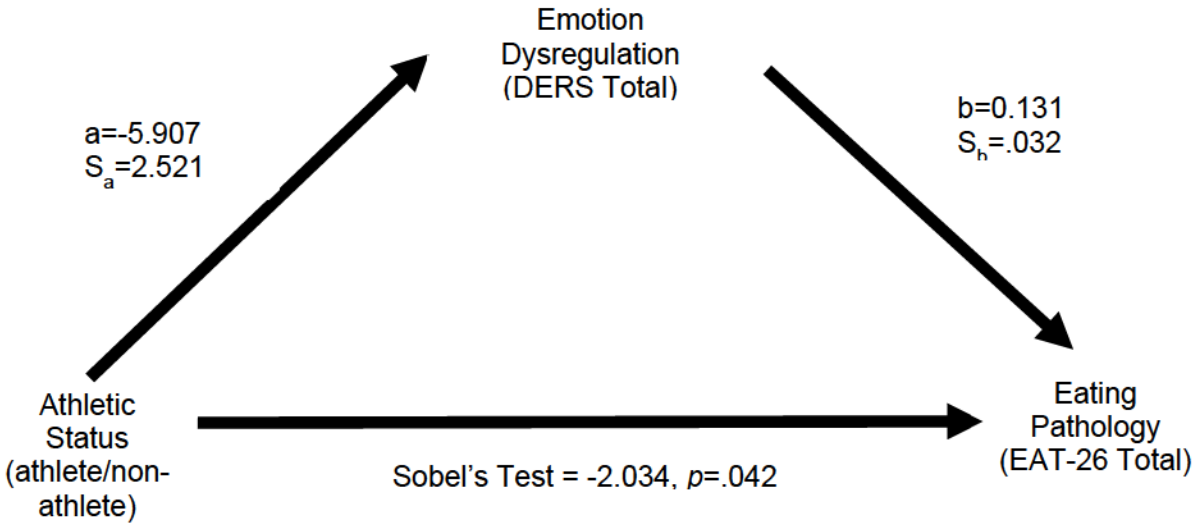

Figure 3. 28. Sobel's Test of Mediation (DERS).

Based on the research which indicated that student athletes tend to report significantly higher scores on assessments of body satisfaction than their non-athlete counterparts, it was hypothesized that the relationship between athletic status (athlete/non-athlete) and eating pathology (EAT-26 total) would be significantly mediated by mean item scores on the BASS (hypothesis 6b). In order to test this prediction Baron and Kenny's (1986) steps for mediation analysis were once again employed.

Results from the regression analyses supported the proposed mediational model and are presented in Table 3.6 and Figure 3.29. The independent variable (athletic status) significantly predicted both the dependent variable (EAT-26 total scores: R = .215, $F(1,205)=9.887$, $p=.002$) and the proposed mediator (BASS mean item scores: R = .373, $F(1,205)=33.109$, $p<.00$). Additionally, the proposed mediator (BASS mean item scores) significantly predicted the dependent variable (EAT-26 total scores: R = .482, $F(1,205)=62.104$, $p<.00$). Finally Sobel's test was used to evaluate the significance of the mediation effect, which was significant, z = -2.034, $p=.042$. However, the fact that the relationship between the independent variable (athletic status) and dependent variable (EAT-26 total scores) remained significant when the effect of the mediator was controlled for indicates that the proposed mediator (DERS total scores) only partially mediated the relationship between athletic status and EAT-26 total scores.

Table 3.6

Summary of Regression Analysis for Sobel's Test of Mediation (BASS).

Variable		*B*	*SE B*	β	*t*	*R*	R^2
Regression 1						.215**	0.046
	Athletic status	-7.821	2.487	-0.215	-- 3.144**		
Regression 2						.373**	0.138
	Athletic status	-0.516	0.090	0.373	- 5.754**		
Regression 3						.484**	0.234
	Athletic status	-1.469	2.408	-0.040	-0.61		
	BASS mean item response	-12.305	1.740	-0.476	- 7.074**		

* $p < .05$, ** $p < .01$ Note. Outliers included. Regression 1 (predictor = athletic status; criterion = EAT-26 total), Regression 2 (predictor = athletic status; criterion = BASS mean item responses), Regression 3 (predictors = athletic status and BASS mean item responses; criterion = EAT-26 total). EAT-26 Total = Eating Attitudes Test-26 Total Score; Athletic Status=athlete/non-athlete; BASS = Body Areas Satisfaction Scale.

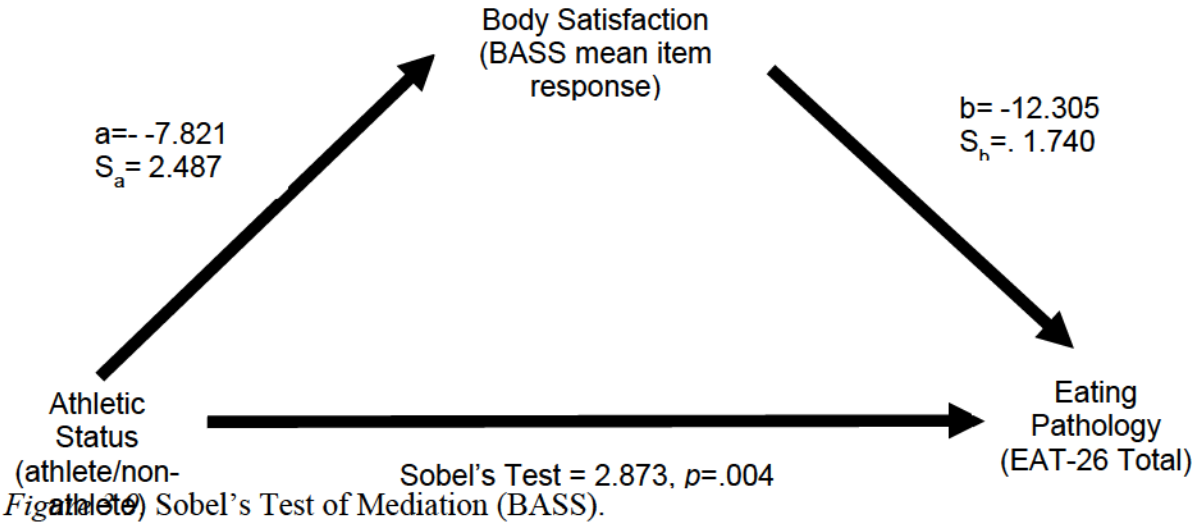

Figure 3.9 Sobel's Test of Mediation (BASS).

4. CHAPTER FOUR

Discussion

4.1 Overview of Current Findings

4.1.1 Eating pathology in student athletes and student non-athletes. Contrary to the hypothesis, the data analysis comparing student athletes and student non-athletes with respect to eating pathology risk revealed that there was no significant difference between the student athlete and student non-athlete participants. Although this finding did not support the hypothesis, it is consistent with the results of Wilkins, Boland and Albinson (1991). However, a number of previous studies which investigated eating pathology risk in student athletes and student non-athletes using the EAT-26 found that student non-athletes reported significantly higher EAT-26 scores than did student athletes (DiBartolo & Shaffer, 2002; Gaines & Burnett, 2014; Kirk, Singh, & Getz, 2001; Wollenberg, Shriver, & Gates, 2015). Closer inspection of the current data revealed that the EAT-26 total scores reported by the male participants from the student non-athlete sample were much lower than those reported by other researchers who have reported EAT-26 data for male undergraduate populations (Makino, Hashizume, Tsuboi, Yasushi, & Dennerstein, 2006; Sira & White, 2010). Thus, the current data indicates that the unexpectedly low EAT-26 total scores reported by the male student non-athletes accounts for the fact that the difference in EAT-26 total scores between student athletes and student non-athletes was non-significant. Nevertheless, what might explain the fact that the male student non-athletes from the current study reported such unexpectedly low scores on the EAT-26?

The most parsimonious explanation for the low observed EAT-26 scores reported by the male student non-athletes is that college-aged males from the province from which the student non-athlete participants were recruited exhibit a particularly low risk for eating pathology. The previous proposition is evidenced by the fact that scores reported by the male student non-athletes were consistent with the data from the 2002 Canadian Community Health Survey for the province from which participants were recruited. The CCHS 2002 data indicated that, of individuals aged 16-29 years, females (*M*=11.21, *S.D.*=9.09) and males (*M*=3.16, *S.D.*=2.09) reported similar EAT-26 total scores to the females (*M*=10.08, *S.D.*=10.25) and males (*M*=3.88, *S.D.*=3.17) from the student non-athlete sample (Stats Canada, 2002). In order to further explore how the current EAT-26 data compared to previous studies, the CCHS 2002 data was used to calculate national means for the male (*M*=8.21, *S.D.*=6.61) and female participants (*M*=11.12, *S.D.*=9.61). The mean EAT-26 score for females from the province from which the student non-athlete participants were recruited was very similar to the national mean. In contrast, the EAT-26 mean for the males from the province from which the student non-athlete participants were recruited was much higher than that reported by the male student non-athletes. Furthermore, when the CCHS 2002 EAT-26 mean total scores were rank ordered for each province it was revealed that males from the province from which participants were recruited ranked lowest in Canada, with the next lowest mean being 5.83 (*S.D.*=4.69). Thus, the EAT-26 data for male student non-athletes was consistent with provincial and national trends in EAT-26 scores and suggests that community and

college attending males, aged 16-29 years, from the province from which the student non-athlete participants were recruited exhibit unusually low risk for eating pathology.

