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THE RELATIONSHIP BETWEEN NON-SUICIDAL SELF-INJURY AND DISORDERED EATING IN FEMALE COLLEGIATE ATHLETES

Mariah Israel Lash

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THE RELATIONSHIP BETWEEN NON-SUICIDAL SELF-INJURY AND
DISORDERED EATING IN FEMALE COLLEGIATE ATHLETES

By

Mariah I Lash, AT, ATC

THESIS

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SIGNATURE APPROVAL FORM

Title of Thesis: THE RELATIONSHIP BETWEEN NON-SUICIDAL SELF-INJURY AND DISORDERED EATING IN FEMALE COLLEGIATE ATHLETES

This thesis by Mariah Israel Lash is recommended for approval by the student's Thesis Committee and Department Head in the Department of Health, Physical Education and Recreation and by the Assistant Provost of Graduate Education and Research.

Committee Chair: Marguerite Moore, Ph.D, AT, ATC Date

First Reader: Julie Rochester, Ed. D, AT, ATC Date

Second Reader: John Lehtinen, M.D. Date

Department Head: Mary Jane Tremethick, Ph.D Date

Dr. Brian D. Cherry Date
Assistant Provost of Graduate Education and Research

ABSTRACT

THE RELATIONSHIP BETWEEN NON-SUICIDAL SELF-INJURY AND DISORDERED EATING IN FEMALE COLLEGIATE ATHLETES

By

Mariah Israel Lash

Context: Societal and sport pressures in female NCAA athletes contribute to an increased risk of disordered eating. Disordered eating (DE) and self-injury are both negative behaviors that affect female athletes. Current research examining all aspects of non-suicidal self-injury (NSSI) in athletes, as well as the co-occurrence of these behaviors with disordered eating is lacking. **Objective:** To investigate the prevalence of DE, NSSI overall and by sport type (individual or team), and the co-occurrence of the two in NCAA female collegiate athletes. **Design:** Cross-sectional Cohort. **Setting:** Online survey administered via Qualtrics Survey Software. **Patients or Other Participants:** Approximately 1,400 female NCAA Division II varsity athletes. **Main Outcome Measures:** Survey comprised of the Eating Attitudes Test (EAT-26) and a portion of the Self-Harm Information Form (SHIF). **Results:** The lifetime prevalence of NSSI was 30.6%. 18.5% fit the criteria for NSSI, with no significant difference by sport type ($t_{266} = 1.248, P = .213$). The DE risk was estimated at 26.5% and there was no significant difference by sport type ($t_{267} = .916, P = .361$). There was a significant correlation between NSSI and DE ($r_{269} = .123, P = .043$). **Conclusions:** The findings of this study support increasing screening of DE and including questions related to NSSI in pre-participation examinations. **Key Words:** female athletes, non-suicidal self-injury, disordered eating

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DEDICATION

This thesis is dedicated to my wonderful husband Colby D. Lash and all the athletes who have struggled with disordered eating and/or non-suicidal self-injury.

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This thesis follows the format set by the Journal of Athletic Training.

PREFACE

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CHAPTER I: MANUSCRIPT

Introduction

Disordered eating (DE) and self-injury are both harmful behaviors found in female athletes. Current research is lacking in the examination of non-suicidal self-injury (NSSI) in athletes, as well as the co-occurrence of these behaviors with eating disorders. Within the past few decades, researchers have begun exploring the issue of disordered eating and body image in female athletes. Disordered eating can range from a clinically diagnosed eating disorder such as bulimia nervosa (BN), anorexia nervosa (AN), eating disorders not otherwise specified (EDNOS), to subclinical eating problems and sub-threshold AN. It is often difficult to distinguish between disordered eating and some eating habits that are simply implemented to improve athletic performance.¹ Disordered eating in athletes may have direct relation to sport, or it may be entirely unrelated.

Pressure to make weight in some sports can contribute to disordered eating, but the pressure alone is not typically the sole cause of disordered eating.² Disordered eating can be related to a desire to fit into cultural norms such as models plastered across billboards and in magazines.³ Although disordered eating is dangerous, it is often culturally accepted because it mimics habits seen to help women fit in, especially in the American culture. It is important to recognize disordered eating early because it can have negative effects on health as well as athletic performance.¹ Screening tools used for athletes need to be designed to increase accuracy in recognition of disordered eating among athletes.⁴

Through anecdotal observation by athletic trainers (AT), it appears there is an occurrence of NSSI in some female college athletes; however, minimal published research is available on the topic. NSSI occurs when an individual inflicts harm to his or

her body purposefully, for reasons not recognized or sanctioned socially and without the obvious intention of committing suicide.⁵ NSSI are generally a response to stress and are often a way to release built up emotional pressure and to feel something other than numbness and emptiness.⁶ Culturally, self-injury is not socially acceptable.³ The co-occurrence of disordered eating and NSSI was discussed in several articles, but data was not available for female collegiate athletes.⁷⁻⁹

There is no current diagnostic criterion for NSSI in the Diagnostic and Statistical Manual for Mental disorders-IV (DSM-IV),¹⁰ though some authors argue it should be included in the upcoming edition.^{11,12} The dearth of diagnostic recognition of self-injury without suicidal intent has led to research in the area utilizing various terms, which can make identifying demographics challenging. Most authors agree the onset is generally in adolescence.^{5,6,11,13} There is varying opinion on whether gender plays a role in the likelihood to self-injure.^{5,6,14-16} Klonsky⁶, Croyle and Waltz¹⁴, and Gollust et al¹⁶ found no significant difference in the prevalence of self-injury between genders. Whitlock et al⁵ and Kakhnovets et al¹⁵ both found a higher prevalence of repeated self-injury in females than males. Authors evaluating lifetime prevalence in college students, where a single occurrence over a lifetime was inclusion criteria, found a range from 12.8-68%.^{5,14,15,17,18}

As an AT, it is important to recognize psychological issues as well as physical injuries in athletes. With self-injury and disordered eating, the dysfunction is physical and psychological. Athletic trainers who recognize a psychological issue in an athlete should have a protocol in place for referral to the appropriate health care provider.

Athletic trainers are often the first to recognize disordered eating among athletes because

of their repeated contact with the athletes and knowledge of the pathological process.¹ If ATs notice signs of NSSI, they can be alert to look for indications of disordered eating.

The purpose of this study was to investigate the prevalence of disordered eating, NSSI, and the co-occurrence of the two in National Collegiate Athletic Association (NCAA) Division II female varsity athletes. Research in this area has been lacking, particularly in athletes. I hypothesized 1) There would be a relationship between NSSI and disordered eating in NCAA Division II female varsity athletes; 2) Athletes participating in individual sports would have a higher prevalence of disordered eating as well as NSSI.

Definition of Terms

A limitation to research in this subject area is the lack of consistency in terminology. This section aims to provide distinction of terms used throughout this study.

- 1.) *Anorexia nervosa (AN)*. “Individual refuses to maintain a minimally normal body weight, is intensely afraid of gaining weight, and exhibits a significant disturbance in the perception of the shape and size of his or her body.”^{10(p583)}
- 2.) *Body image (BI)*. “The self-perception and attitudes an individual holds with respect to his or her body and physical appearance.”¹⁹
- 3.) *Bulimia nervosa (BN)*. “Binge eating and compensatory behaviors (e.g., vomiting, fasting) that occur an average of twice per week for three months and self-concept dominated by shape and weight.”^{20(p168)}
- 4.) *Disordered eating (DE)*. An encompassing term that includes eating disorders as well as a wide spectrum of unhealthy eating and weight control behaviors and attitudes.^{1,21}

- 5.) *Eating disorder (ED)*. Meeting diagnostic criteria for AN, BN, or EDNOS.
- 6.) *Eating disorders not otherwise specified (EDNOS)*. Clinically significant eating disorder that does not meet the diagnostic criteria for either anorexia nervosa or bulimia nervosa.
- 7.) *Individual sports*. Sports where athletes are judged, scored or timed on their individual efforts or skills. Examples: Bowling, cross country, diving, fencing, golf, skiing, swimming, tennis, track & field (indoor and outdoor).
- 8.) *Non-suicidal self-injury (NSSI)*. “The intentional destruction of one’s own body tissue without suicidal intent and for purposes not socially sanctioned.”^{6(p1981)}
- 9.) *Subclinical eating problems*. Clinically significant problems with eating and weight control behaviors and attitudes, that do not meet the diagnostic criteria for an ED.^{1,21}
- 10.) *Subthreshold anorexia nervosa*. One criterion short of diagnosis of anorexia nervosa.²²
- 11.) *Team sports*. Sports where a group of athletes work together for the same outcome. Examples: basketball, lacrosse, soccer, softball, volleyball.

