

THE PHYSIOLOGICAL AND PSYCHOLOGICAL EFFECTS OF EATING DISORDERS IN
FEMALE COLLEGE ATHLETES

by

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ABSTRACT

The number of female athletes participating in college sports has drastically expanded since the incorporation of Title IX in 1972, with an increase of about 628%. As the number of female athletes participating in college athletics continues to rise, the health concerns of women athletes also rise. The main health concerns identified include disordered eating, amenorrhea, and osteoporosis, forming what has been dubbed the female athlete triad¹. Disordered eating is more common in female athletes than non-athletes, and more common in sports in which aesthetics and weight are considered important. While the psychology behind what causes an eating disorder is not yet well researched, perfectionism potentially plays an important role. Athletes with eating disorders report significantly lower levels of emotional well-being, mental health, vitality, and general health. Furthermore, disordered eating can lead to a negative effect on physical fitness and sports performance, despite the fact that many eating disorders develop as a perceived solution to those very issues. Preventative measures are being taught to coaches and athletic trainers to try to deter patterns of disordered eating. As eating disorders are more difficult to treat the longer they progress, early intervention is necessary in order to ensure adequate treatment and outcome. In this paper, I examine the factors that potentially underlie the

¹ Hobart, Julie A., and Douglas R. Smucker. "The female athlete triad." *American family physician* 61.11 (2000): 3357-3364.

development of eating disorders, their physiological and psychological effects, and what steps can be taken to better prevent them.

DEDICATION

This capstone research work is dedicated sincerely to my teammates and fellow college athletes. Thank you for believing in me and inspiring me at every turn. Don't forget that your value as an athlete and as a person is not dependent on how your body looks.

To my friends and family, thank you for your support for something I'm so passionate about. Your interest and questions helped shape this project into what it has become.

Lastly, this work is dedicated to my 14-year-old self, who didn't know the damage she was doing when she thought she had to starve herself to be beautiful. Achieving your dream body won't fix the other, more important issues in your life. Eat the damn burger.

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I. INTRODUCTION

College sports have historically been limited to male participation only, and only recently have they become available to females. The number of female athletes participating in college sports has drastically expanded since the incorporation of Title IX in 1972 when the number of female participants was around 29,000 compared to 2023, where the number is approximately 218,000. This is an increase of about 628%, as female athletic events become more popular and lucrative, and more sports continue to be funded by universities. As the number of females in sports increases, so does the research performed on female athletic performance. Sports medicine healthcare providers have developed a complex of three conditions of unique health concerns of women in sports, deemed the *female athlete triad*. This triad includes disordered eating, amenorrhea, and osteoporosis. Eating disorders are defined by the National Eating Disorders Association as “serious but treatable mental and physical illnesses that can affect people of all genders, ages, races, religions, ethnicities, sexual orientations, body shapes, and weights”². Symptoms of eating disorders vary depending on the type of eating disorder, which I will discuss later. While disordered eating can affect anyone, symptoms are more frequent in athletes than in non-athletes, and more frequent in sports where leanness is emphasized³. The development of eating disorders is not well understood nor sufficiently researched, but the research that has been done indicates that potential psychological reasons for development include perfectionism, emotional problems, social standards, and genetic factors. In this paper, I plan to evaluate the research pertaining to eating disorder development and its effects to adequately discuss the

² Altunkara, E. (2022). What Are Eating Disorders? *National Eating Disorders Association*.
<https://doi.org/10.4135/9781412963862.n311>

³ Torstveit, M. K., & Sundgot-Borgen, J. (2014). Disordered eating and eating disorders in female athletes. *Handbook of Sports Medicine and Science*, 42–55. <https://doi.org/10.1002/9781118862254.ch5>

danger and prevalence of disordered eating in females whose career is indirectly dependent on fueling their body correctly.