Interestingly, when the EAT-26 data was dichotomized based on the cutoff score for clinical concern, it was revealed that the student non-athletes were significantly more likely to score within the range of clinical concern than were student athletes. This result is in contrast to previous studies which have compared the rates of clinical concern between student athletes and student non-athletes (Kirk, Singh, & Getz, 2001; Schwarz, Aruguete, & Gold, 2005). These two previous studies reported that there was no significant difference between student athletes and student non-athletes, with respect to the relative likelihood of scoring within the range of clinical concern on the EAT-26. It should be noted, however, that all the participants from these two previous studies were female and research has demonstrated that females, in general, tend to experience greater risk for eating pathology than do males. Thus, in the two previous female-only studies, it may have been that the protective effect of athletics was not sufficient to overcome the effect of sex. Nevertheless, the EAT-26 cutoff data from the current study suggests that participation in athletics by both male and female university students is associated with lower levels of eating pathology risk, when compared to male and female non-athlete university students.

The student non-athletes reported significantly lower scores on body satisfaction on the BASS than did the student athletes. This result is consistent with other studies which have compared university student athletes and student non-athletes using a variety of instruments to assess body satisfaction (or dissatisfaction) (e.g., Petrie, 1996; Wilkins,

Boland, & Albinson, 1991; Zucker, Womble, Mlliamson, & Perrin, 1999). Thus, the current data, in combination with previous research, suggests that student athletes tend to experience greater satisfaction with their bodies. This trend across studies is not surprising, considering that student athletes engage in regular physical activity, which very likely results in the bodily changes associated with body satisfaction such as leanness and muscularity.

Overall, the results of the current study suggest that participation in athletics by male and female university students is associated with lower levels of eating pathology risk, when compared to male and female university non-athletes. This is consistent with research which compared student athletes and student non-athletes using other eating pathology and body satisfaction assessment instruments (e.g., Petrie, 1996; Sanford-Martens, et al., 2005; Wilkins, Boland, & Albinson, 1991). Furthermore, given the important etiological role of body dissatisfaction in eating pathology development and maintenance, the current and previous data suggest that the proposed protective effect of athletics may be, in large part, due to the association between higher levels of body satisfaction which may be related to athletic participation. Indeed, it is logical to assume that student athletes' bodies more closely match the socially prescribed ideal due to the fact that they engage in regular physical activity. As such, it is also likely that student athletes tend to be more satisfied with their bodies than student non-athletes because they perceive less of a discrepancy between their ideal and actual bodies. Alternatively, it may be that undergraduates who are high in body satisfaction and exhibit low risk for eating pathology tend to engage in athletics more frequently than those who are dissatisfied with

their bodies and at relatively high risk for eating pathology. It is worth noting that data from the current study did not fully support the interpretations above, in that one result suggested that males were more satisfied with their bodies than females, regardless of athletic status, while another result suggested that there was no significant difference in body satisfaction between male and female student athletes. However, the extant literature tends to suggest that male university students experience greater body satisfaction than females, whether they compete in intercollegiate athletics or not (Sanford-Martens, et al. 2005).

While the evidence from the current study suggests that university student athletes are somewhat protected from eating pathology, it is also possible that the instruments used to assess eating pathology have failed to capture the unique manifestation of eating pathology in this special population. Thus, the interpretations above must be considered within the context of athletic culture. Researchers have identified aspects of athletic culture which are different from the general population. For example, student athletes experience pressures to change their body weight and shape from coaches and teammates in order to optimize their athletic performance (Davis & Cowles, 1989; Galli, Petrie, Reel, Chatterton, & Baghurst, 2014). Hence, body satisfaction assessments, such as the BASS, which assess one's satisfaction with the appearance of their bodies would not capture lower levels of body satisfaction related to performance aspects of their bodies. Furthermore, researchers have provided evidence that pathological attitudes and behaviors can be considered normative within the subculture of intercollegiate athletics. For example, in weight class sports (those which require athletes to be a certain weight)

"cutting weight" or losing a relatively large amount of weight (e.g., 10-20 lbs) in a short period of time (e.g., 1-2 days) is a relatively common behaviour. In order to "make weight", athletes have been documented to engage in pathogenic and unhealthy weight loss behaviours, such as fasting and over-exercising (Chatterton & Petrie, 2013). Thus, further research will be required to elucidate the complex relationship between university athletics, body satisfaction, and eating pathology within the context of the unique intercollegiate athletic culture.

4.1.2 Eating pathology in lean and non-lean sport student athletes. The results of the present research indicated that lean sport student athletes reported higher total EAT-26 scores than did the non-lean sport student athletes, however, contrary to predictions, this difference was non-significant. Similarly, a greater proportion of lean sport student athletes reported EAT-26 and SCOFF scores within the range of clinical concern than did non-lean sport student athletes, however, the differences were once again non-significant. These results are consistent with previous research which investigated differences in eating pathology risk in lean and non-lean sport student athletes using the EAT-26. Previous studies have reported that there was no significant difference in EAT-26 total scores or the likelihood of scoring within the range of clinical concern on the EAT-26 between lean and non-lean sport student athletes (Kirk, Singh, & Getz, 2001; Schwarz, Aruguete, & Gold, 2005). It is important to note that these two previous studies recruited only female participants; however, another study which employed the QEDD with a mixed-sex sample of lean and non-lean sport student athletes reported that there was no significant difference in the likelihood of being classified as

clinical or subclinical between lean and non-lean sport student athletes (Sanford-Martens, et al., 2005). Interestingly, there are a number of studies which have reported results contrary to those observed in the current data (Picard, 1999; Reinking & Alexander, 2005; Warren, Stanton, & Blessing, 1990; Zucker, Womble, Mlliamson, & Perrin, 1999). Thus, there is considerable heterogeneity in the results of the current and previous studies. Some studies, including the current research, suggest that lean sport student athletes do not differ from non-lean sport student athletes in terms of eating pathology risk. Other research suggests that lean sport student athletes exhibit an increased eating pathology risk when compared to non-lean sport student athletes.

The same pattern of heterogeneity in results was observed in studies which compared body dissatisfaction between lean and non-lean sport student athletes. Previously, researchers have reported that lean sport student athletes scored higher on assessments of body dissatisfaction than did their non-lean peers (Picard, 1999; Reinking & Alexander, 2005; Warren, Stanton, & Blessing, 1990; Zucker, Womble, Mlliamson, & Perrin, 1999). Yet, the current study and previous researchers have failed to find a significant difference in body satisfaction between lean and non-lean sport student athletes (Ashley, Smith, Robinson, & Richardson, 1996; Sanford-Martens, et al., 2005; Schwarz, Aruguete, & Gold, 2005). These conflicting findings are possibly due to the fact that the sports from which "lean sport student athlete" groups were recruited in previous research have varied greatly. For example, the lean sport student athlete group in one study consisted of athletes recruited from cheerleading, high-tech dance, cross-country running, and track and field (Kirk, Singh, & Getz, 2001) and from cross country

running, gymnastics, swimming, diving, and wrestling in another (Sanford-Martens, et al. 2005). While this methodological inconsistency undoubtedly contributed to the mixed results observed in the research investigating differences in eating pathology and body satisfaction in lean and non-lean student athletes, there is also evidence to suggest that the entire lean/non-lean dichotomy may be an inappropriate reflection of reality.

Research investigating eating pathology in athletes in general (student and non-student) began largely due to anecdotal reports of athletes regarding their struggles with eating pathology. As such, early research focused on the sports in which these athletes participated, such as ballet or gymnastics, with the intuitive assumption that something about participation in these sports was associated with an increased risk of eating pathology. Given the emphasis and importance of aesthetics and body shape associated with performance evaluation in these sports, it was thought that this group of athletes experienced pressure to achieve an ideal body above and beyond that experienced by athletes who participated in sports with less emphasis on body shape for performance evaluation, such as basketball or soccer Researchers further speculated that participation in so-called "lean sports" resulted in increased risk for eating pathology through the effect of sociocultural and sport specific pressures on the body satisfaction of the lean sport athletes (Petrie, 1996; Picard, 1999). It was thought that increased pressure to attain an ideal body led lean sport athletes to become less satisfied with their bodies, which, in turn, has been demonstrated to be a potent predictor of eating pathology.

However, the mixed results from research which has investigated eating pathology in lean and non-lean sport student athletes suggests that there is a source of

uncontrolled variability. For example, one study found significant differences in eating pathology and body satisfaction between athletes who participated in gymnastics and cross-country running, two sports traditionally grouped together under the "lean sport" label (Warren, Stanton, & Blessing, 1990). Thus, there is preliminary evidence suggesting that "lean emphasis" may be better conceptualized from a dimensional, rather than categorical perspective. Based on this preliminary evidence, it is logical to suspect that different sports may emphasize aesthetics and leanness to a different degree.