Methods

The purpose of this study was to investigate the prevalence of disordered eating, NSSI, and the co-occurrence of the two in female collegiate athletes. Females are 80%-90% more likely to suffer from an eating disorder than males.¹⁰ I administered a survey to female college athletes only, because of the higher prevalence of disordered eating in females. The statistical analysis was set with an alpha priori level of 0.05. Sport type

(team or individual) was the independent variable, while score on the Eating Attitudes Test (EAT-26) and occurrence of NSSI (as specified below in instrumentation) were the dependent variables.

Participants

This study included varsity female collegiate athletes. The participants competed in: basketball, bowling, cross country, diving, fencing, golf, lacrosse, skiing, soccer, softball, swimming, tennis, track & field (both indoor and outdoor), and volleyball. Participants had to be at least 18 years old to complete the survey. I selected the participants from colleges or universities classified by the NCAA as Division II and located in the National Athletic Trainers Association's (NATA) District 4. District 4 is comprised of Michigan, Minnesota, Wisconsin, Illinois, Indiana, and Ohio. I recruited participants via email through the NCAA compliance coordinator at each institution. Of the 39 institutions contacted, 10 agreed to participate. Based on the average number of female athletes per NCAA Division II institution,²³ the survey was sent out to approximately 1,400 female varsity athletes.

Instruments

I formulated a survey (Appendix A) containing questions related to disordered eating in athletes and questions pertaining to self-injurious behavior. The disordered eating portion, was constructed of the Eating Attitudes Test (EAT-26) which is a well-validated, reliable (coefficient alpha = .90) instrument.²⁴ The EAT-26 consists of 26 questions divided into three subscales: dieting, bulimia, and food preoccupation/oral control. There are five supplemental questions to help identify participation in risky behaviors regarding weight loss. To qualify as “at risk for disordered eating”²⁴ would require a score of greater than 20 on the EAT-26, **or** require the risk criteria be met for

one supplemental question, **or** have a BMI of 18.0 or less. Appendix B describes the scoring for the EAT-26 and supplemental questions. The portion of the survey regarding NSSI was from The Self-Harm Information Form (SHIF) which had test-retest reliability of $\alpha = .94$ with $p < .001$.¹⁴ The portion of the SHIF regarding other maladaptive behaviors (e.g., compulsive buying, gambling, etc.) was not included because I was not examining these behaviors for this study. Participants were asked if they had ever participated in a list of 17 behaviors and if the answer was *Yes*, they were asked how many times they participated in that behavior in a) The past three months, and b) Over their lifetime. The criterion for being included in the NSSI group is engaging in any of the behaviors (excluding nail biting, and wound interference) once in the past three months **and** five or more times in their lifetime; **or** engaging in any of the 17 behaviors 10 times or more in their lifetime. The criterion for lifetime prevalence was at least one occurrence over the lifetime of any of the behaviors included in the NSSI group. Demographic questions were included at the start of the survey. These questions asked about age, race, sport, number of years competing in the sport, and years of eligibility remaining. There were also anthropometric questions (height, current weight, highest weight excluding pregnancy, lowest weight, and ideal weight) which are part of the EAT-26.²⁴

Procedures

After obtaining approval from the Northern Michigan University's Internal Review Board (IRB Proposal # HS12-496), I contacted 39 NCAA Division II institutions via email and 10 of those schools agreed to send out the survey or provide email addresses for their varsity female athletes. These ten schools consisted of three from

Ohio, one from Minnesota, five from Michigan, and one from Illinois. I sought and obtained IRB approval at each university that requested it.

I provided each compliance coordinator with information regarding the study and a request to send out the informed consent and survey link to each female varsity athlete, or to provide me with a list of email addresses of all female varsity athletes. If the compliance coordinator did not respond to the initial request, I sent up to three follow-up emails. Eight of the ten schools sent the survey link and informed consent directly to their athletes, while two schools provided me email addresses to send the survey directly through Qualtrics. I presented an informed consent (Appendix C) in the email sent out directly via Qualtrics. In order to proceed with the survey the participants had to enter a password and this acknowledged their understanding of the study and agreement to participate. Reminder emails were sent, via Qualtrics, thirteen days prior to, two days prior to, and on the day the survey closed to the two schools where the survey was sent directly via Qualtrics. I also sent emails ten days prior to the survey closing, to the eight compliance coordinators who had sent the informed consent and survey link out to the female varsity athletes. I collected the results with no identifiers via Qualtrics Survey Research Suite.

I excluded 29 partial responses in which participants did not complete the EAT-26 portion or NSSI portion, or did not enter a sport. Participants were permitted to select more than one sport and in all but three instances that participants selected more than one sport, the sports were all in the same category (team or individual). I excluded the three cases where at least one team and one individual sport were selected from any of the statistics that were divided by sport, but included them in the demographics and overall

correlation statistics. One participant who participated in a team sport did not complete the NSSI portion of the survey so I only used this response for statistics regarding demographics and prevalence of being at risk for disordered eating.

Data Analysis

Statistics were performed using SPSS 19th edition. I evaluated the Pearson product moment correlation coefficient (r) to determine whether there was a relationship between DE and NSSI in the entire group, in team sports, and in individual sports. I also completed an independent samples t test to establish if there was significance between sport types when examining the prevalence of DE, and the prevalence of NSSI.

Results

The potential participants were approximately 1,400 female college athletes from 10 NCAA Division II institutions. Of these, 301 (21.5%) participants began the survey, and 272 (19.4%) completed the survey. Demographic information about the 272 participants who completed the survey is reported in Table 1. The lifetime prevalence of NSSI was 30.6%, while the prevalence of being at risk for disordered eating and fitting the criteria for NSSI was 26.5% and 18.5% respectively. Refer to Table 2 for prevalence rates by type of sport.

Pearson product-moment correlations revealed a relationship ($r_{269}=.123, P=.043$; Table 3), between a risk for disordered eating and meeting the criteria for NSSI. An independent samples t test found there was no significant difference between individual and team sports regarding risk for disordered eating ($t_{267}=.916, P=.361$) or fitting the criteria for NSSI ($t_{266}=1.248, P=.213$; Table 4).

Discussion

The purpose of the current study was to determine the prevalence of NSSI, disordered eating, and the co-occurrence of the two in NCAA Division II female varsity athletes. In the participants of this study the lifetime prevalence of NSSI was 30.6%, while 18.5% fit the established criteria to be in the NSSI group, and the prevalence of disordered eating was 26.5%. My first research hypothesis was supported as the results showed a statistically significant correlation between NSSI and disordered eating in the sample ($r_{269}=.123, P=.043$). Though there was a statistically significant correlation, the effect size was small. My second hypothesis was refuted because although the prevalence rates were higher in individual sports than in team sports, there was not a statistically significant difference for prevalence of NSSI or disordered eating.