II. CHARACTERISTIC CRITERIA

There is a range of different eating disorders with different symptoms and effects. The most seen eating disorders are anorexia nervosa, bulimia nervosa, and binge eating disorder. However, more forms of disordered eating have been identified such as orthorexia, rumination, avoidant restrictive food intake, and pica. In this paper, I will be focusing on the most common three eating disorders, as they are the most well-researched as well as the most dangerous. Anorexia nervosa is characterized by three factors according to the DSM-V: 1) the restriction of energy intake relative to the requirements of the body leads to a significantly low weight in the context of sex, age, developmental trajectory, and physical health 2) the intense fear of gaining weight or being fat, although underweight 3) 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 weight⁴. Behavioral symptoms of anorexia nervosa include dramatic weight loss, preoccupation with food and weight, intense fear of gaining weight, withdrawal from friends, loss of period, rigid exercise regimen, and inflexible thinking. Physical symptoms include stomach cramps, difficulty focusing, fainting/syncope, feeling cold, dry skin, sleep problems, and immune deficiencies. In anorexia, the body goes through cycles of self-starvation, denying the nutrients needed to function. Anorexia is the most dangerous mental health disorder, with a mortality rate five times that of the general population relevant to age and

⁴ American Psychiatric Association. (2013). DSM, DSM-IV, DSM-IVR. *Encyclopedia of Pain, V*, 666–666. https://doi.org/10.1007/978-3-540-29805-2_1208

sex⁵. Bulimia nervosa is defined by the DSM as 1) recurrent episodes of binge eating 2) recurrent inappropriate compensatory behavior to prevent weight gain 3) both the binge eating and compensatory behaviors occur at least once a week for three months, on average 4) self-evaluation is unduly influenced by body shape and weight 5) the disturbance does not occur exclusively during episodes of anorexia nervosa. The amount of food that is binged is larger than average and typically eaten with a sense of lack of control. The compensatory behavior can include vomiting, laxatives, diuretics, fasting, and excessive exercise. Behavioral symptoms include fear of eating in public, disappearance after meals, drinking excessive amounts of water, rigid exercise regimens, and withdrawal from friends. Physical symptoms include fluctuating weight, teeth discoloration, fainting/syncope, feeling cold, sleep problems, and immune deficiencies. Binge eating disorder is like bulimia in that a large amount of food is consumed at one time with a lack of control, but no compensatory behavior occurs. Diagnostic criteria from the DSM include 1) recurrent episodes of binge eating associated with eating much more rapidly than normal, eating until uncomfortably full, eating when not hungry, eating alone, and feelings of disgust and guilt 2) marked distress regarding binge eating 3) binge eating occurs once a week for three months on average 4) binge eating is not associated with the recurrent use of compensatory behaviors. Behavioral symptoms include fear of eating in public, hoarding food, frequent diets, extreme concern with body shape, eating alone, disruption in normal eating behaviors, and lifestyle and schedule changes to make time for binge sessions. Physical symptoms include noticeable fluctuations in weight, stomach cramps and gastrointestinal complaints, and difficulties concentrating.

⁵ Edakubo, S., & Fushimi, K. (2020). Mortality and risk assessment for anorexia nervosa in acute-care hospitals: A nationwide administrative database analysis. *BMC Psychiatry*, 20(1). <https://doi.org/10.1186/s12888-020-2433-8>

III. PREVALENCE OF EATING DISORDERS

The prevalence of eating disorders in female college athletes is difficult to determine, and further research is still required to fully understand the extent of disordered eating among the population. As of now, estimates of symptoms as well as a history of eating disorders range from less than 1%-39.2%⁶. This data has been obtained primarily via questionnaires or standardized instruments. Much of the data surrounding eating disorders regards the general public, not necessarily the highlighted population of collegiate athletes, and studies that do focus on female college athletes are typically small. From this standpoint, data collection is minimal, and more extensive experimentation must be performed to determine prevalence more accurately. In all scenarios, however, the risk of eating disorders is higher in females than in males. It has also been determined that the prevalence of disordered eating is higher in sports that emphasize leanness and a certain aesthetic appearance than in non-lean sports⁷. Lean sports, also known as aesthetic sports, include dancing, swimming, long-distance running, gymnastics, wrestling, jockeys, and other sports that are either weight-dependent or where appearance is a factor that results in more favorable judging. Female athletes tend to have a lower mean desired body fat than actual body fat, with lean-sport athletes having a lower desired body weight than non-lean-sport athletes. Athletes also tend to have a lower body dissatisfaction score than non-athletes, indicating that they are more satisfied with portions of the body that are typically of the greatest concern in eating disorders. However, lean-sport athletes had a significantly higher body dissatisfaction score than non-lean-sport athletes, once again confirming that they place more