Early researchers who investigated differences in eating pathology risk between lean and non-lean sport athletes relied on logic when operationalizing lean and non-lean sport groups (Smolak, et al., 2000; Borgen & Corbin, 1987). As such, subsequent researchers used the same operationalization when investigating differences between lean and non-lean sport student athletes. For example, Stoutjesdyk and Jevne (1993) stated that "Activities emphasizing leanness were defined as those in which appearance is considered highly important to success. Activities not emphasizing leanness were those in which appearance is deemed less essential to success (p. 274)", which was originally attributed to Borgen and Corbin (1987). Researchers continued to define lean sports based on the categories used in previous studies. For instance, Sanford-Martens, et al. (2005) specifically referenced the methodology of Petrie (1996) and defined lean sports as those which "have weight requirements, appearance considerations, or where being thin has a competitive advantage (p. 80)." It was presumed that athletes who participated in lean sports experienced greater pressure to achieve a perfect body than their non-lean counterparts, which in turn led to body dissatisfaction and the development

of eating pathology. However, researchers have not directly measured "pressure to attain a perfect body" in the various lean and non-lean sports. It may be that some, so-called, lean sports turn out to be associated with relatively low levels of pressure to conform to body ideals.

4.1.3 Sex differences in eating pathology.

Sex differences between student athletes and student non-athletes. The data analysis indicated that female participants reported significantly higher total scores on the EAT-26 and were also significantly more likely to score within the range of clinical concern on the EAT-26 than were male participants. This result is consistent with a number of studies which have investigated eating pathology risk in undergraduate (National College Health Assessment, 2007) and community samples (APA, 2000). A large body of research suggests that one reason why females experience a disproportionate risk for eating pathology is that they tend to experience relatively higher levels of pressure to conform to an unrealistic, socially prescribed body ideal (Bessenoff, 2006; Engeln-Maddox, 2005; Strahan, Wilson, Cressman, & Buote, 2006; Striegel-Moore, Silberstein, & Rodin, 1986). Furthermore, the above research also suggests that women experience relatively lower levels of body satisfaction compared to men as a result of sociocultural pressure to achieve an unrealistic body ideal. As such, the BASS was used to investigate sex differences in body satisfaction as well. More specifically, based on a large body of research which suggested that female undergraduates experience lower body satisfaction than their male peers, it was expected that the same effect would be observed in the current samples of athletes and non-athletes. Indeed, the results of the

data analysis were consistent with this prediction and indicated that female participants reported less satisfaction with their bodies than did male participants. The significant sex main effect is consistent with a number of other studies which have investigated body satisfaction in undergraduates (Clark, et al., 2005; Peltzer & Pengpid, 2012) and student athletes (Blackmer, Russell Searight, & Ratwik, 2011; Hausenblas & Downs, 2001).

Previous research and the current study suggest that women, especially in contemporary society, are subject to more intense pressures to conform to a socially prescribed ideal of bodily attractiveness (Bessenoff, 2006; Engeln-Maddox, 2005; Strahan, Wilson, Cressman, & Buote, 2006; Striegel-Moore, Silberstein, & Rodin, 1986). Furthermore, research also suggests that women are continuously exposed to unrealistic social comparisons from media which is, in turn, associated with greater levels of body dissatisfaction in women (Ata, Ludden, & Lally, 2007).

As was noted in the section above, the main effect of sample (athlete vs undergraduate) on body satisfaction was also significant and indicated that student non-athletes reported less satisfaction with their bodies than did the student athletes. The current results suggest that, despite pressure to achieve a particular body shape or type, student athletes are able to more closely approximate the social prescriptions for body shape perhaps due to the regular and intense physical activity required of student athletes. The fact that the interaction term was non-significant suggested that female participants reported lower body satisfaction than male participants, regardless of if they were student non-athletes or student athletes. However, closer inspection of the data revealed that there was insufficient power to detect a small effect size, with respect to the interaction term,

thus the interaction may have been present but not detected. Furthermore, when body satisfaction was compared between female and male student athletes, it was revealed that the difference was non-significant. This combination of low power and non-significant sex main effect in the student athlete sample suggests that there was a significant interaction between sample (athlete vs non-athlete) and sex (male vs female), such that females reported significantly lower body satisfaction than did males, but only for the student non-athlete group. The fact that the effect of sex on body satisfaction observed in the student non-athletes was not observed in the student athletes suggests that both male and female student athletes are similarly satisfied with their bodies. It is logical to suspect that male and female student athletes are more similar, with respect to body satisfaction, than male and female student non-athletes because the student athletes, both male and female, engage in regular physical activity, which is likely to lead them to have bodies which more closely match the socially prescribed ideal.

Sex differences in student athletes only. The results of the current study indicated that female student athletes reported significantly higher total scores on the EAT-26 and were also significantly more likely to score within the range of clinical concern on the EAT-26 than were male student athletes. However, this trend was not observed in the data for the SCOFF, which revealed that while more female student athletes scored within the range of clinical concern on the SCOFF than did male student athletes, female student athletes were not significantly more likely to score within this range.

Taken together, the results from the EAT-26 and the SCOFF suggest that female student athletes exhibit higher levels of subclinical eating pathology than male student

athletes but that the two groups did not differ in terms of clinical levels of eating pathology. However, the fact that only one male student athlete reported a score within the range of clinical concern on the EAT-26 and yet three exceeded the cutoff for clinical concern on the SCOFF suggests that there may have been some issues with the assessment of eating pathology in this population. As was mentioned in the introduction, the EAT-26 is associated with subclinical levels of eating pathology (Garner, Olmsted, Bohr, & Garfinkel, 1982; Lee et al., 2002; Mintz & O'Halloran, 2000) and the SCOFF is associated with clinical levels of eating pathology (Luck, et al., 2002). As such, it was expected that participants from the same sample would report lower rates of clinical concern on the SCOFF than the EAT-26. However, the fact that more student athletes exceeded the cutoff for clinical concern on the SCOFF than the EAT-26 suggests that this result may be an artifact which resulted from the assessment tools employed. Indeed, researchers and experts have suggested that extant eating pathology assessment instruments may not be appropriate for assessment in athlete samples in general. For example, Van Zyl, Surujlal, and Dhurup (2012) noted that 36% of their sample of student athletes exceeded the cutoff of clinical concern on the SCOFF and it was suggested that the item "food dominates your life" might be interpreted differently by athletes than non-athletes. More specifically, because athletes engage in regular exercise and competition they must replace calories expended and consume enough protein to repair muscle tissue and prevent injury. These authors suggested that athletes may have misinterpreted this question to mean "food is extremely important in your life." More specifically, student athletes must pay close attention to their diet in order to ensure optimal performance and

decrease the likelihood of injury and as a result they may feel that food does indeed occupy a substantial portion of their daily lives. However, given the level of physical activity engaged in by student athletes, it would be adaptive to spend significant amounts of time and energy to nutritionally compensate for the intense and frequent engagement in physical activity. Indeed, the pattern of responding on the SCOFF in the current study indicated that male student athletes disproportionately endorsed this item. Furthermore, a number of experts have noted issues with the use of eating pathology assessment instruments which were designed and validated using community or clinical samples for the assessment of eating pathology in athletes (Petrie & Greenleaf, 2007; Beals, 2004). As such, since the collection of the current data researchers have developed athlete specific eating pathology assessment tools, such as the Dissatisfaction and Body Checking in Sports Scale (Fortes, Cyrino, Almeida, & Ferreira, 2017) or the Internalization of Sociocultural and Thin-Ideal Standards in Sports scale (Scoffier-Mériaux, Ferrand, & d'Arripe-Longueville, 2017). Thus, the results of the SCOFF should be interpreted with caution due to the fact that there is reason to suspect that this instrument may not be appropriate for the assessment eating pathology within the context of elite athletics.

With respect to sex differences in body satisfaction, the results of the current study indicated that female student athletes were not significantly different from male student athletes. This result was surprising, given the number of studies which have found that males and females do tend to differ significantly, with respect to body image (e.g., Stice, 2002). The available data suggests that females experience greater pressure

than males to achieve the culturally defined ideal body and it is possible that the effect of athletic participation negates this disproportionate pressure. As mentioned previously, student athletes' bodies are more likely to match the socially prescribed ideal by virtue of their engagement in regular physical activity, thus, the current data suggest that athletic participation negates the sex effect on eating pathology risk observed in the general population.

4.1.4 Perceived stress in student athletes and student non-athletes. The data analysis from the current study indicated that student athletes reported significantly higher scores on an assessment of perceived stress, when compared to student non-athletes. This is consistent with previous research which investigated perceived stress in student athletes and student non-athletes (Richards & Aries, 1999; Wilson & Pritchard, 2005) which also suggests that student athletes tend to experience higher levels of perceived stress than do their non-athlete peers. It has been further suggested that the trend for student athletes to report higher levels of perceived stress than student non-athletes is the result of the fact that student athletes experience a large number of stressors which are not present in the lives of student non-athletes, for example, training, travel, and practice (Wilson & Pritchard, 2005). The results of the PSS-10 indicated that the student athlete participants scored within the "slightly higher than average" range, which indicated that the student athletes also had a "high" level of health concern related to the negative effects of elevated levels of perceived stress (Kelly & Percival, 2006). This provides further support for the notion that student athletes, in part, may experience

relatively high levels of perceived stress due to the "dual demands" of athletics and academics.