NSSI

Prevalence

This was the first study to evaluate prevalence of NSSI in NCAA female varsity athletes as well as the first to examine the co-occurrence of NSSI and disordered eating in this population. It is alarming to observe a lifetime prevalence of 30.6% and to detect that 18.5% of the female athletes surveyed met the established criteria for NSSI. The criteria set for this study was more stringent than criteria set by several other researchers examining the occurrence of NSSI in the college population. In the current study, to be classified in the NSSI group, a participant must have engaged in any of the behaviors regarding NSSI on the survey (excluding nail biting, and wound interference) once in the past three months **and** five or more times in their lifetime; **or** engaged in the behaviors ten times or more in their lifetime. A majority of the previous research examined lifetime prevalence, which ranged from 12.8-68%, where a single occurrence over a lifetime was

inclusion criteria.^{5,14,15,17,18} In addition, several researchers examined additional time frames other than lifetime prevalence.^{5,14,17} Croyle and Waltz¹⁴ asked about behaviors over the course of a lifetime, in the past three years and in the past three months. Both Whitlock et al⁵ and Kuentzel et al¹⁷ discussed behaviors over a lifetime as well as in the past 12 months. In contrast, Gollust et al¹⁶ investigated over a four-week period, and found a prevalence rate of 7%. Just as there is variation in how authors examined prevalence, method in assessing behaviors varied as well.

Behaviors

In the current study, participants responded if they had ever participated in a list of behaviors (Table 5 and 6). If respondents answered yes to a behavior, they indicated how many times in the past three months and over their lifetime they had participated in the specific behavior. Behaviors were not broken into different groups.

In previous research, most researchers asked about specific behaviors^{5,14,16-18,25} while others asked open-ended questions.¹⁵ Only two of the studies mentioned above, divided the behaviors into classifications.^{14,25} Croyle and Waltz¹⁴ split the behaviors into low- and high-level self harm. Whitlock et al²⁵ separated behaviors into three categories; potential for superficial tissue damage, likely to cause bruising or light tissue damage, and potential of severe tissue damage.

Disordered Eating in Athletes

There is extreme variation in the screening tools used in research on disordered eating in collegiate athletes. The current study utilized the EAT-26 and found 26.5% of the participants at risk for disordered eating. Frequencies and proportions of responses to EAT-26 questions are displayed in Tables 7 and 8. Several other authors used the EAT-26 (some in addition to other surveys) to determine risk of disordered eating in athletes,

and prevalence rates varied from 9.3-49.2%.^{19,26-29} Reinking and Alexander³⁰ utilized the Eating Disorder Inventory-2 (EDI-2) and found 7.1% of female athletes to have high risk for disordered eating. Johnson et al³¹, along with various other surveys, utilized three subscales of the Eating Disorder Inventory (EDI) and when looking at risk for AN and BN determined that respectively 35% and 38% of females and 9.5% and 38% of males were at risk for these disorders. When Greenleaf et al³² utilized the Questionnaire for Eating Disorder Diagnoses (QEDD) and the Bulimia Test-Revised (BULIT-R), they determined 25.5% of respondents were symptomatic and 2% were eating disordered. The 26.5% prevalence rate for being at risk for disordered eating found in the current study falls within the range of 7.1-49.2% for being at risk for disordered eating within these previous studies.^{19,26-32}

Practical Implications

This study helps reiterate the need to include questions pertaining to disordered eating in the medical history during the pre-participation examination.^{1,33} Not only do ATs need to look for history of disordered eating in pre-participation examinations, but they should also be aware to watch for signs and symptoms. Please refer to the NATA position statement on disordered eating to be familiar with all the signs and symptoms as well as management of disordered eating.¹ With the information presented in this study, it is clear that ATs need to be observant of any behaviors that may indicate an athlete might be engaging in NSSI. Athletes in the current study were participating in NSSI, so I suggest that questions regarding NSSI be included in the medical history form. It is also important to educate coaches and athletes on the signs and symptoms of disordered eating and NSSI as well as possible short-term and long-term associated health risks.

Limitations

The current study had several advantages, such as having the survey distributed to 10 NCAA Division II institutions across four states, having athletes from 15 different sports, and being the first study, to my knowledge, to investigate NSSI in athletes. There were however, several limitations in this study. Though 10 institutions participated in this study, all were located in the Midwestern region of the United States, which may have contributed to the lack of ethnic diversity. The survey was a self-reported online questionnaire, which may have limited the number of respondents to those who owned a computer or who had easy access to one, though considering the population; it is unlikely this changed the response rate. I chose a self-reported survey due to the nature of the questions and because some respondents might be embarrassed of their behavior and may not report these behaviors in an interview, which may result in bias. I only distributed the survey to NCAA Division II institutions, so one should use caution assuming these results would be similar in NCAA Division I and III institutions. In this study, I examined behaviors and prevalence but did not focus on underlying cause or function (pressure from sport, pressure from parents, self-injuring to alleviate negative emotion, etc.). When I formulated inclusion criteria for the NSSI group, I considered all behaviors in the inclusion criteria equal for ease of data transformation. This led me to not include some respondents who had indicated they cut or carved themselves 5-9 times in their lifetime in the NSSI group because they did not meet the threshold of 10 times over their lifetime. Lastly, the EAT-26, though used in other research with athletes, is not designed or validated for athletes. The EAT-26 is also only a tool to screen for at risk individuals, it is not meant as a diagnostic tool.

Future Research

Since this is the first study I know of to examine NSSI in NCAA athletes, future research on this topic must occur. After conducting this study I feel it is important to differentiate between types of behaviors when creating groups, whether it be by severity of tissue damage or level of self harm.^{14,25} It would also be interesting to see research on NSSI done in NCAA Division I and III institutions. This study focused on female athletes due to the increased prevalence of disordered eating in female athletes, yet it would be relevant to determine prevalence rates of NSSI in male athletes since previous research shows similar rates of self-injury between genders. I would also encourage the use of a questionnaire designed specifically for athletes, in future research on disordered eating.

Conclusions

The current study examined the prevalence rates of disordered eating and NSSI in NCAA Division II female varsity athletes and the co-occurrence of the two. The prevalence of being at risk for disordered eating in this sample was 26.5%, which is consistent with previous literature. Thirty percent of participants in the current sample had engaged in some form of NSSI at least once in their life, and 18.5% met the criteria for NSSI established for the current study.

Research on NSSI or other self-injury has been emerging for the past fifteen years, but has become much more abundant in the past five years. To my knowledge, this study is the first to examine the prevalence of NSSI in NCAA athletes. The information discovered in this study demonstrates the need for future research on NSSI in NCAA athletes.

It is important for ATs and other members of the sports medicine team to be aware that NSSI may be occurring among athletes at their institution. Identifying a qualified team of healthcare providers is extremely important in the prevention, detection, and management of both disordered eating and NSSI.¹ Athletic trainers need to be alert to these conditions and have a protocol in place to manage concerns as they arise. I concur with Bonci et al¹ when they emphasize that education of coaches, athletes, ATs and other key personnel is a vital component to prevention and should be implemented at every institution.

CHAPTER II: LITERATURE REVIEW

Introduction

The purpose of this study is to investigate the prevalence of disordered eating, NSSI, and the co-occurrence of the two in female collegiate athletes. In order to develop a comprehensive background from previous research studies, this review of literature is divided into six major sections, which include disordered eating, disordered eating in athletes, co-morbidities of disordered eating, self-injury, co-occurrence of self-injury with disordered eating, and summary of the literature.

Disordered Eating (DE)

Anorexia Nervosa (AN)

According to the Diagnostic and Statistical Manual for Mental disorders-IV (DSM-IV)¹⁰, four criteria are required to meet the diagnosis of AN:

1. 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 < 85% of expected weight), OR failure to make expected weight gain during growth period, leading to weight <85% of expected normal body weight.
2. Intense fear of gaining weight or becoming fat, even though underweight.
3. Disturbance in the way in which one's body weight and shape are experienced, undue influence of body weight or shape on self-evaluation, OR denial of the seriousness of the current low body weight.
4. In postmenarchal females, amenorrhea, i.e., the absence of at least three consecutive menstrual cycles (amenorrhea exists if periods occur only via hormone induction).