⁶ Edakubo, & Fushimi, 179

⁷ Greenleaf, C., Petrie, T. A., Carter, J., & Reel, J. J. (2009). Female collegiate athletes: Prevalence of eating disorders and disordered eating behaviors. *Journal of American College Health*, 57(5), 489–496. <https://doi.org/10.3200/jach.57.5.489-496>

emphasis on appearance than other athletes⁸.

IV. CAUSES OF EATING DISORDERS

The cause of an eating disorder varies between individuals, and a combination of factors can contribute. There's no one reason why someone would develop an eating disorder and the onset is often due to multiple biopsychosocial influences. As a society, thinness has been idealized for the past century, with the most "desirable" women displaying often unhealthy body standards. Exposure to media is easier and more potent today than it ever has been, exposing young girls to these unrealistic standards. The rise of social media has made it easier than ever to keep up with trends and can lead to unhealthy comparisons, as photos on social media can be edited. This can lead to thin-ideal internalization, the cognitive "buying into" social standards of attractiveness. On top of this concept, personality traits including negative emotionality, perfectionism, and negative urgency play a role in the development of eating disorders⁹. Recently evidence has pointed to eating disorders being genetically inherited, as they historically cluster in families. As of now, around 11-17% of anorexia nervosa heritability has been contributed to common genetic variants. There is also a significant overlap of genes coding for eating disorders and psychological traits, specifically obsessive-compulsive disorder. Genetic overlap has also been observed between eating disorders and metabolic phenotypes¹⁰. While more research must be conducted on this front, it is a promising lead in better understanding eating disorders and subsequently treating them.

⁸ Greenleaf, Petrie, Carter, & Reel, 49

⁹ Culbert, K. M., Racine, S. E., & Klump, K. L. (2015). Research review: What we have learned about the causes of eating disorders - a synthesis of sociocultural, psychological, and Biological Research. *Journal of Child Psychology and Psychiatry*, 56(11), 1141–1164. <https://doi.org/10.1111/jcpp.12441>

¹⁰ Watson, H. J., Palmos, A. B., Hunjan, A., Baker, J. H., Yilmaz, Z., & Davies, H. L. (2021). Genetics of eating disorders in the genome-wide era. *Psychological Medicine*, 51(13), 2287–2297. <https://doi.org/10.1017/s0033291720005474>

V. PHYSIOLOGICAL CONCERNS

The physical strain placed on the body due to eating disorders is dangerous, especially for athletes who rely on their bodies to perform in sports. Anorexia is the most dangerous of eating disorders, with a treatment success rate of 80% and a 20% death rate. While the development of eating disorders is typically paired with the concept that an athlete will be able to perform better athletically due to leaner body mass, the opposite effect is true. Long-term dietary restrictions lead to a deterioration in sports performance due to glycogen depletion, an increase in circulatory lactate, dehydration, and loss of lean mass. While low body weight may initially enhance athletic performance, there is a point at which continued weight loss leads to a negative performance due to excessive loss of lean mass and fluids¹¹. Disordered eating is also frequently accompanied by excessive and compulsive exercise, particularly in the purging subgroup of anorexia patients and bulimia patients, which leads to overtraining and injuries. Exercise is considered excessive when it significantly interferes with other activities, at inappropriate times and places, or continues regardless of injury or medical conditions¹². Excessive and compulsive exercise is associated with an increased risk of medical complications including overuse injuries, bone fractures, and cardiac complications. It is also associated with higher rates of dropout from treatment programs, longer inpatient treatment, poorer treatment outcomes, and quicker relapse, as well as greater severity of eating disorders, and general psychopathology¹³. While results are inconclusive, binge eating *seems* to negatively influence sport performance if associated with weight gain. When bingeing is accompanied by purging, a negative effect on athletic performance is observed.