There is very little research using the HIDS to investigate stress in populations of undergraduates or student athletes. However, the instrument was employed in the original research project as a screening tool to identify a population of research participants who reported engaging in eating pathology or self-harm as a means of coping with stress. The HIDS Stress Item was used in the current research in order to investigate the concordance between a one-item assessment of perceived stress and a previously validated and reliable assessment of perceived stress. Button (2014) reported data for the HIDS Stress Item from a population of health professional students (Nursing, Medicine, and Pharmacy) and, when compared to the current sample, both the student athletes and student non-athletes reported significantly lower scores for perceived stress than did the sample of health professional students. The sample from Button (2014) was identified as a "high stress" sample due to the highly intensive and competitive nature of health professional programs. One might argue that the dual demands of academics and athletics are very similar to the stress endured by health professional students, which would lead one to predict that student athletes and health professional students would report similar levels of perceived stress. It is possible that the pressures faced by student athletes may be comparable to those endured by health professional students; however, student athletes have an effective stress reduction technique incorporated into their daily lives, namely, exercise, which has been shown to be an effective strategy for coping with stress (von Haaren, Haertel, Stumpp, Hey, & Ebner-Priemer, 2015). Hence, it may be that student

athletes are better able to effectively mitigate the effects of stress in their daily lives through the use of exercise. This idea will be explored in greater detail in the following section. Regardless, the HIDS stress item and scores on the PSS-10 were shown to be significantly, positively associated in both the current (r=.68, p<.00) and a previous study (r=.68, p<.00) (Button, 2014). As such, the current and previous data suggest that the HIDS stress item may be an economical stress screening tool in undergraduate populations.

4.1.5 Difficulties in emotion regulation in student athletes and student non-athletes. The data analysis indicated that the student athlete participants tended to report lower scores on an assessment of difficulties in emotion regulation than did the student non-athletes but the difference only trended towards significance. This is not consistent with a previous study which also employed the DERS to compare difficulties in emotion regulation between student athletes and student non-athletes (Wollenberg, Shriver, & Gates, 2015) which found that the student athletes reported significantly lower scores on the DERS than did the student non-athletes. It is important to note, however that the samples of student athletes and student non-athletes from the Wollenberg, Shriver and Gates (2012) study included only female participants. It is possible that male student athletes and student non-athletes, in general, tend not to differ significantly in terms of difficulties in emotion regulation. If this were the case, then in the current study the male participants' scores on the DERS may have diminished the effect seen in female student athletes and student non-athletes. Yet, the fact that the sex main effect and interaction

effect in the current data were non-significant would suggest that an alternative explanation would be more likely.

Closer inspection of the data revealed that the DERS scores reported by the student athletes and student non-athletes in the current study were nearly half those reported by Wollenberg, Shriver, and Gates (2015). Additionally, in developing the DERS, the authors (Gratz & Roemer, 2004), recruited a sample of undergraduate students, who reported scores which were very similar to those reported by Wollenberg, Shriver, and Gates (2015). Thus, previous research suggests that the DERS scores reported in the current study were unusually low. Furthermore, it is possible that a floor effect was responsible for the lack of significance observed for the sample main effect on DERS scores. That is, both the student athletes and student non-athletes reported such low scores on the DERS that the effect could not be detected due to the lack of variability. The fact that the DERS scores from the current samples were so markedly divergent from previous studies raises the question: Why were the DERS total scores so much lower in the current samples? It is possible that the culture of the province from which the student athletes and student non-athletes were recruited can explain the unusually low DERS total scores. More specifically, there is a culture of extended community support within the province and it may be that residents are less prone to difficulties in emotion regulation as a result of the close community bonds which exist within the province. Future research which examines difficulties in emotion regulation, culture, and community support in the province from which the student athletes and student non-athletes were recruited would help elucidate the cause of the low observed

DERS total scores in the current research. Furthermore, a greater understanding of the relationship between difficulties in emotion regulation and community support might lead to community prevention and intervention initiatives aimed at decreasing difficulties in emotion regulation.

4.1.6 Mediational model. The data analysis indicated that athletic status (athlete vs non-athlete) significantly predicted scores on the EAT-26. This is consistent with the results of Wollenberg, Shriver, and Gates (2015) who also observed that athletic status significantly predicted EAT-26 scores in a sample of female student athletes and student non-athletes. These data suggest that student athletes exhibit lower risk for eating pathology than do student non-athletes, which is consistent with a number of studies which investigated eating pathology in student athletes and student non-athletes (e.g., Gaines & Burnett, 2014; Sanford-Martens, et al., 2005; Wilkins, Boland, & Albinson, 1991).

The current data also revealed that athletic status significantly predicted the proposed mediator (DERS scores) as well. Once again, this result was consistent with the data reported by Wollenberg, Shriver, and Gates (2015). These data suggest that participation in intercollegiate athletics by university students is associated with fewer difficulties in emotion regulation. One of the differences between student athletes and student non-athletes which might explain this difference in difficulties in emotion regulation is that student athletes engage in regular, mandatory, physical activity. There are a number of studies which suggest that regular physical activity is an effective emotion regulation strategy (Bernstein, & McNally, 2017; Edwards, Rhodes, & Loprinzi,

2017; Thayer, Newman, & McClain, 1994), and as such, it is possible that student athletes experience fewer difficulties in emotion regulation by virtue of their regular engagement in physical activity.

Next, the data analysis showed that the proposed mediator (DERS scores) significantly predicted EAT-26 scores in student athletes and student non-athletes. Once again, Wollenberg, Shriver, and Gates (2015) observed the same relationship in their sample of female student athletes and student non-athletes. This result is also consistent with a large body of research which has implicated difficulties in emotion regulation in the development and maintenance of eating pathology (Brockmeyer et al., 2012; Deaver, et al., 2003; Engel et al., 2013; Heatherton & Baumeister, 1991). More specifically, the results of these studies and the current study suggest that individuals engage in eating pathology following experiences of negative affect and with the goal of mitigating these uncomfortable emotional experiences.

The results of the current study indicated that when athletic status and difficulties in emotion regulation were entered into the same model predicting eating pathology risk, the proportion of variance accounted for by athletic status decreased. The fact that difficulties in emotion regulation remained a significant predictor of eating pathology risk suggested that difficulties in emotion regulation statistically mediated the relationship between athletic status and eating pathology risk. The mediational model was confirmed by the significance of the Sobel test. Wollenberg, Shriver, and Gates (2015) also found that the relationship between athletic status and eating pathology risk was mediated by difficulties in emotion regulation in their sample of female athletes. The results of the

current study suggest that this relationship holds true for mixed sex groups of student athletes.

Finally, the results of the current study indicated that when athletic status and body satisfaction were entered into the same model predicting eating pathology risk, the proportion of variance accounted for by athletic status was no longer significant. This result suggests that the relationship between athletic status and eating pathology risk was fully mediated by body satisfaction. This is consistent with the proposition that the student athletes exhibit lower risk for eating pathology than the student non-athletes by way of the relationship between athletic status and body satisfaction.

Consistent with previous research, the mediational models in the current study suggested that participation in elite levels of athletics by male and female university students has an indirect and protective effect on eating pathology risk through the effect of athletic participation on difficulties in emotion regulation. According to sociocultural models of eating pathology etiology, pressure from friends, family, peers, and media can result in body dissatisfaction, which in turn can lead to negative affect and pathological eating behaviors and attitudes (Petrie & Greenleaf, 2007; Stice, 2004; Striegel-Moore, Silberstein, & Rodin, 1986). Thus, the current results imply that the protective effect associated with participation in elite levels of athletics by university students on eating pathology is the result of relatively low levels of body dissatisfaction and difficulties in emotion regulation. While the current study did not assess negative affect, the results suggest that the effect of high body satisfaction and low difficulties in emotion regulation in student athletes on eating pathology risk may act through impact on negative affect.

4.2 Methodological Considerations: Strengths and Limitations

Strengths. One of the major strengths of the current study is that it synthesized a large and diverse body of research which has examined various aspects of eating pathology in student athlete populations. The methodology employed by researchers investigating eating pathology in student athletes has varied greatly and this synthesis allowed for the elucidation of trends in eating pathology and body satisfaction in the extant literature.

Another strength of the current study is that it adds to the limited understanding of the complex associations between eating pathology risk, sports participation, and difficulties in emotion regulation in male and female university student athletes. The current research is one of only two known studies to have investigated difficulties in emotion regulation related to student athlete eating pathology. There is a relatively large body of research from community and clinical populations which strongly implicates difficulties in emotion regulation as a key causal risk factor for the development of eating pathology. Historically, research investigating the etiology of eating pathology in student athletes has tended to understate the causal impact of difficulties in emotion regulation. Thus, the current research has applied the results of general eating pathology research to the specific population of university student athletes. Furthermore, the current study also assessed body satisfaction, which added explanatory power to the theory of eating pathology etiology in student athletes and student non-athletes.