The DSM-IV also breaks anorexia nervosa into two subtypes:

1. Restricting- Consisting of those individuals whose eating behavior is characterized by restriction of type and quantity of food without binge eating or purging behaviors.
2. Binge-Purge- Consisting of those who also exhibit binge eating and/or purging behaviors, such as vomiting or misuse of laxatives.

The definition according to the International Classification of Diseases- Version 10 (ICD-10) displayed as a table in Bulik et al²² is similar, but gives variations in certain criterion for males. The following are the diagnostic criteria for anorexia nervosa following the ICD-10 guidelines:

1. Body weight is maintained at least 15% below that expected (either lost or never gained), body-mass index (BMI) is 17.5 kg/m² or less, OR prepubertal patients may show failure to make the expected weight gain during the period of growth.
2. Weight loss self-induced by avoidance of “fattening foods” AND one or more of the following: self-induced vomiting; self-induced purging; excessive exercise; use of appetite suppressants and/or diuretics.
3. Body image distortion in the form of a specific psychopathology whereby a dread of fatness persists as an intrusive, overvalued idea AND patient imposes a low weight threshold on himself or herself.
4. In women, amenorrhea, and in men, loss of sexual interest and potency (an apparent exception is the persistence of vaginal bleeds in anorexic women who are receiving replacement hormonal therapy, most commonly taken as a contraceptive pill). There may also be elevated levels of growth hormone, raised

levels of cortisol, changes in the peripheral metabolism of the thyroid hormone, and abnormalities of insulin secretion.

5. With prepubertal onset, the sequence of pubertal events is delayed or even arrested (growth ceases; in girls, the breasts do not develop and there is primary amenorrhea; in boys, the genitals remain juvenile); with recovery, puberty is often completed normally, but the menarche is late.

Demographics for Anorexia Nervosa

Anorexia nervosa is thought of as a female disease. According to Morris and Twaddle³⁴, anorexia nervosa affects 0.3% of the population, primarily affects females (80-90% of patients are female), and the average age of onset is 15 years old. Bulik et al²² report the same level of prevalence, but continue to discuss prevalence of sub-threshold AN ranging from 0.37% to 1.3%. These authors report the peak age of onset is between 15 and 19 years old, but also discuss anecdotal reports of AN presenting in prepubertal children as well as mid- and late-life.²² Attia and Walsh³⁵ report a slightly higher prevalence. They describe a prevalence range from .5%-1.0% for females and males being affected approximately one-tenth as frequently.³⁵ The DSM-IV¹⁰ lists the prevalence of AN at 0.5% with the typical onset between 14-18 years old. Culturally, the DSM-IV¹⁰ states that AN is more prevalent in cultures where food is of abundance and an emphasis is placed on thinness and being attractive. According to a meta-analysis by Vince and Walker³⁶, race does not have an association with the presence of disturbed eating or attitudes. This study debated that Caucasians had an increased occurrence of disordered eating, but through their analysis, they established this was not the case.³⁶ AN seems to occur more in females in their late adolescence in cultures where food is of abundance and there is an emphasis on being thin and attractive.^{10,22,34,35}

Bulimia Nervosa (BN)

Bulimia nervosa is a clinical eating disorder defined in the DSM-IV. To be diagnosed with bulimia nervosa, according to the DSM-IV,¹⁰ an individual must meet the following criteria:

1. Recurrent episodes of binge eating (classified by both of the following).
 - a. Eating, in a discrete period of time (eg, within a two-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.
 - b. A sense of lack of control over eating during the episode (eg, a feeling that one cannot stop eating or control what or how much one is eating).
2. 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.
3. The binge eating and compensatory behaviors both occur, on average, at least twice a week for three months.
4. Self-evaluation is unduly influenced by body shape and weight.
5. The disturbance does not occur exclusively during episodes of anorexia nervosa.

The DSM-IV divides BN into two types:

1. 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.
2. Non-purging 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, or diuretics or enemas.

Demographics for Bulimia Nervosa

Bulimia nervosa seems to occur in similar frequencies among industrialized countries, though in the United States it appears there is a higher incidence in white individuals.¹⁰ Females are 90% more likely to suffer from BN than males.¹⁰ The overall prevalence of BN in woman ranges between 1% and 3%, with males having about one-tenth the prevalence of that in females.¹⁰

Eating Disorders Not Otherwise Specified (EDNOS)

Eating Disorders Not Otherwise Specified is a classification for eating disorders that do not meet the classifications for another specific eating disorder.¹⁰ Listed in the DSM-IV are examples:

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 three 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 (BED): recurrent episodes of binge eating in the absence of the regular use of inappropriate compensatory behaviors characteristic of bulimia nervosa.

Disordered Eating in Athletes

Research on disordered eating in athletes is becoming more common with authors discovering various results on the prevalence rates between athletes and non-athletes. Coelho et al³⁷ performed a systematic review of 22 recent studies that compare the presence of disordered eating in young female athletes to control subjects. The results they presented were that most studies suggested athletes had similar risk of developing disordered eating as non-athletes.³⁷

According to Davis and Strachan² numerous studies have reported a higher than expected prevalence of pathogenic weight loss techniques in female athletes. These authors examine whether there is a difference in psychopathological characteristics in elite female athletes. The population in this study was 144 female patients in treatment at Toronto General Hospital between 1994 and 2000 for clinical eating disorders.² Out of the 144 participants Davis and Strachan² included, 25% were classified as elite athletes. It was determined the athletes displayed psychological traits and symptoms similar to those of the patients who were non competitive athletes.² The authors caution against the view that athletes are prone to developing different or less severe forms of eating disorders than other women.²

Klinkowski et al³⁸ had contrasting results, where they compared psychopathology in rhythmic gymnasts to high school students and anorexia nervosa patients. In this study of 159 female adolescent participants, 51 were elite rhythmic gymnasts, 55 AN patients,

and 53 were high school students.³⁸ The authors reported no parallels in psychopathology between elite rhythmic gymnasts and anorexia nervosa patients.³⁸

Beals³⁹ discusses a spectrum of abnormal and harmful eating patterns. These patterns range from clinical anorexia nervosa and bulimia nervosa to various disordered eating behaviors such as limiting food groups or moderately restricting energy intake. Beals³⁹ states, due to the different screening methods used in studies and the differences in definitions of *eating disorders* as well as the different athletic populations studied, the prevalence of disordered eating ranges from 1%-62%. Though Beals³⁹ examined female athletes in general, other authors examined female athletes at colleges and universities.^{31,32,40}

A study by Greenleaf et al³² examined a group of 204 female college athletes. The authors found the prevalence of eating disorders in their population was 2%, but the prevalence of disordered eating was 25.5%.³² Greenleaf et al³² discuss the sport environment, which tends to emphasize body size and shape, weight, and physical training, may make it challenging to identify individuals who are suffering from disordered eating habits.

A study by DiBartolo and Shaffer⁴⁰ examined eating disorder (ED) symptomatology and psychological well-being comparing female college athletes to non-athletes. These authors determined, in contrast to most literature, female athletes reported significantly healthier attitudes about themselves, their eating, and their body shape than non-athletes.⁴⁰ The authors thought the results might be related to the study taking place at a Division III college (less competitive than Division I) where the athletes were educated on nutrition and eating disorders.⁴⁰

In 1999, Johnson et al³¹ surveyed both male and female athletes from 11 Division I institutions. These authors found none of the athletes surveyed met DSM-IV requirements for AN, but 2.85% of the females had clinically significant symptoms of AN.³¹ With regards to BN, 1.1% of the female athletes met DSM-IV criteria, while 9.2% of females and .005% of males had clinically significant symptoms.³¹ Johnson et al³¹ noted that these results were lower than previous studies and discussed the study being performed in conjunction with the NCAA may have led to an under reporting of symptoms by athletes trying to protect their athletic institution.