¹¹ El Ghoch, M., Soave, F., Calugi, S., & Dalle Grave, R. (2013). Eating disorders, physical fitness and sport performance: A systematic review. *Nutrients*, 5(12), 5140–5160. <https://doi.org/10.3390/nu5125140>

¹²Ackard, D., Brehm, B., & Steffen, J. (2002). Exercise and eating disorders in college-aged women: Profiling excessive exercisers. *Eating Disorders*, 10(1), 31–47. <https://doi.org/10.1080/106402602753573540>

¹³ El Ghoch, Soave, Calugi, & Dalle Grave, 5147

This is due to a negative caloric balance, hypokalemia, and dehydration. In a sample of adults, anorexia nervosa patients tended to have a lower level of skeletal muscle mass and muscle strength than healthy counterparts¹⁴. Eating disorders that result in a significant decrease in required nutrients are associated with starvation symptoms including, preoccupation with thoughts about food and eating, irritability, mood changes, sleep disturbances, social withdrawal, weakness, gastrointestinal discomfort, cold intolerance, impaired concentration, apathy, and heightened satiety¹⁵. These symptoms in combination with an extensive training routine and mental pressure experienced by female athletes lead to increased risk for physical health.

VI. PSYCHOLOGICAL CONCERNS

Psychiatric disorders commonly seen in primary care such as eating disorders are associated with impairment in Health-Related Quality of Life (HRQoL) more commonly than other medical disorders. From this perspective, a relationship can be drawn between the psychology behind eating disorders and long-standing illness, depression, and self-harming behaviors. In 2005, a collective study examining the physical and emotional states of college students (non-athletes) based on self-reports of eating disorder behaviors was conducted by the Department of Public Health of the United Kingdom. I will briefly summarize those results and how they are relevant to American collegiate female athletes. Subjects with an eating disorder history have significantly lower scores in the dimensions of role emotional, mental health, vitality, and general health, in addition to significant impairment in emotional well-being. Self-reports from students with eating disorders demonstrate that subjects with an eating disorder

¹⁴ İlhan, B., Bahat, G., Erdoğan, T., Kiliç, C., & Karan, M. A. (2018). Anorexia is independently associated with decreased muscle mass and strength in community-dwelling older adults. *The Journal of Nutrition, Health & Aging*, 23(2), 202–206. <https://doi.org/10.1007/s12603-018-1119-0>

¹⁵ Grave, R. D., Pasqualoni, E., & Marchesini, G. (2011). Symptoms of starvation in eating disorder patients. *Handbook of Behavior, Food and Nutrition*, 2259–2269. https://doi.org/10.1007/978-0-387-92271-3_143

history are significantly more likely than those with no such history to report that their health was poor. These subjects experienced increased concerns for contraception, depression, worry, and anxiety when compared to subjects with no eating disorder history. Furthermore, subjects with an eating disorder history are significantly more likely to report suffering from emotional and psychological problems and had a higher probability of reporting self-harming behavior and suicidal ideation. 4.5% of subjects with no eating disorder history report thoughts of taking their own life in a specific period in comparison to 4.5% of binge eating disorder subjects, 15% of bulimia nervosa subjects, and 29% of anorexia nervosa subjects. Reports of psychological and emotional problems were also much more common in those with an ED history than those without. Eating disorder subjects also have impaired domains of energy, emotional reaction, and social isolation¹⁶. While this study does not involve the population that I am examining, these results are significant in that they give insight into the psychological implications caused by eating disorders in college students. There is a decline in the quality of life experienced by subjects who currently have or have a history of eating disorders. Additionally, perfectionism is associated with eating disorders. Perfectionism comes in two distinct forms, positive and negative. Positive or adaptive perfectionism is defined as being driven to achieve positive consequences/motivation to achieve a certain goal to obtain a favorable outcome. Negative or maladaptive perfectionism is defined as a function of avoidance of negative consequences/motivations to achieve a certain goal to avoid adverse consequences¹⁷. Subjects

