Spring 2019

Orthorexia Nervosa among Collegiate Female Student-Athletes

Maryse Bard-Martel
Missouri State University, Maryse112@live.missouristate.edu

ORTHOREXIA NERVOSA AMONG COLLEGIATE FEMALE STUDENT-ATHLETES

A Master's Thesis

Presented to

The Graduate College of

Missouri State University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Sciences, Health Promotion and Wellness Management

By

Maryse Bard-Martel

May 2019

ORTHOREXIA NERVOSA AMONG COLLEGIATE FEMALE STUDENT-ATHLETES

Kinesiology

Missouri State University, May 2019

Master of Science

Maryse Bard-Martel

ABSTRACT

Orthorexia nervosa (ON) is a specific style of disordered eating defined as an unhealthy obsession with eating healthy food, or going to extremes in the pursuit of a diet that is supposed to be good for you. The purpose of this study was to explore the prevalence of orthorexia nervosa tendencies in college female soccer players in the NCAA Division 1. Purposive sampling was used, and participants were current student-athletes from the Missouri State women's soccer team (n=18). Survey research was utilized to assess athletes' attitudes and behaviors related to various aspects of diet and training, and the control it has over their lives, using the ORTHO-15 to assess orthorexia nervosa tendencies and the Eating Habit Questionnaire (EHQ) scales. Other survey items included weight status and motives for eating behaviors as well as three open ended qualitative items. Between the ORTHO-15 and EHQ, a statistically significant positive correlation existed ($r=0.595$, $p=0.007$). The mean scores for the ORTHO-15 and the EHQ were 39.94 ± 6.44 and 66.67 ± 6.90 respectively. Implications from this research indicate a trend towards orthorexia nervosa behaviors among college female soccer players, which warrants more research.

KEYWORDS: Orthorexia nervosa, healthy eating, eating behaviors, eating disorders, performance, student-athletes

ORTHOREXIA NERVOSA AMONG COLLEGIATE FEMALE STUDENT-ATHLETES

By

Maryse Bard-Martel

A Master's Thesis
Submitted to the Graduate College
Of Missouri State University
In Partial Fulfillment of the Requirements
For the Degree of Master of Science, Health Promotion and Wellness Management

May 2019

Approved:

Melinda Novik, Ph.D., Thesis Committee Chair

Sara Powell, Ph.D., Committee Member

Daniela Novotny, D.H.Sc., Committee Member

Julie Masterson, Ph.D., Dean of the Graduate College

ACKNOWLEDGEMENTS

I would like to thank the following people for their support during the course of my graduate studies.

Coach Rob Brewer, thank you for giving me the opportunity to start my coaching career with the Missouri State Women's Soccer team. It is a pleasure to work with you every day, and I will forever be grateful for your trust and belief in me.

A special thank you to Dr. Melinda Novik, as the completion of this study could have not been possible without your help. I appreciate your guidance, encouragement, patience and support throughout the entire research process. I express sincere gratitude to Dr. Sara Powell and Dr. Daniela Novotny for taking the time to read my work, and whose guidance and feedback helped develop and polish my ideas.

Last but not least, I would like to thank my parents – Hélène Bard and Claude Martel: without you none of this would indeed be possible. Thank you for your unconditional love, and for the sacrifices you have made and continue to make every day so I can pursue my dreams.

TABLE OF CONTENTS

Introduction	Page 1
Overview of the Health Problem	Page 1
Purpose of the Study	Page 2
Significance of the Study	Page 3
Literature Review	Page 6
Orthorexia Nervosa	Page 6
Concurrent Health Issues	Page 10
Existing Criteria for Orthorexia Nervosa	Page 14
Measurement of Orthorexia Nervosa	Page 17
Student-Athletes and Orthorexia Nervosa	Page 19
Methods	Page 25
Participants	Page 25
Sampling Procedures	Page 25
Data Collection	Page 26
Measures	Page 27
Analysis Procedures	Page 29
Results	Page 31
Discussion	Page 40
Data Limitations	Page 44
Recommendations for Future Research	Page 45
References	Page 47
Appendices	Page 50
Appendix A: ORTHO-15 Test	Page 50
Appendix B: Bratman's Orthorexia Test	Page 51
Appendix C: Eating Habits Questionnaire	Page 52
Appendix D: IRB Approval	Page 53
Appendix E: Additional Survey Items	Page 54