In the National Athletic Trainers' Association's position statement on disordered eating in athletes, Bonci et al¹ presented recommendations for the prevention, detection, and comprehensive management of disordered eating in athletes. They made recommendations for both physical and psychological sign and symptom detection and well-being.¹ They determined need for collaboration between physicians, dietitians, psychotherapists, athletic trainers, administrators, coaches, and close significant others in the complex management of athletes.¹

Body Image and Athletes

Body image can play a role in female athletics, because female athletes have the pressure to perform in their sport as well as the pressure to be the size of an *ideal* woman. In 2012 Torres-McGehee et al²⁹ examined female collegiate cheerleaders for the prevalence of ED risk, pathogenic weight control behaviors, and variation in clothing-specific body image (BI) among cheerleading position and academic status. When examining clothing specific BI, the authors compared cheerleaders' perceived and desired BMI in daily clothing, full uniforms, and midriff uniforms (stomach is bare). The authors reported in regards to BI, cheerleaders wished to be smaller than their perceived

BMI, with the greatest difference for the midriff uniform.²⁹ By position, the authors found flyers (the cheerleaders who are thrown in the air) to be at the greatest risk for ED and found that overall the ED risk for cheerleaders was 33.1%.²⁹

Culpepper et al¹⁹ looked at 118 female college athletes in eight mainstream sports from Division I and Division III universities in regards to body image disturbances and eating characteristics. The authors found 24.2% of the Division I athletes were either very dissatisfied or mostly dissatisfied with their appearance, and 30.7% of the Division III athletes fell into this category.¹⁹ In addition to body image disturbances, the authors also reported that 49.2% of the Division I athletes and 40.4% of the Division III athletes were in the subclinical eating disorder range.¹⁹

Michou and Costarelli⁴¹ examined 74 elite Greek female basketball players and 80 female non-athletes to discover possible differences between DE attitudes, body image, self-esteem and anxiety levels. These authors found that 11% of the basketball players demonstrated DE attitudes, in comparison to 15% of the non-athletes.⁴¹ They also found no significant difference between basketball players and non-athletes in the appearance evaluation component of the body image questionnaire.⁴¹

Disordered eating in female athletes can cause serious health risks and may even hinder athletic performance.^{1,39} There are many factors that affect female athletes, and these factors can place limitations on research regarding disordered eating. Though research is conflicting whether female athletes are at a higher risk for DE, it is clear that a lack of consistency in screening tools and terminology leads to extreme variation in prevalence statistics.

Co-morbidities of Disordered Eating

As with other psychological disorders, it appears that DE has a high prevalence of co-morbidities. In a study by Kaye et al⁴² individuals with AN and/or BN were screened for anxiety disorders and compared with women from the community. Among the 1,366 participants in the study, there were 97 individuals with AN, 282 with BN, 293 with both AN and BN, and 694 women from the community.⁴² This study indicated that approximately two-thirds of individuals with AN, BN, or both reported one or more anxiety disorders in their lifetime, with the most common diagnoses being obsessive compulsive disorder (OCD) and social phobia.⁴² These authors found post traumatic stress disorder (PTSD) was three times more likely in participants with BN or BN and AN, than those participants with just AN.⁴² Another important finding was a majority of the participants with eating disorders and anxiety disorders had the onset of the anxiety disorder prior to the development of the eating disorder.⁴²

Chen et al⁴³ assessed 135 women with borderline personality disorders (BPD). The authors were trying to determine if eating disorder is associated with the recurrence and severity of suicide attempts, non-suicidal self-injury, rates of other co-occurring Axis I and II disorders, as well as examining psychosocial functioning among BPD outpatients.⁴³ The occurrence of eating disorders in these women was examined and 6.7% met the criteria for AN, 5.9% met criteria for BN, and 5.2% met the criteria for BED.⁴³ Chen et al⁴³ found that current BN was associated with recurrent suicide attempts and current AN was associated with recurrent non-suicidal self-injury. However, in a more recent study evaluating similar issues by Chen et al⁴⁴ it was not indicated that risk of suicide attempts or non-suicidal self-injury went up with ED's. It was found that having an ED increased the likelihood of having other non-ED axis I and II disorders.⁴⁴

Self-Injury

Non-Suicidal Self-Injury (NSSI)

Non-suicidal self-injury (NSSI) is the intentional damage to one's self without intent to die, in ways that are not deemed socially acceptable.^{6,11} Wilkinson and Goodyer¹¹ discuss the lack of inclusion of NSSI in the DSM-IV and it is not a component of any current anxious or depressive syndrome and also discuss the proposed inclusion of NSSI in the DSM-V. These authors are supportive of the inclusion to help improve communication, reduce problems from lack of diagnostic specificity, improve provision of treatment and to improve research on an etiology.¹¹

Gollust et al¹⁶ administered surveys to university students to help establish prevalence and correlates of NSSI. The survey yielded a 56.6% response rate with slightly higher response from females versus males, and graduate students versus undergraduate students.¹⁶ In this study, wound interference, banging one's body parts, and punching oneself were the most commonly reported behaviors.¹⁶ This study supported previous research that feelings of depression and anxiety co-occur with self-injury, but contrary to previous studies found a co-occurrence with symptoms of eating disorders in males, but not in females.¹⁶

Klonsky⁶ conducted a telephone survey to adults randomly selected in the United States to examine the prevalence, sociodemographics, topography and functions of NSSI. Of the 439 respondents, the lifetime prevalence of NSSI was 5.9%, with the average age of onset being 16 years old.⁶ Though there was an association with younger age and being unmarried, and having a history of mental health treatment, there was no association between gender, ethnicity, educational history or household income.⁶

Self-Injurious Behaviors (SIB)

Whitlock et al⁵ define SIB as those in which an individual purposefully inflicts harm to his or her body for reasons not recognized or sanctioned socially, and without obvious intention of committing suicide. These authors administered a survey to university students and included 2,875 responses in their analysis and found a 17% prevalence rate of SIB.⁵ The authors discuss that SIB has been thought to be a female phenomena and SIB has popularly been associated with cutting and in this study, women were found more likely to cut than men.⁵ The authors did find that women engaged in more repeat SIB, but the odds ratio was < 2.0 .⁵

According to White Kress⁴⁵, within the DSM-IV-TR, SIB is related to stereotypic movement disorder with self-injurious behavior, trichotillomania (recurrent hair pulling), impulse-control disorder not otherwise specified, and BPD. White Kress⁴⁵ describes SIB as varied and complex. The author discusses a four-category classification system: stereotypic, major, compulsive, and impulsive.⁴⁵ Stereotypic SIB are behaviors typically seen in organic mental disorders and can include head banging, self-hitting and face slapping, lip and hand chewing, self-biting and hair pulling.⁴⁵ Major SIB are catastrophic, such as castration, eye enucleation (removal of the eyeball from the orbit), and limb amputation.⁴⁵ Compulsive SIB includes repetitive hair pulling, skin picking, and nail biting of a mild to moderate severity.⁴⁵ Impulsive SIB consists of skin cutting, burning, and self-hitting of mild to moderate severity and can either be episodic (meaning it occurs a limited number of times) or repetitive which tend to have an addictive quality.⁴⁵

In a study by Kakhnovets et al¹⁵, 79 college students who had participated in SIB were surveyed about their experiences with SIB. For this study SIB was defined as any

behavior that seeks out pain and/or blood from one's own body tissue without conscious suicidal intent.¹⁵ This does not include cultural practices such as tattooing or body piercing, and also excluded repetitive behaviors of individuals with cognitive and developmental disorders.¹⁵ The authors found it more likely for reports of history of abuse, eating disorders, low self-esteem and suicidal ideation in students who reported SIB.¹⁵ An important finding was that students who had self-injured more than once were more likely to report suicidal ideation than those who had only self-injured once.¹⁵

Subclinical Self-Harm

Croyle and Waltz¹⁴ examined characteristics associated with mildly injurious behaviors (fingernail biting, skin picking, etc.) and more injurious self-harm behaviors (cutting, burning, etc.) in an undergraduate sample. They define sub-clinical self-harm as self-harm occurring at mildly to moderately injurious levels of severity and/or in non-clinical populations.¹⁴ This study revealed that 31% of the respondents reported mildly injurious self-harm in the past three years, 20% reported moderately injurious self-harm in the past three years, and there was not a significant gender difference in this behavior.¹⁴ Moderately injurious self-harm was associated with more somatic symptoms, impulsivity, some characteristics of OCD, more disordered eating behaviors, higher levels of general shame, and a history of emotional abuse.¹⁴ Though NSSI, SIB, and subclinical self-harm all refer to very similar issues, the lack of defined criteria in the DSM-IV can cause difficulty determining prevalence rates secondary to the lack of consistent terminology.