¹⁶ Doll, H. A., Petersen, S. E., & Stewart-Brown, S. L. (2005). Eating disorders and emotional and physical well-being: Associations between student self-reports of eating disorders and quality of life as measured by the SF-36. *Quality of Life Research, 14*(3), 705–717. <https://doi.org/10.1007/s11136-004-0792-0>

¹⁷ Haase, A. M., & Prapavessis, H. (2004). Assessing the factor structure and composition of the sport's positive and negative perfectionism scale. *Personality and Individual Differences, 36*(7), 1725–1740. <https://doi.org/10.1016/j.paid.2003.07.013>

with an eating disorder history reported significantly higher measures of negative perfectionism, which may be associated with poorer psychological health and greater eating disorder symptomatology¹⁸. In collegiate sports, the environment is loaded with pressure to succeed and measures of failure, with an emphasis on maintaining a certain physique. Altogether, the standards of success can become overwhelmingly unrealistic, and lead to a detriment in psychiatric health. Furthermore, the brain requires adequate levels of nutrients to perform properly; when it is deprived of food, it can cause many consequences including irritability, a decrease in emotional awareness, sleep disruption, a lack of flexible thinking, mood swings, decreases in brain function, and overall changes in behavior. When diagnosing eating disorders, these factors together with dramatic weight changes are typically what is looked for. In many cases of eating disorders, eating becomes associated with negative self-concept and anxiety around appearance, and not eating can decrease negative anxiety. In this case, eating becomes a punishing cognitive process through conditioning. Thus, the psychological effects are not as easy to solve as the physical effects since they can require retraining the brain and changing rigid thinking patterns.

VII. EVIDENCE AND LIMITATIONS

While research on eating disorders is gaining some speed, there are still limited studies with conclusive results offering insight into how eating disorders develop and what their consequences are. Few studies are available that accurately measure physical fitness for eating disorders, as most studies are short-term and made of small sample sizes. In addition to these limitations, many symptoms are subjective, not objective, so comparison among subjects and

¹⁸ Forsberg S, Lock J. The relationship between perfectionism, eating disorders and athletes: a review. *Minerva Pediatr.* 2006 Dec;58(6):525-36. PMID: 17093375.

data sets is extremely difficult. Regarding athletes, studies become even more difficult. Collegiate athletes are protected by the NCAA from being study participants, so the only viable alternative to experimenting is through surveys. While surveys can be useful, they are not as definitive as experimental studies, and frankly, get ignored by many athletes they are sent to. Because of this, research involving the population of female college athletes is extremely small. However, due to the awareness that is being brought to eating disorders through media and educational methods, hopefully, future research will be easier to conduct with willing participants.

VIII. PERPETUATION OF EATING DISORDER DEVELOPMENT IN COLLEGE ATHLETICS

As previously mentioned, the high-pressure environment of collegiate athletics plays a role in the perpetuation of eating disorders, especially for lean sports athletes. Social standards enforced by coaches and teammates can increase the risk of disordered eating, as well as comparison of body aesthetics to other athletes. The increased influence of social media in college sports can also play a role in the development of eating disorders, as unrealistic standards are constantly presented, editing tools are used to look thinner in pictures, and diet trends and culture are enforced. Even if no eating disorder develops, female athletes are constantly bombarded with this type of information and get their attention drawn to what they look like as well as what they eat. Recently, the rise of Name, Image, and Likeness rights has led to an increase in athletes using their image to make money. While there is currently no research about how this affects mental health, there is a possibility that having income dependent upon one's image could lead to an unhealthy self-image. Similarly, revealing clothing athletes wear in competition can also be a factor in developing an eating disorder. The identification and