LIST OF TABLES

Table 1. Similarities and Differences among Individuals with Orthorexia Nervosa, Anorexia Nervosa, and Obsessive-Compulsive Disorder — Page 15

Table 2. Frequency of Female Student-Athletes Engaging in Orthorexic Behaviors (ORTHO-15) — Page 31

Table 3. Frequency of Female Student-Athletes Engaging in Orthorexic Behaviors (EHQ) — Page 33

Table 4. ORTHO-15 and EHQ Summed Scores (n=18) — Page 35

Table 5. Mean differences in summed test scores between those who are trying to lose weight and maintain weight — Page 36

Table 6. Mean differences in summed test scores between those with high and low athletic identity — Page 36

Table 7. Mean differences in summed test scores and reasons for following a special diet — Page 37

Table 8. Mean differences in summed scores among personal health values — Page 38

INTRODUCTION

Overview of the Health Problem

The mental health of college athletes has become a top priority for the National Collegiate Athletic Association (NCAA) and is the number one concern of current student-athletes, as results from studies suggest that many are suffering from anxiety, depression, and eating disorders in silence. One of the primary concerns regarding the prevalence of mental illness among student-athletes is that it may affect not only their success in academics and athletics, but also their general well-being (Davoren & Hwang, 2014). Many sociocultural changes influence the mental and emotional health of today's student-athletes. The pressures in their daily routine, increased with the media closely monitoring their performance, can create intense emotional responses at unstable times in their lives (Stull, 2014). Correspondingly, the lifestyle of an athlete can be so demanding and stressful that the risk of developing anxiety or an eating disorder is not unlikely. Both represent an important issue for many athletes, and female athletes are especially at risk; over 33% of female participants in a study conducted by the NCAA reported specific habits and symptoms related to eating disorder (Olejniczak et al., 2017).

A particularly interesting issue among female athletes in the NCAA is orthorexia nervosa (ON). ON has been defined as an unhealthy obsession with eating healthy food (Bratman, 2017). In recent years, clean dieting trends have grown increasingly popular, and there has been a sharp rise in healthy lifestyle-related propaganda as information is more accessible than ever through social media and the internet (Dunn & Bratman, 2015). Because of their discipline, work ethic, desire to succeed, and commitment to athletics, in addition to the influence of both the sports culture and their daily environment, female student-athletes at the Division 1 level are clearly a

population at risk for developing disordered eating behaviors such as orthorexia nervosa (Bunda and Bratu, 2016). Though some researchers have raised questions about the validity of orthorexia nervosa as a unique disorder, others believe that it is indeed unique, different from recognized eating disorders, and that it should be included in the next edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM) due to its distinct features (Dunn & Bratman, 2015). There has been intense media interest in people whose highly restrictive "healthy" diet leads to disordered eating. This study was designed to examine the new phenomenon of orthorexia nervosa and its associated behaviors among the elite female athletic population at the college level, as there is a clear need to explore this potential eating disorder within the female athletic population.

Purpose of the Study

The purpose of this study was to explore the prevalence of orthorexia nervosa tendencies in college female soccer players in the NCAA Division 1. This study was delimited to the following:

1. 22 female collegiate soccer players, ages 18 to 24.
2. A purposive sample of female soccer players from Missouri State University.
3. The use of the ORTO-15 test to measure the construct and concerns characteristics of orthorexia nervosa.
4. The use of the Eating Habits Questionnaire to measure behaviors, thought processes, and feelings that could suggest an abnormal fixation with healthy eating.
5. The use of qualitative questions to measure athletic identity, reasons for following special diets, motivators for food-related choices, values, and social and environmental influence on eating behaviors.
6. Administration of the data collection instruments (surveys) per email, sent to players by assistant coach.

For the purposes of this research study, the following assumptions have been made:

- Orthorexia nervosa exists and can affect every area of an individual's life and well-being.
- Coaching staff cooperation from Missouri State University encouraged student-athletes to participate with compliance to NCAA guidelines.
- All research participants answered the online survey questions honestly and correctly.

Anxiety Disorder: A nervous disorder characterized by a state of excessive uneasiness and apprehension, typically with compulsive behavior or panic attacks.