Demographics of Self-Injury

The dearth of diagnostic recognition of self-injury without suicidal intent has led to research in the area utilizing various terms, which can make identifying demographics challenging. Most authors agree the onset is generally in adolescence.^{5,6,11,13} There is varying opinion on whether gender plays a role in the likelihood to self-injure.^{5,6,13-16} Klonsky,⁶ Croyle and Waltz,¹⁴ and Gollust et al¹⁶ found no significant difference in the prevalence of self-injury between gender. Whitlock et al⁵ and Kakhnovets et al¹⁵ both found a higher prevalence of repeated self-injury in females than males. Kerr and Muehlenkamp¹³ only studied females. Regarding ethnicity, Kakhnovets et al¹⁵ and Klonsky⁶ agree that ethnicity does not effect the likliehood to self-injure, while Gollust et al¹⁶ suggest that black students are less likely to self-harm than white students.

Co-occurrence of Self-Injury with Disordered Eating

Thomas et al⁸ studied 376 female inpatients with DSM-IV diagnosis of AN, BN, or EDNOS. For this study SIB was defined as a self-inflicted direct injury of the body without conscious suicidal intent.⁸ These authors found a lifetime occurrence of greater than 30% of SIB in the eating disordered inpatients included in the study, but found no significant difference between types of eating disorder.⁸ From the questionnaires administered, the authors determined the primary functions of patients self-injuring were: to reduce anger, to punish themselves, to reduce tension, to feel physical pain instead of emotional pain, and to end uncontrollable feelings.⁸ These authors also suggested the development of a standardized questionnaire for SIB.⁸

In a study by Solano et al⁹, 109 outpatient females diagnosed with either AN or BN, were interviewed and given self-report questionnaires. For this study, the authors consider SIB as cutting, burning, hitting, scratching, and hair pulling that is direct and

intentional physical self-damage which did not lead to death.⁹ These authors reported a 32% lifetime history of self-harm behaviors in the outpatient sample, but did not find a difference in prevalence between AN and BN.⁹ The authors noted that the occurrence of SIB was found more frequently in patients with greater symptomatology and severity of eating disorder.⁹

Ahrén-Moonga et al⁴⁶ evaluated personality traits and SIB in 38 female inpatients with eating disorders who were age matched with healthy women from the community. The authors performed interviews and collected clinical records to gain information on SIB, which for this study, they were only concerned with severe cases of cutting, scratching or hitting that were reported by clinicians.⁴⁶ The overall prevalence of SIB in eating disordered patients as reported by these authors was 36.8%, with the prevalence in BN patients being 55.6%, and 20% in AN patients.⁴⁶

A study examining the co-occurrence of self-reported disordered eating and self-harm in male and female United Kingdom (UK) university students was conducted by Wright et al.⁷ The two surveys administered asked questions about disordered eating, self-harm, psychological well-being, and seeking medical or psychological help for eating disorders or self-harm.⁷ The authors found that in both surveys there was between 4.5% and 4.9% of the students sampled who reported both disordered eating and self-harm.⁷

Muehlenkamp et al⁴⁷ examined emotion dysregulation in female college students who met risk screening criteria on questionnaires regarding NSSI as well as DE. The authors were examining models of analysis based on the different questionnaires' ability to classify individuals with either NSSI, DE, or NSSI + DE.⁴⁷ The authors found body

dissatisfaction and a person's psychological investment with body image to be more predictive of DE.⁴⁷ According to the authors, depressive symptoms are a stronger predictor of NSSI, while tendencies to use the body as a coping tool often predict both NSSI and DE.⁴⁷ It does appear that in the populations observed in the aforementioned studies, there is a fairly high co-occurrence of self-injury and disordered eating.^{7-9,46}

Summary of the Literature

The purpose of this study was to investigate the prevalence of disordered eating, NSSI, and the co-occurrence of the two in female collegiate athletes. There have been numerous studies on disordered eating in female athletes as well as several studies on the co-occurrence of self-injury and disordered eating. From a review of the research it does appear there is a co-occurrence between self-injury and disordered eating in the general population.⁷⁻⁹ The ambiguity regarding the terminology of self-injury without suicidal intent has made it difficult to compare statistics. Including NSSI in DSM-V will make research terminology more consistent.¹¹ The literature is lacking regarding NSSI in female athletes and the co-occurrence of NSSI with DE in female athletes, thus providing an opportunity for further research. By administering a survey to female college athletes, I examined the relationship between NSSI and DE in this population.

CHAPTER III: CONCLUSIONS AND RECOMMENDATIONS

The current study examined the prevalence rates of disordered eating and NSSI in NCAA Division II female varsity athletes and the co-occurrence of the two. The prevalence of being at risk for disordered eating in this sample was 26.5%, which is consistent with previous literature. Thirty percent of participants in the current sample had engaged in some form of NSSI at least once in their life, and 18.5% met the criteria for NSSI established for the current study.

Research on NSSI or other self-injury has been emerging for the past 15 years, but has become much more abundant in the past five years. To my knowledge, the current study is the first to examine the prevalence of NSSI in NCAA athletes. The information discovered in this study demonstrates the need for future research on NSSI in NCAA athletes.

It is important for ATs and other members of the sports medicine team to be aware that NSSI may be occurring among athletes at their institution. Identifying a qualified team of healthcare providers is extremely important in the prevention, detection, and management of both disordered eating and NSSI.¹ Athletic trainers need to be alert to these conditions and have a protocol in place to manage concerns as they arise. I concur with Bonci et al¹ when they emphasize that education of coaches, athletes, ATs and other key personnel is a vital proponent to prevention and should be implemented at every institution.

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Appendices

Appendix A: Survey

What was your age as of January 1, 2013? _____

What is your gender:

Male

Female

Please select one of the following that best describes your race:

White/Caucasian

Native American

African American

Pacific Islander

Hispanic

Other

Asian

Prefer not to answer

What sport(s) do you participate in at the varsity level? _____

How many years experience do you have competing in this sport? _____

How many years of eligibility do you have remaining (following this year)?

How tall are you? _____

What is your current weight in pounds? _____

What was your highest weight (excluding pregnancy)? _____

What was your lowest adult weight? _____

What is your ideal weight? _____

**Please answer the following questions on the following scale 1-Always, 2-Usually, 3-
Often, 4- Sometimes, 5- Rarely, 6-Never**

Am terrified about being overweight.

Avoid eating when I am hungry.

Find myself preoccupied with food.

Have gone on eating binges where I feel that I may not be able to stop.

Cut my food into small pieces.

Aware of the calorie content of foods that I eat.

Particularly avoid food with a high carbohydrate content (i.e. bread, rice, potatoes, etc.)

Feel that others would prefer if I ate more.

Vomit after I have eaten.

Feel extremely guilty after eating.

Am preoccupied with a desire to be thinner.