The current research also extended the generalizability of a previous study (Wollenberg, Shriver, & Gates, 2015), the results of which suggested that difficulties in

emotion regulation mediated the relationship between athletic status and eating pathology risk in a sample of female student athletes. The current research recruited samples of both male and female student athletes, thus replicating the previous study while extending the generalizability of the trends observed to include male student athletes.

An additional strength of the current research is that validated and reliable assessment instruments were employed to assess eating pathology, body satisfaction, and difficulties in emotion regulation. The use of these instruments allows for the research to be replicated, in addition to providing confidence that the instrument assesses the construct it is purported to assess. Furthermore, the use of these instruments allowed for comparisons to be made between the current and previous research which utilized the same instruments.

A final strength of the current study is that great efforts were put forth to protect the confidentiality of the participants. Thus, participants may have felt safe to disclose uncomfortable feelings or behavior without fear of being identified by teachers, coaches, or the research team.

Limitations. While the current research has provided some useful insights into the prevalence and etiology of eating pathology in student athletes, it is not without its limitations. Firstly, the current study was devised using a cross-sectional design, which allows for inferences about association rather than causation. For example, the current data suggests that student athletes experience fewer difficulties in emotion regulation than do their non-athlete counterparts, however, it may be that individuals who

experience few difficulties in emotion regulation also tend to self-select into engagement in intercollegiate sport.

A second limitation of the current research is the fact that all data collected was in the form of self-report instruments. That is, self-report data is inherently vulnerable to influences which can distort the data from the actual experiences of the participants by way of, social desirability, response styles, over/underreporting, demand characteristics, and inaccurate recall.

Another limitation of the current study was that challenges were encountered during data collection and despite best efforts to work with the coaches and athletics department, student athletes from a number of sports were not adequately represented in the current sample of student athletes. The student athlete population has been identified as one in which time resources are scarce and this was evidenced by the difficulty in scheduling data collection. As such, it was not possible to perform inferential tests on any of the variables of interest across teams due to the small and uneven number of participants recruited from each team. The literature review suggested that differences in eating pathology may exist between different sports which were previously grouped under lean or non-lean categories. Indeed, it is logical to assume that differences in the socially prescribed ideal for body type would exist between athletes who participate in long-distance running versus those who participate in swimming. Unfortunately, these proposed differences could not be investigated in the current research due to data collection difficulties. Additionally, given the low response rates for the student athletes (50.9%) and student non-athletes (18.5%) we cannot rule out the possibility that that a

large proportion of the individuals who chose not to participate in the current study may have done so for social desirability reasons, due to the fact that they suffer from eating pathology. Thus, the possibility exists that the results of the current study could be based on unrepresentative samples and hence, should be generalized with caution. Difficulty in data collection seems inherent with student athletes (Sanford-Martens, et al., 2005), whose resources are particularly strained and as such, researchers investigating populations of student athletes in the future would benefit from close and long term partnering with coaches and athletic departments, who were integral in the collection of the data for the current study.

A final limitation of the current research concerns the comparison sample of undergraduates, which was utilized due to availability. The student non-athlete samples consisted of predominantly first-year students, who have been identified as being a special population themselves, with respect to the pressures and stress with which they must contend. As such, this sample is not entirely representative of the undergraduate population as whole. Thus, future research which employs a more robust comparison group, such as age and year matched undergraduates, would allow for greater confidence in the conclusions drawn. Additionally, it was noted that the timing of the data collection may have impacted the results of the self-report instruments for the student non-athlete samples. More specifically, the student non-athlete data was collected in the first two weeks of class, which may have resulted in lower scores for perceived stress and difficulties in emotion regulation than would be observed later in the semester when academic demands are greater. As such, future research would benefit from an

appreciation for the temporal dynamics of stress and stress related constructs over the course of an academic year.

4.3 Clinical Implications and Recommendations

There are a number of clinical implications of the results from the current study. Eating pathology is a complex constellation of problematic behaviours, the treatment and prevention of which has proven to be challenging. The results of the current research suggest that student athletes exhibit some level of protection from eating pathology by way of body satisfaction and emotion regulation, which is likely the result of regular engagement in physical activity. Thus, prevention and intervention strategies which focus on teaching emotion regulation skills and engagement in regular physical activity may be effective in preventing and treating eating pathology in the undergraduate population. Additionally, the current research suggests that eating pathology prevention efforts should be targeted toward female undergraduates, as they evidenced the greatest risk for eating pathology. Emotion regulation skills training for student athletes and student non-athletes at risk for eating pathology could be a particularly valuable prevention due to the transdiagnostic nature of emotion regulation skills. Difficulties in emotion regulation have been associated with a variety of pathological behaviours in university students, such as substance abuse and dependence (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996), self-harm (Klonsky, & Muehlenkamp, 2007) and eating pathology (Deaver, Miltenberger, Smyth, Meidinger, & Crosby, 2003). As such, there is evidence to suggest

that emotion regulation skills training for undergraduates might be a particularly efficient strategy for the prevention of a variety of psychopathologies.

Data from the current study also suggests that eating pathology may follow a different etiological pathway in student athletes as compared to other populations. More specifically, the current and previous studies suggest that body satisfaction, which is central to etiological models of eating pathology, may not exert such a significant pathogenic effect in student athlete populations as compared to others. While student athletes don't evidence a particularly elevated rate of eating pathology risk, intervention for those student athletes who do develop eating pathology is nevertheless important. Given the severe physical and psychological outcomes associated with eating pathology it is still necessary to intervene with student athletes using empirically supported treatments. However, interventions based on incomplete or inaccurate understandings of the target pathology are not likely to be as effective as those which are based on relevant etiological models. Thus, traditional interventions may not be appropriate or effective in treating student athletes with eating pathology.

4.4 Directions for Future Research

As mentioned in the introduction, the extant research investigating eating pathology in student athletes has yielded heterogeneous results. In order to more clearly elucidate trends in this body of research it would be helpful to conduct a meta-analysis of studies which investigated eating pathology in student athlete and student non-athlete populations. By using this methodology, it would not only provide an indication of the

direction of trends but would also allow for the estimation of the strength of the association through the calculation of pooled effect sizes.

Further research which employs a longitudinal design would allow for the observation of the temporal trajectory of the proposed causal variables from the current research and allow for more latitude when making inferences regarding causation. For example, whether individuals who are low in difficulties in emotion regulation tend to gravitate towards intercollegiate athletics in university or whether university student athletes experience fewer difficulties in emotion regulation as a result of their regular engagement in physical activity is unclear. Methodologies such as longitudinal designs and structural equation modeling will allow researchers to move from merely noting associations to an understanding of the causal effects of the variables under study.

It is important for future researchers to further investigate the etiology of eating pathology in student athletes to ensure that the interventions employed are as efficacious as possible. Existing etiological models of eating pathology posit that body dissatisfaction leads to the development of negative affect, which in turn leads to eating pathology. Given that the current research suggests that student athletes are relatively satisfied with their bodies it would be enlightening to investigate the relationships between body satisfaction, difficulties in emotion regulation, negative affect, and eating pathology risk in student athletes. Furthermore, examining the mediation of the relationship between athletic status and eating pathology by difficulties in emotion regulation, while controlling for negative affect would allow researchers to determine whether or not

difficulties in emotion regulation accounts for variance in eating pathology above and beyond its association with negative affect .

Future research comparing levels of eating pathology across specific sports will help elucidate differences in eating pathology that might result from a sport-specific emphasis on aesthetics and leanness. Additionally, the development of assessment instruments which can assess the level of emphasis on leanness and aesthetics in a continuous manner would help identify those student athletes at increased risk of eating pathology as a result of competing in a sport which emphasizes leanness.

The use of qualitative methods in future research may help to address some of the gaps and limitations identified in the previous studies as well as the current study. It has been suggested that the existing eating pathology assessment measures do not adequately assess eating pathology in student athletes due to their unique relationship with food and exercise. However, qualitatively investigating student athletes' lived experiences with eating pathology may highlight manifestations of eating pathology specific to athletes, which would in turn guide the development of athlete specific eating pathology assessment instruments.

Finally, given the changes to the "Feeding and Eating Disorders" chapter in the DSM-V (APA, 2013), future research using eating pathology assessment instruments based on the DSM-V will be necessary to examine whether or not the same trends emerge as did from the extant research. One of the aims of the Eating Disorders Work Group in making the revisions to this chapter was to reduce the frequency with which individuals seeking eating disorder treatment were being assigned a diagnosis of Eating

Disorder Not Otherwise Specified (Call, Walsh, & Attia, 2013). As such, eating pathology assessment instruments based on the DSM-V revisions would likely reveal higher rates of eating pathology.