Eating Attitudes: Beliefs, thoughts, feelings, behavior and relationship with food influencing one's food choices and health status.

Motivation: The reason for people's actions, desires, and needs. Motivation is also one's direction to behavior, or what causes a person to want to repeat a behavior.

Obsessive traits: Personality traits characterized by extreme perfectionism, order, and neatness.

Orthorexia Nervosa: An unhealthy obsession with eating healthy food or going to extremes in the pursuit of a diet that is supposed to be good for you.

Pathological: Involving, caused by, or of the nature of a physical or mental disease.

Perfectionism: A personality trait characterized by a person's striving for flawlessness and setting high performance standards, accompanied by critical self-evaluations and concerns regarding others' evaluation.

Student-Athletes: Athletes currently enrolled and eligible to play a sport at an institution accredited by the NCAA.

Wellness: The state of being in good health, especially as an actively pursued goal.

Well-Being: The state of being comfortable, healthy, or happy.

Significance of the Study

It has been shown that eating disorders are more common among physically active individuals. Previous research has indicated that high-performance athletes have a higher

prevalence of pathological eating behaviors, such as anorexia nervosa and bulimia nervosa, than a control group of the general population (Rudolph, 2017). The connection between pathological eating behavior relating to anorexia nervosa and bulimia nervosa and time spent in leisure time activities as well as in high performance sports has been demonstrated in a number of studies (Rudolph, 2017). With that in mind, many studies have focused on the prevalence of clinical eating disorders such as anorexia and bulimia nervosa among female student-athletes (Greenleaf et al., 2009). However, results showed that many student-athletes were only symptomatic, thus passing under the diagnosis radar, since their primary goal was performance and not weight loss, which is what mainly differentiates the phenomenon of ON with anorexia and bulimia nervosa (Dunn & Bratman, 2015). There were very few studies analyzing the connection between the pathological eating behavior ON and sporting activities. Positive correlations between ON and physical activity of university students have been observed (Rudolph, 2017). In the same study, females scored higher, more intensively or with a greater volume of exercise. Overall, a higher prevalence of ON was identified in male and female athletes compared to the general population in a study (Rudolph, 2017). It makes sense, as the sports environment and the culture of toughness surrounding student-athletes at top institutions adds to the risks of developing problematic behaviors leading to orthorexia. Those extreme behaviors such as doing extra training after team practice and obsessing over the purity of one's diet can be normalized in this environment, but become of orthorexic nature once it takes over the athlete's life (Kiss-Leizer & Rigo, 2018). The athlete role can disguise disordered eating patterns for being performance driven, but the underlying problem may remain in an athlete's life after their competitive career ends if not identified early. In light of the prevalence of disordered eating behaviors among female student-athletes, and the specific characteristics, traits, and culture of that population,

researchers and athletic staff were seeking to know more about the new phenomenon of orthorexia nervosa that might be affecting elite collegiate female athletes (Rudolph, 2017). The current study helped fill in the existing gaps between orthorexia nervosa, the known behaviors associated with the condition, and the athletic population

LITERRATURE REVIEW

The literature related to orthorexia nervosa (ON) in female collegiate athletes is reported in this chapter. For organizational purposes, the literature is presented under the following topical areas: (1) Orthorexia Nervosa, (2) Concurrent Health Issues, (3) Existing Criteria for ON, (4) Measurement of ON, and (5) Student-Athletes and ON.

Orthorexia Nervosa

Background. Holistic physician Steven Bratman first coined the term orthorexia nervosa in 1997. He defined it as an unhealthy obsession with eating healthy food, or going to extremes in the pursuit of a diet that is supposed to be healthy (Dunn & Bratman, 2015). The term was created from "orthos", which means "accurate or right" and "orexis", meaning hunger or appetite (Brytek-Matera, 2012). The behavior can be characterized as exaggerated, obsessive, pathological fixation on healthy food that is described as "a disease disguised as a virtue." ON shares issues with disordered eating attitudes as shown by excessive focus on food-related topics, strict diet, perfectionism, co-occurrence of anxiety, need of control, stiffness of behavior, and rituals related to preparation of meals (Gramaglia et al., 2017). In contrast to eating disorders such as anorexia and bulimia nervosa, people with orthorexia are obsessed with food quality rather than quantity and they do not care excessively for thin silhouette (Brytek-Matera, 2012). The most characteristic features of clinical eating disorders are absent in individuals with orthorexia, namely excessive preoccupation with losing weight, extreme fear of gaining weight and body size overestimation. Instead, orthorexic individuals constantly struggle against feelings

of being unclean and feel compelled to achieve even greater heights of dietary perfection; to feel entirely clean, pure and transparent.