Think about burning up calories when I exercise.

Other people think that I am too thin.

Am preoccupied with the thought of having fat on my body.

Take longer than others to eat my meals.

Avoid foods with sugar in them.

Please answer the following questions on the following scale 1-Always, 2-Usually, 3- Often, 4- Sometimes, 5- Rarely, 6-Never

Eat diet foods.

Feel that food controls my life.

Display self-control around food.

Feel that others pressure me to eat.

Give too much time and thought to food.

Feel uncomfortable after eating sweets.

Engage in dieting behavior.

Like my stomach to be empty.

Have the impulse to vomit after meals.

Enjoy trying new rich foods.

For the next 4 questions, please answer using the following scale 0-Never, 1-Once a month or less, 2- 2-3 times a month, 3- Once a week, 4- 2-6 times a week, 5- Once a day or more

In the past 6 months have you:

Gone on eating binges where you feel that you may not be able to stop? (Eating much more than most people would eat under the same circumstances)

Ever made yourself sick (vomited) to control your weight or shape?

Ever used laxatives, diet pills or diuretics (water pills) to control your weight or shape?

Exercised more than 60 minutes a day to lose or to control your weight? (In addition to required exercise for your sport)

In the past 6 months have you:

Lost 20 pounds or more in the past 6 months? Yes or No

Indicate whether you have ever done any of the following behaviors. If yes, rate how many times you engaged in the behavior a.) in the past 3 months b.) over your lifetime.

Stuck yourself with pins, needles, etc., on purpose and NOT drawn blood.

Interfered with the healing of a wound (e.g., by repeatedly pulling off scabs).

Bitten your fingernails enough to cause bleeding or pain.

Scratched your skin severely enough to cause bleeding or scarring.

Picked at your skin severely enough to cause bleeding or scarring.

Pulled out large amounts of your hair.

Punched or hit yourself to the point of bruising or more.

Banged your head, arms, or legs on purpose to the point of bleeding.

Stuck yourself with pins, needles, etc., on purpose and drawn blood.

Burned yourself on purpose.

Carved words or symbols on your skin.

Indicate whether you have ever done any of the following behaviors. If yes, rate how many times you engaged in the behavior a.) in the past 3 months b.) over your lifetime.

Cut your wrists (not trying to die).

Cut other areas of your body (not trying to die).

Swallowed harmful objects (not drugs).

Taken drugs for the purpose of harming yourself (not to get high or die).

Broken your bones on purpose.

Strangled yourself (not trying to die).

Appendix B: Scoring for EAT-26

Test Item Scoring

Items 1-25 are scored as follows: Always = 3; Usually = 2; Often = 1; Other answers = 0

Item 26 is scored in the opposite direction (Never = 3 etc.)

Total Test Score: Add item scores for a "total test score."

Total test score of 20 or more is considered at risk for disordered eating

Behavioral Scoring

	Never	Once a month or less	2-3 times a month	Once a week	2-6 times a week	Once a day or more
A) Binge			✓	✓	✓	✓
B) Vomit		✓	✓	✓	✓	✓
C) Laxatives, diuretics		✓	✓	✓	✓	✓
D) Exercise						✓
Lost 20 pounds or more	Yes	✓	No			

If respondent chooses any of the checked boxes, they are considered at risk for disordered eating.

Underweight

BMI of 18.0 or less is considered at risk for disordered eating.

Divide weight in pounds by height in inches and then by height in inches again and then multiply by 703

Example: 5'4" = 64 inches. Weight = 105 lbs.

So, $(105 \div 64 = 1.641)$ $(1.64 \div 64 = .0256)$ $(.0256 \times 703 = 18.0)$

Appendix C: Informed Consent

My name is Mariah Lash. I am a graduate student at Northern Michigan University, and collecting data for my master's thesis. The purpose of this research is to evaluate relationships between various psychological behaviors. I am asking female NCAA Division II varsity athletes who are 18 years of age or older to complete this electronic survey. More specifically, you will be asked to answer questions regarding your demographic background, eating habits, training habits, self- image, and self-injury.

The potential benefits of this study include improving assessment skills of health care professionals involved with female athletics. You can enter your email address or mailing address for a chance to receive an honorarium of one **50\$** Amazon gift card or one of multiple **25\$** Amazon gift cards. This address will only be collected for the purpose of drawing a prize and not used for any promotion, list serve or any other purpose. The potential risks of participating in this survey include emotional distress caused by remembering unpleasant experiences. It will take about 10-15 minutes to complete the survey. Your part in this study is anonymous. That means that your answers to all questions are private. No one else can know if you participated in this study and no one else can find out what your answers were. Scientific reports will be based on group data and will not identify you or any individual as being in this project. All data will be stored in a password protected electronic format. The results of the study will be used for scholarly purposes only.

By clicking on the link and entering the password **NCAA2** you acknowledge that you are at least 18 years of age, have read this information and agree to participate in this research. Taking part in this research study is completely voluntary. If you decide not to be in this study, or if you stop participating at any time, you won't be penalized or lose any benefits for which you otherwise qualify.

Thank you for your time. If you have any questions, feel free to contact me at mlash@nmu.edu or (906) 227-2130, Dr. Marguerite Moore at mmoore@nmu.edu or (906) 227- 2228, or Dr. Brian Cherry the Assistant Provost of Graduate Education and Research at bcherry@nmu.edu or (906) 227- 1823.

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Table 1. Self-Reported Demographic Information and Anthropometric Data

Characteristic	Finding
Sex, no. (%)	
Male	0 (0%)
Female	272 (100%)
Race, no. (%)	
White/Caucasian	247 (90.8%)
African American	8 (2.9%)
Hispanic	6 (2.2%)
Asian	1 (0.4%)
Native American	2 (0.7%)
Other	7 (2.6%)
Prefer not to answer	1 (0.4%)
Sport, no. (%)	
Basketball	37 (13.6%) ^a
Bowling	1 (0.4%) ^a
Cross Country	35 (12.9%) ^a
Diving	4 (1.5%) ^a
Fencing	7 (2.6%) ^a
Golf	12 (4.4%) ^a
Lacrosse	4 (1.5%) ^a
Skiing	11 (4.0%) ^a
Soccer	47 (17.3%) ^a
Softball	22 (8.1%) ^a
Swimming	20 (7.4%) ^a
Tennis	16 (5.9%) ^a
Track & Field (Indoor)	41 (15.1%) ^a
Track & Field (Outdoor)	56 (20.6%) ^a
Volleyball	25 (9.2%) ^a
Experience competing in selected sport, no. (%)	
0-3 years	36 (13.2%)
4-6 years	38 (14.0%)
7-9 years	60 (22.1%)
10-12 years	58 (21.3%)
13-15 years	42 (15.4%)
More than 15 years	38 (14.0%)
Remaining eligibility (following this year), no. (%)	
0 years	53 (19.5%)
1 years	53 (19.5%)
2 years	71 (26.1%)
3 years	83 (30.5%)
4 years	12 (4.4%)
Age, y (Mean ± SD) ^b	19.81 ± 1.27
Height, cm (Mean ± SD)	169.59 ± 8.12
Weight, kg (Mean ± SD)	65.54 ± 10.63
BMI, Kg/m ² (Mean ± SD)	22.74 ± 3.05

^a Indicates participants could choose more than one.

^b One subject selected "Over 25", this response was omitted from reported age as it could not be quantified.