4.5 Conclusion

Overall, the results of the current study suggest that university student athletes exhibit a decreased risk for eating pathology, as compared to non-athlete students. Furthermore, the current data imply that student athletes are somewhat protected from eating pathology development by way of satisfaction with their bodies. It is logical to assume that student athletes were more satisfied with their bodies than student non-athletes because student athletes' bodies are more likely to approximate the socially prescribed ideal as a result of their regular engagement in physical activity. The results of the current study also tentatively suggest that regular engagement in physical activity by the student athlete participants may have resulted in them experiencing fewer difficulties in emotion regulation than the student non-athletes. However, further investigation will be required to support this conclusion given that the difference between student athletes and student non-athletes, in terms of difficulties in emotion regulation, merely approached significance. Nevertheless, considering that difficulties in emotion regulation have been implicated in the etiology of eating pathology, treatment and prevention efforts which focus on increasing emotion regulation skills may be particularly effective as interventions.

5. References

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Appendix A

Table A1. DSM-IV-TR Diagnostic criteria for eating disorders

Anorexia Nervosa	
A.	Refusal to maintain body weight at or above a minimally normal weight for age and height (e.g.,, weight loss leading to maintenance of body weight less than 85% of that expected; or failure to make expected weight gain during period of growth, leading to body weight less than 85% of that expected).
B.	Intense fear of gaining weight or becoming fat, even though underweight.

C.	Disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or denial of the seriousness of the current low body weight.	
D.	In postmenarchal females, amenorrhea, i.e., the absence of at least three consecutive menstrual cycles. (A woman is considered to have amenorrhea if her periods occur only following hormone, e.g.,, estrogen, administration.)	
	Restricting Type:	During the current episode of Anorexia Nervosa, the person has not regularly engaged in binge-eating or purging behavior (i.e., self-induced vomiting or the misuse of laxatives, diuretics, or enemas)
	Binge-Eating/Purging Type:	During the current episode of Anorexia Nervosa, the person has regularly engaged in binge-eating or purging behavior (i.e., self-induced vomiting or the misuse of laxatives, diuretics, or enemas)

Bulimia Nervosa

A.	Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following:	
	1.	Eating, in a discrete period of time (e.g.,, within any 2-hour period), an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances
	2.	A sense of lack of control over eating during the episode (e.g.,, a feeling that one cannot stop eating or control what or how much one is eating)
B.	Recurrent inappropriate compensatory behavior in order to prevent weight gain, such as self-induced vomiting; misuse of laxatives, diuretics, enemas, or other medications; fasting; or excessive exercise.	
C.	The binge eating and inappropriate compensatory behaviors both occur, on average, at least twice a week for 3 months.	
D.	Self-evaluation is unduly influenced by body shape and weight.	
E.	The disturbance does not occur exclusively during episodes of Anorexia Nervosa.	
	Purging Type:	During the current episode of Bulimia Nervosa, the person has regularly engaged in self-induced vomiting or the misuse of laxatives, diuretics, or enemas

Nonpurging Type:	During the current episode of Bulimia Nervosa, the person has used other inappropriate compensatory behaviors, such as fasting or excessive exercise, but has not regularly engaged in self-induced vomiting or the misuse of laxatives, diuretics, or enemas

Eating Disorder Not Otherwise Specified

The Eating Disorder Not Otherwise Specified category is for disorders of eating that do not meet the criteria for any specific Eating Disorder. Examples include:	
1.	For females, all of the criteria for Anorexia Nervosa are met except that the individual has regular menses.
2.	All of the criteria for Anorexia Nervosa are met except that, despite significant weight loss, the individual's current weight is in the normal range.
3.	All of the criteria for Bulimia Nervosa are met except that the binge eating and inappropriate compensatory mechanisms occur at a frequency of less than twice a week or for a duration of less than 3 months.
4.	The regular use of inappropriate compensatory behavior by an individual of normal body weight after eating small amounts of food (e.g.,, self-induced vomiting after the consumption of two cookies).
5.	Repeatedly chewing and spitting out, but not swallowing, large amounts of food.
6.	Binge-eating disorder: recurrent episodes of binge eating in the absence of the regular use of inappropriate compensatory behaviors characteristic of Bulimia Nervosa (see Binge-Eating Disorder for suggested research criteria).

Table A2. Subclinical Disordered Eating Syndromes

Features of the Female Athlete Triad Syndrome- American College of Sports Medicine (Otis, Drinkwater, Johnson, Loucks, & Wilmore, 1997)

1.	Disordered Eating: extreme or harmful methods of weight control, including binge-eating and purging and restricting food intake.
2.	Amenorrhea: primary amenorrehea defined as the absence of menstruation in a girl by age 16 with secondary sex characteristics; Secondary amenorrehea defined as the absence of 3 consecutive menstrual cycles after menarche.

3.	Osteoporosis: bone mineral density more than 2.5 standard deviations below the mean for young adults.

Features of the Anorexia Athletica Syndrome – (Sundgot-Borgen, 1993)

Required Criteria:
1. Weight loss (>5% of expected body weight)
2. Gastrointestinal complaints
3. Absence of medical illness or affective disorder explaining weight reduction
4. Excessive fear of becoming obese
5. Restriction of caloric intake (e.g., <1200 calories/day)
At least one criteria required:
1. Delayed puberty (Primary amenorrehea)
2. Disturbance in body image (as defined in DSM-IV-TR)
3. Use of purging methods
4. Binge eating (as defined in DSM-IV-TR)
5. Compulsive exercising (as defined in DSM-IV-TR)
6. Menstrual dysfunction (primary or secondary amenorrehea, or oligomenorrehea)

Features of the Orthorexia Nervosa Syndrome – (Varga, Dukay-Szabo, Tury, and Eric, 2013)

1.	A strong preoccupation with ‘‘healthy eating’’ as manifested by the avoidance of all foods or ingredients considered by the subject to be ‘‘unhealthy,’’ such as those containing preservatives or manmade food additives.
2.	An unusual concern about one’s own health.
3.	Significant distress or impairment in social, occupational or other important areas of functioning.
4.	Due to selective eating malnutrition and weight loss can ensue.
5.	The symptoms are not due to another mental disorder (e.g., hypochondriasis or anorexia nervosa).

Appendix B

Consent to Take Part in Research

TITLE: Athletes Stress Study

INVESTIGATOR(S): Chris Duggan, Dr. Olga Heath (Supervisor), Dr. LeAnne Petherick (Committee Member)

You have been invited to take part in a research study. Taking part in this study is voluntary. It is up to you to decide whether to be in the study or not. You can decide not to take part in the study. If you decide to take part, you are free to leave at any time. This will not affect your grades, evaluation of your course, or your participation in varsity sport in any way.

Before you decide, you need to understand what the study is for, what risks you might take and what benefits you might receive. This consent form explains the study.

Please read this carefully. Take as much time as you like. If you like, take it home to think about for a while. Mark anything you do not understand, or want explained better. After you have read it, please ask questions about anything that is not clear.

The researchers will:

- discuss the study with you
- answer your questions
- keep confidential any information which could identify you personally
- be available during the study to deal with problems and answer questions

1. Introduction/Background:

We know that university life can be very stressful for students especially at certain times and these students find different ways to handle that stress. Compounded with the stress of academic studies, is the stress of varsity sport participation and competition. It is important to understand how student-athletes cope with these stresses and the skills used to facilitate or hinder the student athlete's relationship with stress.

2. Purpose of study:

The purpose of this project is to learn about the different ways that student-athletes at MUN cope with the stresses they are facing. Athletes are usually highly motivated individuals, but limited research pertains to how university student-athletes cope with the burdens of academic and athletic obligations. We are particularly interested in understanding more about some of the common kinds of coping strategies that student-athletes employ so we can better support them during their time at the university.

3. Description of the study procedures:

The questionnaires you are being asked to complete will take about thirty minutes. At the end of the questionnaires you will be asked if you are interested in being involved in the next phase of the study which is a one-on-one interview about your experience of stress, how you have coped, and the services and information available to student-athletes. If you are interested, you will provide contact information (email and/or phone number) at the end of the questionnaires and you will be contacted to set up an interview.

If you choose not to participate in this study you can place the questionnaires into the envelope provided and return them to the research assistant.

4. Length of time:

The questionnaires you are being asked to complete will take about thirty minutes.

5. Possible risks and discomforts:

While there are no physical risks to being involved in this research project, some participants might be upset by or uncomfortable with, some of the questions. If you feel this way, you are free to not answer any questions or to simply stop filling out the questionnaires at any time, with no consequences. If you are upset by answering the questions, you can see a counsellor at the Counselling Centre any day by going to the centre (5th floor of the University Centre) between 9 and 5 and asking to see the counsellor on call or by calling 864-8874 and setting up an appointment time.

6. Benefits:

It is not known whether this study will benefit you directly. The information you provide about student services may be used to enhance support offered to current and future varsity student athletes.

7. Liability statement:

Filling out this questionnaire means that you have consented to be in this study. It tells us that you have understood the information about the research study. When filling

out this questionnaire, you do not give up your legal rights. Researchers or agencies involved in this research study still have their legal and professional responsibilities.

8. What about my privacy and confidentiality?

Protecting your privacy is an important part of this study. Every effort to protect your privacy will be made. However it cannot be guaranteed. For example we may be required by law to allow access to research records.