Although not yet officially recognized with a valid diagnosis by inclusion in the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) of the American Psychiatric Association (Thomas, 2017), orthorexia is often associated with significant impairment. It starts as an attempt to attain optimum health through attention to diet may lead to nutritional deficiencies, medical complications, and poor quality of life (Koven & Abry, 2015). Findings showed that orthorexic behaviors did not overlap with anorexia nervosa and seemed to be influenced by cultural issues (Gramaglia et al., 2017). This makes sense with the increasing popularity of clean dieting trends in recent years that go against the national guidelines for nutrition. There has been a sharp rise in healthy lifestyle-related propaganda, and information is more accessible than ever through social media, Internet, and magazines. This makes it easy for individuals to become obsessive about the subject and to develop health anxiety, especially in those who are anxious or perfectionist in nature (Kovon & Abry, 2015). ON is a specific style of unhealthy eating, since the initial goal of individuals who suffer from the condition is to improve health and/or performance.

Questions and concerned have been raised within the sports context as performance is the primary focus, and where athletes go above and beyond to reach their dreams. The scientific community has largely neglected the subject, even though eating disorder specialists frequently observe its behavioral pattern in their daily practice. In a recent study including more than a hundred of mental health specialists, two-third of clinicians indicated that the syndrome deserved more scientific attention (Koven & Abry, 2015). Clinicians and scientists still carry on the debate on whether orthorexia is a real and unique disorder and whether it is worth its own categorization

in the DSM-IV, together with eating disorders including anorexia nervosa, bulimia nervosa and eating disorders not otherwise specified (Brytek-Matera, 2012).

A Potential Clinical Disorder. In the preparation process of DSM-V, many new syndromes have been proposed and considered eligible for inclusion/official recognition in the diagnostic bible of mental disorders. While the literature is limited in this area, there are convincing case studies and broad anecdotal evidence to conclude that sufficient evidence exists to pursue whether ON is a distinct condition (Dunn & Bratman, 2015). At present, using the DSM-V classification, disordered eating driven by the need to follow an obsessively rigid diet designed to promote good health would likely be best classified as Avoidant/Restrictive Food Intake Disorder (ARFID) (Dunn & Bratman, 2015). However, unlike ARFID, individuals with ON choose not to restrict their intake based on a disinterest in food, the sensory properties of what they eat, or because of a previous aversive experience with food, but because of a pathological drive to be as healthy as possible. These distinctions are important, as traditional treatment approaches to eating disorders like anorexia may not be appropriate for those with ON (Dunn & Bratman, 2015). The notion has been largely neglected in the professional literature although its behavioral pattern appears to be very recognizable. Results from a survey among professionals in the field of mental disorders showed that orthorexia seems to be taken seriously in the sense of "genuine" syndromes which should be paid more attention to in research and clinical practice. Among professionals who participated in the survey, over 66% regularly observed the phenomenon in their own practice, and 70% agreed that it deserved more attention and the need for more research about the subject (Vandereycken, 2011).

The Tipping Point. Bratman (2017) stresses the idea that adopting a theory of healthy eating is not orthorexia. In essence, following a healthful diet doesn't make a person a health

food junkie. The conscious consumption of food definitively has an important role in the prevention and intervention of numerous diseases and can also increase quality of life (Kiss-Leizer & Rigo, 2018). Healthy diet turns into orthorexia when a boundary is crossed and a person's relationship with food begins to impair various essential dimensions of life. It is transferring too much of life's meaning onto food that makes orthorexia an eating disorder (Bratman, 2017). If an individual simply eats healthy food but does not give it more of a place in their life than it is really due, they have a good diet – a laudable goal. But when one uses food to drain away the energy from other parts of their life, they are impoverishing their soul (Bratman, 2017). Individuals with ON desire to improve self-esteem and self-realization through controlling food intake. ON include abnormal compulsive behaviors or mental preoccupations with dietary choices believed to promote optimal health, self-imposed anxiety, self-punishment, and escalating highly restrictive diets leading to disordered eating (Matera et al., 2018).