diagnosis are especially hard in a competitive athletic environment, as symptoms tend to not be obvious. Leanness in competition is expected, and certain eating habits are expected, it becomes difficult to distinguish normal athletic behaviors from obsessive disordered ones. Personality factors also contribute to the stress of the college athletics environment. As I already discussed, perfectionism in female athletes significantly contributes to eating disorder development. High self-expectation, persistence, and independence in female athletes can also play a role in body image and their relationship with food. Traumatic events and injuries can also contribute, as they interfere with normal activity levels and can trigger a negative psychological response. A temporary pause in normal exercise or unexpected events can trigger eating disorder behavior as psychological stressors can trigger coping mechanisms. While resources such as athletic trainers are available to help athletes, findings indicate that few ATs have a formal education in eating disorders. In a study examining 171 athletic trainers, only 27% reported that they felt confident in identifying a female athlete with an eating disorder, and 38% felt confident about communicating with a female athlete on the topic of eating disorders¹⁹. The combination of all these factors creates an environment that is rife to sustain eating disorder development if preventative actions are not taken by teammates, coaches, and athletic trainers.

IX. PREVENTION

Eating disorders progress exponentially, meaning that they become more difficult to treat the longer they progress. The behaviors become habits so deeply ingrained they can take several years to treat, and even then, relapse is not uncommon. Knowing this, early intervention is essential to preventing and treating eating disorders. There are several measures university

¹⁹ Vaughan JL, King KA, Cottrell RR. Collegiate Athletic Trainers' Confidence in Helping Female Athletes with Eating Disorders. *J Athl Train.* 2004 Mar;39(1):71-76. PMID: 15085214; PMCID: PMC385264.

interdisciplinary teams can take to ensure the most success in identifying disordered eating and offering help to the athlete. Nutritionists and dieticians are often employed by athletic departments to educate athletes on their body's needs and how to fuel up in a healthy, sustainable way. They can also provide individual services to each athlete, such as creating a meal plan and identifying realistic weight goals. Similarly, mental health professionals are extremely useful for discussing the psychiatric issues behind eating disorders, as well as providing therapy and assisting the athlete in the mental and emotional reframing that may need to take place to overcome an eating disorder. The education of coaches and trainers in eating disorder prevention and treatment would also play an important role in the potential identification of eating disorder symptoms in athletes. Knowing what steps to take and how to best support and help athletes would not only assist in treatment but create a trusting and comfortable environment between teams and coaches. Educating athletes on symptoms could increase intervention by friends and teammates, allowing for earlier action as well as social support. Professional help from university psychologists should also be offered to athletes who seek help away from athletics. Education is the most important factor in preventing eating disorders so early intervention and support can be offered. In extreme cases, in-patient and out-patient care may also be beneficial in the recovery process.

X. CONCLUSIONS

Eating disorders are serious mental and physical illnesses that have long been ignored. While the entire population can be seriously affected by disordered eating tendencies, athletes live in an environment where these tendencies are easily able to develop. Patterns of abnormal and detrimental eating can have adverse effects on athletic performance, mental and physical health, and overall quality of life. Female athletes rely on their athletic performance to be

successful in their sport, and eating disorders inhibit their ability to function at the maximum level. There is currently little research on this topic since it is so difficult to navigate. The symptoms are generally subjective, so to obtain any data, researchers must compare populations across individualized standards. The female collegiate athlete population is relatively small compared to other populations that could be evaluated, making it difficult to acquire representative data. Developing insight and motivations for treatment is difficult for this population, even though the risk of death makes it even more important. While these factors make data retrieval extremely difficult, more attention has recently been brought to the subject of eating disorders, which could potentially open doors for different forms of studies and experiments. Knowledge of prevention is essential for coaches, teammates, and trainers to know to limit the development of disordered eating, and resources must be made available to athletes to guide them through the difficulties that come along with eating disorders.

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