Table 2. Prevalence by Sport Type and Condition

Sport Condition	Sample size	Prevalence, no. (%)	Mean^a	SD
Overall				
At risk for DE	272	72 (26.5%)	1.74	0.44
Fits criteria for NSSI	271	50 (18.5%)	1.82	0.39
Engaged in NSSI behavior at least once	271	83 (30.6%)	1.69	0.46
Team				
At risk for DE	132	32 (24.2%)	1.76	0.43
Fits criteria for NSSI	131	20 (15.3%)	1.85	0.36
Engaged in NSSI behavior at least once	131	34 (26.0%)	1.74	0.44
Individual				
At risk for DE	137	40 (29.2%)	1.71	0.46
Fits criteria for NSSI	137	29 (21.2%)	1.79	0.41
Engaged in NSSI behavior at least once	137	48 (35.0%)	1.65	0.48

^a Mean is based off a score of 1=Yes, 2=No

DE is abbreviation for disordered eating

NSSI is abbreviation for non-suicidal self injury

SD is abbreviation for standard deviation

Table 3. Pearson Correlation

Pearson Correlation

		Classified as at risk by EAT-26	Fits criteria for NSSI
Classified as at risk by EAT-26	Pearson Correlation	1	.123*
	Sig. (2-tailed)		.043
	N	272	271
Fits criteria for NSSI	Pearson Correlation	.123*	1
	Sig. (2-tailed)	.043	
	N	271	271

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4. Independent Samples T-Test Comparing At Risk for Disordered Eating and Fitting Criteria for Non-Suicidal Self-Injury by Sport Type

Independent Samples Test

		t-test for Equality of Means		
		t	df	Sig. (2-tailed)
Classified as at risk by EAT-26	Equal variances assumed	.916	267	.361
	Equal variances not assumed	.917	266.874	.360
Fits criteria for NSSI	Equal variances assumed	1.248	266	.213
	Equal variances not assumed	1.252	264.231	.212

Table 5. Frequencies and Proportions of Behaviors Included in Criteria for Non-Suicidal Self-Injury Group (n=271)

Behavior	Yes Response, no. (%)	Timeframe	0	1	2-4	5-9	10-14	15+
Stuck yourself with pins, needles, etc., on purpose and NOT drawn blood	10 (3.7%)	Past 3 months	9	1	0	0	0	0
		Over lifetime	0	1	2	5	1	1
Scratched your skin severely enough to cause bleeding or scarring	38 (14.0%)	Past 3 months	17	8	8	2	1	2
		Over lifetime	0	5	10	6	8	9
Picked at your skin severely enough to cause bleeding or scarring ^a	31 (11.5%)	Past 3 months	6	7	8	2	2	6
		Over lifetime	0	2	8	4	3	14
Pulled out large amounts of your hair	5 (1.8%)	Past 3 months	3	1	1	0	0	0
		Over lifetime	0	2	0	1	2	0
Punched or hit yourself to the point of bruising or more	14 (5.2%)	Past 3 months	8	4	2	0	0	0
		Over lifetime	0	1	6	3	2	2
Banged your head, arms, or legs on purpose to the point of bleeding	1 (0.4%)	Past 3 months	0	1	0	0	0	0
		Over lifetime	0	0	0	1	0	0
Stuck yourself with pins, needles, etc., on purpose and drawn blood	9 (3.3%)	Past 3 months	7	2	0	0	0	0
		Over lifetime ^b	0	0	2	2	1	3
Burned yourself on purpose	5 (1.8%)	Past 3 months	4	1	0	0	0	0
		Over lifetime	0	1	2	1	0	1
Carved words or symbols on your skin	11 (4.1%)	Past 3 months	10	1	0	0	0	0
		Over lifetime	0	5	2	3	1	0
Cut your wrists (not trying to die)	19 (7.0%)	Past 3 months	14	3	0	0	0	2
		Over lifetime	0	3	4	2	2	8
Cut other areas of your body (not trying to die)	14 (5.2%)	Past 3 months	11	1	1	1	0	0
		Over lifetime	0	0	1	3	0	10
Swallowed harmful objects (not drugs)	0 (0.0%)	Past 3 months	0	0	0	0	0	0
		Over lifetime	0	0	0	0	0	0
Taken drugs for the purpose of harming yourself (not to get high or die)	3 (1.1%)	Past 3 months	2	1	0	0	0	0
		Over lifetime	0	1	1	0	1	0
Broken your bones on purpose ^a	0 (0.0%)	Past 3 months	0	0	0	0	0	0
		Over lifetime	0	0	0	0	0	0
Strangled yourself (not trying to die) ^a	0 (0.0%)	Past 3 months	0	0	0	0	0	0
		Over lifetime	0	0	0	0	0	0

^a Indicates questions that had 270 responses^b Indicates one respondent did not provide an answer for this question

Behavior	Yes Response, no. (%)	Timeframe	0	1	2-4	5-9	10-14	15+
Interfered with the healing of a wound (e.g., by repeatedly pulling off scabs)	111 (41.0%)	Past 3 months	31	38	30	7	1	4
		Over lifetime	0	5	25	25	23	33
Bitten your fingernails enough to cause bleeding or pain	51 (18.8%)	Past 3 months	4	11	19	10	2	5
		Over lifetime	0	1	4	9	8	29

Question	Always	Usually	Often	Sometimes	Rarely	Never	Total
Am terrified about being overweight.	44	47	28	55	63	35	272
Avoid eating when I am hungry.	2	4	3	50	111	102	272
Find myself preoccupied with food.	11	20	23	101	71	46	272
Have gone on eating binges where I feel that I may not be able to stop.	4	6	12	45	59	146	272
Cut my food into small pieces.	6	14	24	64	88	76	272
Aware of the calorie content of foods that I eat.	18	35	49	64	57	49	272
Particularly avoid food with a high carbohydrate content (i. e. bread, rice, potatoes, etc.)	5	14	12	56	96	89	272
Feel that others would prefer if I ate more.	1	7	8	31	78	147	272
Vomit after I have eaten.	1	0	2	6	8	255	272
Feel extremely guilty after eating.	6	7	16	60	72	111	272
Am preoccupied with a desire to be thinner.	19	17	19	69	78	70	272
Think about burning up calories when I exercise.	25	32	43	74	57	41	272
Other people think that I am too thin.	2	6	5	36	73	149	271
Am preoccupied with the thought of having fat on my body.	18	12	19	67	92	64	272
Take longer than others to eat my meals.	9	26	13	58	100	66	272
Avoid foods with sugar in them.	1	5	19	67	106	74	272
Eat diet foods.	2	8	18	76	87	81	272
Feel that food controls my life.	3	11	11	29	71	147	272
Display self-control around food.	11	47	80	73	31	30	272
Feel that others pressure me to eat.	0	6	9	23	80	154	272
Give too much time and thought to food.	10	9	22	49	97	85	272
Feel uncomfortable after eating sweets.	9	18	24	75	86	60	272
Engage in dieting behavior.	5	7	19	67	99	75	272
Like my stomach to be empty.	4	8	9	33	71	147	272
Have the impulse to vomit after meals.	1	1	5	8	30	227	272
Enjoy trying new rich foods.	41	51	40	90	30	19	271

Table 8. Frequencies of Responses to Supplemental Behavior Questions of the Eating Attitudes Test (EAT-26)

Question	Never	Once a month or less	2-3 times a month	Once a week	2-6 times a week	Once a day or more	Total responses
Indicate how many times in the past 6 months you have gone on eating binges ^a where you feel that you may not be able to stop	160	49	21	10	6	1	247 ^c
Indicate how many times in the past 6 months you have made yourself sick (vomited) to control your weight or shape	215	13	3	0	2	3	236 ^c
Indicate how many times in the past 6 months you have used laxatives, diet pills or diuretics (water pills) to control your weight or shape	215	14	3	1	1	1	235 ^c
Indicate how many times in the past 6 months you have exercised more than 60 minutes a day to lose or to control your weight ^b	154	39	26	13	11	6	249 ^c
In the past 6 months have you lost 20 pounds or more?	Yes	6		No	266		272

^a Binge defined as eating more than most people would eat under the same circumstances

^b In addition to required exercise for sport

^c Indicates question was a sliding scale, respondent had to click on scale to record response even if answer was "never"
 Highlighted boxes indicate respondents are considered at risk for disordered eating