Exercise and Orthorexia Nervosa. One of the most dramatic changes in orthorexia since it was first defined in 1997 is its current inclusion of exercise (Bratman, 2017). It would now appear that the majority of people with orthorexia are also exercise enthusiasts of one sort or another. For some, exercise is as much a primary focus of their lives as eating, and out of the same motivations. Regular physical activity has positive effects on individual wellbeing, reduces the symptoms of psychiatric disorders such as depressions and anxiety disorders, and also achieves positive physiological effects (Rudolph, 2017). Thus, any health-conscious person would naturally exercise as well (Bratman, 2017). Exercise and sports activity are beneficial both, physically and psychologically, but excessive exercise may have adverse physiological and psychological effects (Rudolph, 2017). With that in mind, excessive exercise plays a central role in relation to orthorexia. Very few articles have been conducted on the subject, and these have

not focused on aspects of food and eating, sports, or a societal perspective (Haman et al., 2015). There is a clear need for examining the role of sports and exercise in relation to orthorexia that takes problematizing of "orthorexic behaviors" within the sports context into account.

Concurrent Health Issues

Some personality features have been proved to be important factors in the development of ON. According to earlier studies, patients with high orthorexia tendencies also presented characteristics of perfectionism, anxiousness, avoidant attachment styles, and need for control, as well as obsessive-compulsive symptoms (Kiss-Leizer & Lefevre, 2018). Those underlying issues and their associated consequences must be taken into consideration when one looks at the big picture of what is ON.

Perfectionism. Perfectionism and eating disorders have been long thought to go hand in hand (Schapmann, 2018). This tendency to hold unrealistically high standards plays a role in the etiology, development, and maintenance of eating disorders (Muhlheim, 2017). Perfectionism is a complex personality characteristic with no universally accepted definition. It is sometimes viewed as a personality trait or symptom or can also be understood as a process. Perfectionism can have positive and negative aspects. Having high standards can be an asset in attaining goals (Mulheim, 2017), however, perfectionism also exacts a cost, and too much of it can be an impediment. In psychology there are two types of perfectionism (Schapmann, 2018): adaptive and maladaptive. Adaptive perfectionism drives people to strive for their best and achieve the goals they set for themselves. It is the "good" kind that is motivating as long as satisfaction is derived from one's best efforts, and that one does not beat himself up if he falls short of his goal (Schapmann, 2018). On the other hand, maladaptive perfectionism is a rigid, unwavering need to

achieve goals, even if they are unrealistic. It is the problematic perfectionism associated with psychological problems and is also referred to as clinical (or dysfunctional) perfectionism (Muhlheim, 2017). It can negatively affect one's social relationships, mental health, and/or physical health, and has three aspects:

1. The continuous expectation to meet high standards that, given the circumstances, other people consider extreme or unreasonable.

2. Judging self-worth largely on the ability to strive for and achieve these unrelenting high standards.

3. Continuing to aim for these standards despite consistently negative consequences.

The link between perfectionism and eating disorders is complex. According to the literature, both phenomena seem to be correlated, but the causality is not clear. In a study published in the *Journal of Eating Disorders*, researchers found that those at most risk for developing eating disorders experienced forms of both adaptive and maladaptive perfectionism (Schapmann, 2018). Some research studies indicate that people with eating disorders and perfectionism often displayed perfectionistic traits before their eating disorders began, and that those traits persisted even after recovery (Muhlheim, 2017). In one study, researchers found that women who showed personality traits as children like perfectionism, being driven by rules, inflexibility, preoccupation with order, cautiousness and excessive doubt were 35 times more likely to develop an eating disorder than those without these traits (Schapmann, 2018). A similar study found perfectionism almost always preceded the development of eating disorders.