By completing the questionnaires you give us permission to

- Collect information from you

- Share information with the people conducting the study

Use of your study information

The research team will collect and use only the information they need for this research study.

This information will include your contact information, should you choose to provide it for the second phase interviews, as well as information from study interviews and questionnaires

Your contact information will be kept secure by the research team in Newfoundland and Labrador.

It will not be shared with others without your permission. Your name will not appear in any report or article published as a result of this study.

Information collected for this study will kept for five years.

Information collected and used by the research team will be stored at Memorial University Counselling Center, UC-5000. Dr. Olga Heath is the person responsible for keeping it secure.

9. Questions or problems:

If you have any questions about taking part in this study, you can meet with the investigator who is in charge of the study at this institution. That person is: Dr. Olga Heath 864-3493

Principal Investigator's Name and Phone Number

Chris Duggan

709-728-8799

Or you can talk to someone who is not involved with the study at all, but can advise you on your

rights as a participant in a research study. This person can be reached through:

Ethics Office

Health Research Ethics Authority

709-777-6974 or by email at info@hrea.ca

Appendix C

MEMORIAL UNIVERSITY

Demographics Form

Please note that you are not required to answer any question that makes you uncomfortable.

Please begin by completing the following information:

1. Varsity Team: _____

2. Number of years of participation on this Varsity Team: _____

3. Sex: _____

4. Age: _____

5. Program: □ Undergraduate □ Undergraduate with honors □ Masters □ Ph.D.

6. Faculty:

□ Arts (Philosophy, English, Anthropology, Political Science, Sociology, etc.)	□ Science (Biology, Physics, Chemistry, Biochemistry, etc.)	□ Professional Programs (Nursing, Business, HKR, Social Work, Pharmacy, Medicine, etc.)
□ General Studies (Undeclared)	□ Other (please specify):	_____

7. Did you come to Memorial for the first time this year? □ Yes □ No

8. Current year in program: _____

9. Student status: □ Full Time □ Part Time

10. Number of courses currently enrolled in **this semester**: _____

11. Average number of courses taken per **semester:** _____

12. Average number of **semesters per year:** _____

MEMORIAL UNIVERSITY

Demographics Form

13. Do you travel to away competition: □ Yes □ No □ Sometimes

14.	Do you train for your sport outside the regular training/competition season:	□ Yes	How many weeks? _____
		□ No	

15. Height: _____ Feet _____ Inches _____ OR cm

16.	Weight:	_____	Pounds	_____ OR Kilograms

17. Country of birth: □ Canada/USA □ Other

18.	What was the population of the town/community/city where you grew up?	□ **Much smaller** than St. John's	□ **Somewhat smaller** than St. John's	□ **Same size** as St. John's
		□ **Much larger** than St. John's	□ **Somewhat larger** than St. John's	

19.	Sexual Orientation:	□ Heterosexual	□ Gay/Lesbian	□ Bi-sexual
		□ Transgendered	□ Questioning	

		Not Important	Somewhat Important	Important	Very Important
20.	How important is it for you to do well in your academic program?	1	2	3	4
21.	How important is it for you to do well in your sport at Memorial?	1	2	3	4
22.	How important is it for you to be a member of your team?	1	2	3	4
23.	How important is your personal success in your sport?	1	2	3	4
24.	How important is it to you for your team to be successful?	1	2	3	4

Appendix D

How I Deal With Stress
(Heath & Ross, 2007; Adapted by O. Heath, 2008)

Young adults have to deal with a lot of stress. In a recent survey, young adults said they used the following list of strategies to help them deal with problems. We are interested in knowing if you have also used any of these strategies to help you deal with stress.

Please read each item and indicate whether you:

Coping Strategies	Never	Once	Few Times	Frequently
1. Try not to think about it	0	1	2	3
2. Talk to someone	0	1	2	3
3. Try to solve the problem	0	1	2	3
4. Do something to keep myself busy	0	1	2	3
5. Say to myself it doesn't matter	0	1	2	3
6. Listen to music	0	1	2	3
7. Exercise	0	1	2	3
8. Play Sports	0	1	2	3
9. Go out	0	1	2	3
10. Go shopping	0	1	2	3
11. Eat	0	1	2	3
12. Do risky things	0	1	2	3
13. Drink alcohol	0	1	2	3
14. Hit someone	0	1	2	3
15. Get into an argument with someone	0	1	2	3
16. Do drugs	0	1	2	3
17. Smoke	0	1	2	3
18. Try to control my weight	0	1	2	3
19. Physically hurt myself on purpose	0	1	2	3
20. Cry	0	1	2	3
21. Sleep	0	1	2	3
22. Pray /engage in other religious activity	0	1	2	3
23. Other: _____	0	1	2	3

24. **On a scale of 1 to 10 (1 = "no stress at all" to 10 = "the most stressed out you have ever felt") please circle how stressed you have been over the past two weeks.**

1 2 3 4 5 6 7 8 9 10

Appendix E

Attitudes Towards Feelings (Gratz & Roemer, 2004)

This purpose of this questionnaire is to find out what people believe they can do about upsetting emotions or feelings. Please answer the statements by giving as true a picture of your own beliefs as possible. There are no right or wrong answers. Remember, the questionnaire is about what you actually or usually do. ***Indicate how often this statement applies to you by circling the appropriate number in the column on the right.***

Almost **never**
Sometimes
About **half** of the time
Most of the time
Almost **always**

	Never	Sometimes	Half of the time	Most	Always
1. I am clear about my feelings.	0	1	2	3	4
2. I pay attention to how I feel.	0	1	2	3	4
3. I experience my emotions as overwhelming and out of control.	0	1	2	3	4
4. I have no idea how I am feeling.	0	1	2	3	4
5. I have difficulty making sense of my feelings.	0	1	2	3	4
6. I am attentive to my feelings.	0	1	2	3	4
7. I know exactly how I am feeling.	0	1	2	3	4
8. I care about what I am feeling.	0	1	2	3	4
9. I am confused about how I feel.	0	1	2	3	4
10. I am confused about how I feel.	0	1	2	3	4
11. When I'm upset, I become angry with myself for feeling that way.	0	1	2	3	4
12. When I'm upset, I become embarrassed for feeling that way.	0	1	2	3	4

Attitudes Towards Feelings (Gratz & Roemer, 2004)

	Never	Sometimes	Half of the time	Most	Always
13. When I'm upset, I have difficulty getting work done.	0	1	2	3	4
14. When I'm upset, I become out of control.	0	1	2	3	4
15. When I'm upset, I believe that I will remain that way for a long time.	0	1	2	3	4
16. When I'm upset, I believe that I'll end up feeling very depressed.	0	1	2	3	4
17. When I'm upset, I believe that my feelings are valid and important.	0	1	2	3	4
18. When I'm upset, I have difficulty focusing on other things.	0	1	2	3	4
19. When I'm upset, I feel out of control.	0	1	2	3	4
20. When I'm upset, I can still get things done.	0	1	2	3	4
21. When I'm upset, I feel ashamed with myself for feeling that way.	0	1	2	3	4
22. When I'm upset, I know that I can find a way to eventually feel better.	0	1	2	3	4
23. When I'm upset, I feel like I am weak.	0	1	2	3	4
24. When I'm upset, I feel like I can remain in control of my behaviors.	0	1	2	3	4
25. When I'm upset, I feel guilty for feeling that way.	0	1	2	3	4
26. When I'm upset, I have difficulty concentrating.	0	1	2	3	4
27. When I'm upset, I have difficulty controlling my behavior.	0	1	2	3	4
28. When I'm upset, there's nothing I can do to make myself feel better.	0	1	2	3	4
29. When I'm upset, I become irritated with myself for feeling that way.	0	1	2	3	4

Attitudes Towards Feelings (Gratz & Roemer, 2004)

	Never	Sometimes	Half of the time	Most	Always
30. When I'm upset, I start to feel very bad about myself.	0	1	2	3	4
31. When I'm upset, I believe that wallowing in it is all I can do.	0	1	2	3	4
32. When I'm upset, I lose control over my behaviors.	0	1	2	3	4
33. When I'm upset, I take time to figure out what I'm really feeling.	0	1	2	3	4
34. When I'm upset, it takes me a long time to feel better.	0	1	2	3	4
35. When I'm upset, my emotions feel overwhelming.	0	1	2	3	4
36. When I'm upset, I have difficulty thinking about anything else.	0	1	2	3	4

Appendix F

Eating Attitudes Test – EAT-26 (Garner, et al., 1982)

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

Highest Adult Weight: _____ Lowest Adult Weight: _____

Do you participate in athletics at any of the following levels:	□ Intramural	□ Varsity Team	□ Recreational	□ Community Team

Please Circle a Response for Each of the Following Statements:

	Never	Rarely	Sometimes	Often	Usually	Always
1. Am terrified about being overweight.	0	1	2	3	4	5
2. Avoid eating when I am hungry.	0	1	2	3	4	5
3. Find myself preoccupied with food.	0	1	2	3	4	5
4. Have gone on eating binges where I feel I may not be able to stop.	0	1	2	3	4	5
5. Cut my food into small pieces.	0	1	2	3	4	5
6. Aware of the calorie content of foods I eat.	0	1	2	3	4	5
7. Particularly avoid food with a high carbohydrate content (bread, rice, potatoes, etc.)	0	1	2	3	4	5
8. Feel that others would prefer if I ate more.	0	1	2	3	4	5
9. Vomit after I have eaten.	0	1	2	3	4	5
10. Feel extremely guilty after eating	0	1	2	3	4	5
11. Am preoccupied with a desire to be thinner.	0	1	2	3	4	5
12. Think about burning up calories when I exercise.	0	1	2	3	4	5
13. Other people think I'm too thin.	0	1	2	3	4	5
14. Am preoccupied with the thought of having fat on my body.	0	1	2	3	4	5
15. Take longer than others to eat my meals.	0	1	2	3	4	5

Eating Attitudes Test – EAT-26 (Garner, et al., 1982)

	Never	Rarely	Sometimes	Often	Usually	Always
16. Avoid foods with sugar in them.	0	1	2	3	4	5
17. Eat diet foods.	0	1	2	3	4	5
18. Feel that food controls my life.	0	1	2	3	4	5
19. Display self-control around food.	0	1	2	3	4	5
20. Feel that other pressure me to eat.	0	1	2	3	4	5
21. Give too much time and thought to food.	0	1	2	3	4	5
22. Feel uncomfortable after eating sweets.	0	1	2	3	4	5
23. Engage in dieting behavior.	0	1	2	3	4	5
24. Like my stomach to be empty.	0	1	2	3	4	5
25. Have the impulse to vomit after meals.	0	1	2	3	4	5
26. Enjoy trying new rich foods.	0	1	2	3	4	5

Appendix G

Body Satisfaction Scale (Cash, 2000)

Use this 1 to 5 scale to indicate *how dissatisfied or satisfied you are* with each of the following areas or aspects of your body:

1	2	3	4	5
Very Dissatisfied	Mostly Dissatisfied	Neither Satisfied Nor Dissatisfied	Mostly Satisfied	Very Satisfied

_____ 1. Face (facial features, complexion)

_____ 2. Hair (color, thickness, texture)

_____ 3. Lower torso (buttocks, hips, thighs, legs)

_____ 4. Mid torso (waist, stomach)

_____ 5. Upper torso (chest or breasts, shoulders, arms)

_____ 6. Muscle tone

_____ 7. Weight

_____ 8. Height

_____ 9. Overall appearance

Appendix H

Perceived Stress Scale (Cohen, 1994)

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
1. In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2. In the last month, how often have you felt you were unable to control the important things in your life?	0	1	2	3	4
3. In the last month, how often have you felt nervous and stressed?	0	1	2	3	4
4. In the last month, how often have your felt confident about your ability to handle personal problems?	0	1	2	3	4
5. In the last month, how often have you felt that things were going your way?	0	1	2	3	4
6. In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
7. In the last month, how often have you been able to control irritations in your life?	0	1	2	3	4
8. In the last month, how often have you felt that you were on top of things?	0	1	2	3	4
9. In the last month, how often have you been angered because of things that were outside of your control?	0	1	2	3	4
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	0	1	2	3	4

Appendix I

SCOFF
(Morgan et al., 1999; Adapted by Mond, et al., 2008)

Instructions: Answer the following questions by ticking the yes or no boxes. If you need to edit your choice, put an x through the wrong answer.

1. Do you make yourself sick because you feel uncomfortably full?	□ Yes	□ No
2. Do you worry you have lost control over how much you eat?	□ Yes	□ No
3. Have you recently lost more 14 lbs in a 3 month period?	□ Yes	□ No
4. Do you believe yourself to be fat when others say you are too thin?	□ Yes	□ No
5. Would you say that food dominates your life?	□ Yes	□ No

Appendix J

Missing Values. One of the main sources of missing values in the current research stems from the fact that the current study utilized a sample of student non-athletes from a related study as a comparison group. As such, the two samples (student athlete and student non-athlete Phases I and II) did not complete exactly the same assessment instruments and as a result, data values for some instruments were not available for all samples. The student non-athlete phase I and II samples were recruited in the first study and instruments were added to the battery as the program of research developed. The student non-athlete participants did not have the opportunity to complete the PSS-10 or the SCOFF which resulted in data values being unavailable for those variables. Additional challenges in data analysis arose from attempts at maintaining participant confidentiality. More specifically, in the screening phase, student non-athlete participants were instructed to create a unique personal code and were provided specific and explicit instructions on how to complete the task. The unique code was then to be used to connect the phase I and phase II data. However, there was marked inconsistency in code generation which made connecting the phase I and phase II data for the majority (52%) of participants impossible. As such, data for the student non-athletes had to be split into two samples, where the student non-athlete phase I sample completed the HIDS and the student non-athlete phase II sample completed the EAT-26, DERS, and BASS. One sample of student athletes was used to compare to both the student non-athlete phase I

and student non-athlete phase II samples. The student athlete sample also completed two instruments (PSS-10, SCOFF) which the student non-athlete samples did not.

The number of missing cases for the self-report instruments for the student non-athlete phase I, student non-athlete phase II, and student athlete samples are listed below in Table J1. Thirty-eight student non-athletes (30.9%) and two athletes (2.4%) failed to report the age variable. For the student non-athlete sample one participant failed to report their sex.

Missing responses in all three databases were analyzed to determine the best course of action for accounting for the missing data. The visual analysis of missing responses in all three databases suggested that participants simply skipped or missed one or two items on the instrument. Further analysis of the data revealed that for the DERS, EAT-26, and BASS, no participant failed to respond to more than two items on the scale. There were very few missing items and it was desirable to preserve as many student athlete participants' data as possible, given the relatively low number of student athlete participants compared to the student non-athlete sample. Additionally, researchers have reported relatively low incidence of eating pathology in samples from community populations, hence, in order to maximize the statistical power of the design to detect small effect sizes it is advisable to maximize the available number of participants and hence, the overall variance (Tabachnick & Fidell, 2007; Madlow, Olkin, & Rubin, 1983; Roth & Switzer, 1995). In order to manage the missing data points, the method of person mean substitution was utilized (Downey & King, 1998), such that missing items for the DERS and the EAT-26 were imputed using the mean response for the other non-missing

items on that subscale, where the alpha value for that subscale was > .70. For the EAT-26-OC, DERS-GOALS, and DERS-AWARE subscales and the BASS-TOTAL, the mean response for the non-missing items for the entire scale was used due to the fact that the BASS has no subscales and the subscales on the other measures demonstrated an internal consistency < .70. This method of imputation was advisable based on the fact that self-report instruments and their subscales are most often designed such that items are included based on the degree of intercorrelation with the total score of all the other items in the scale (Crocker & Algina, 1986). Thus, substituting the mean of the non-missing items for the missing data can provide a reasonable estimate of the missing items, especially considering that as the number of items in a scale increases this technique more closely approximates imputation using regression (Downey & King, 1998). This method of imputation does have limitations, however, as this technique can result in an underestimation of variance and disturb relations between variables (Van Buuren, 2012). However, given the fact that little data was missing, the impact of the above limitation is likely to be minor.

Table J1. Frequency of Missing Values for the DERS, EAT-26, BSS, PSS, and SCOFF.

	Undergraduate		Athlete	
	#Missing	% Missing	#Missing	% Missing
DERS Item				
5	1	0.8	0	0.0
7	1	0.8	1	1.2
10	1	0.8	2	2.4
16	1	0.8	0	0.0
18	5	4.1	0	0.0
19	0	0.0	1	1.2
23	1	0.8	0	0.0

	24	0	0.0	1	1.2
	25	4	3.3	0	0.0
	26	2	1.6	0	0.0
	27	1	0.8	0	0.0
	28	0	0.0	1	1.2
	31	1	0.8	1	1.2
	34	2	1.6	0	0.0
	35	1	0.8	0	0.0
	36	1	0.8	0	0.0
EAT-26 Item					
	4	0	0.0	1	1.2
	6	0	0.0	1	1.2
	7	0	0.0	1	1.2
	10	0	0.0	1	1.2
	11	0	0.0	1	1.2
	14	0	0.0	2	2.4
	17	0	0.0	1	1.2
	18	0	0.0	1	1.2
	19	0	0.0	1	1.2
	20	0	0.0	2	2.4
	21	0	0.0	2	2.4
	22	0	0.0	1	1.2
	23	0	0.0	1	1.2
	24	0	0.0	1	1.2
	25	0	0.0	1	1.2
	26	0	0.0	1	1.2
BSS Item					
	2	1	0.8	0	0.0
	4	0	0.0	1	1.2
	6	1	0.8	0	0.0
	7	1	0.8	0	0.0
	8	4	3.3	0	0.0
	9	1	0.8	0	0.0
PSS Item					
	2	Na	Na	1	1.2
	7	Na	Na	1	1.2
	9	Na	Na	1	1.2
	10	Na	Na	1	1.2
SCOFF Item					
	1	Na	Na	3	3.6

2	Na	Na	3	3.6
3	Na	Na	4	4.8
4	Na	Na	2	2.4
5	Na	Na	1	1.2