People with eating disorders aren't just perfectionistic about food. They are most often high achievers, and many holds themselves to extremely high standards in other areas of life, such as athletics (Schapmann, 2018). Furthermore, there is a lot of fear and anxiety involved in perfectionism. Fear of failure, a symptom of perfectionism, can feel paralyzing to people with

eating disorders. This fear at failing in getting everything right can be so overwhelming that they may become isolated, not even attempting to be social, get a promotion apply to graduate school, or follow otherwise healthy pursuits because the fear of trying and failing is too much to bear (Schapmann, 2018). In addition, people with eating disorders often have an intense fear of losing control. Not only do they fear being out of control with food, but also in other areas of their lives like relationships and emotions. Disordered eating behaviors may give them a sense of control. The rest of life can feel chaotic to them but focusing on perfection around food gives them a sense of control, even if short-lived (Schapmann, 2018). In all cases, clinical perfectionism is described as one of four key factors that maintain eating disorders, and it negatively affects one's social relationships, mental health, and/or physical health (Muhlheim, 2017).

Anxiety and Obsessive-Compulsive Disorder (OCD). Eating disorders commonly co-occur with anxiety disorders. In fact, studies show that about two-thirds of people with eating disorders also suffer from an anxiety disorder at some point in their lives (Cowden, 2018), and that around 42 % of people with eating disorders had an anxiety disorder during childhood, well before the onset of their eating disorder (Anxiety and Depression Association of America, 2017-a). Other studies also confirm that an anxiety disorder usually is the onset of an eating disorder (ADAA, 2017-b). For those with an anxiety disorder, a co-occurring eating disorder may make their symptoms worse and recovery more difficult. Obsessive-compulsive disorder (OCD) is the most common anxiety disorder to co-occur with an eating disorder, followed by generalized anxiety disorder (GAD). Those who have both (OCD + ED) often develop compulsive rituals connected to food, such as weighing every bit of food or cutting it into tiny pieces (ADAA, 2017-a), all frequent in people with high orthorexic tendencies.

OCD affects millions of people from all walks of life, and currently affects approximately 1 in 40 adults and 1 in 100 children in the U.S. (ADAA, 2017-c). People with OCD experiences obsessions and compulsions. Obsessions are intrusive and frequent thoughts or impulses that cause distress and anxiety, while compulsions are behaviors that the person feels compelled to perform in order to ease their distress or anxiety and suppress the thoughts (Cowden, 2018). Some of these behaviors are visible actions while others are mental acts. Common obsessions include concerns about contamination, cleanliness, or the need for symmetry. Common compulsions include checking, washing/cleaning, and arranging. There is not always a logical connection between obsessions and compulsions (Cowden, 2018). Although the goal of these acts is to reduce anxiety and worry, they are excessive. Many people with OCD recognize that their obsessions and compulsions are not rational. Nevertheless, they still feel a strong need to perform the repetitive behavior or mental acts. They may spend several hours a day focusing on their obsessions, performing seemingly senseless rituals. The obsessions and compulsions continue to cause distress and take up significant portions of time. This disrupts one's normal routine and can cause problems in multiple areas of life (ADAA, 2017-c).

Individuals with eating disorders and individuals with OCD suffer from intrusive thoughts and compulsive actions. But for those people who only have an eating disorder, these obsessions and compulsions are limited to thoughts and actions related to food. When a person with an eating disorder also has obsessions and compulsions about other areas of their lives, they may also be experiencing symptoms of OCD. Interestingly, research shows that women who experienced OCD in childhood are at a higher risk for developing an eating disorder later in life (Cowden, 2018).

It is not clear to what extent ON is an eating disorder or a form of obsessive-compulsive disorder, because some features are shared with anorexic and bulimic patients (intense anxiety about food, rigidity, need for control), but other features can be classified as obsessions or compulsions (individuals with higher OCD symptoms had higher ON tendencies) (Kiss-Leizer & Lefevre, 2018). Literature on classic eating disorders shows that people with anorexia and bulimia nervosa have recurring, lifetime struggles with perfectionism, anxiety, avoidant personality disorder and OCD. Perfectionism is a trait that often underlies these diagnoses, and many times clients enter treatment with several of those co-occurring disorders (Schapmann, 2018). In all cases, all of these factors help to understand the following criteria for orthorexia nervosa.

Because there are overlapping or similar features that exists among individuals with OCD, ON, and AN, it is important to highlight not only these similarities but also differences between each of these conditions (Koven & Abry, 2015). By highlighting the distinctions, it makes it more apparent as what characterizes orthorexia nervosa. The table below illustrates these 3 health conditions based on their similarities and differences (Table 1).

Existing Criteria for Orthorexia Nervosa

In ON, purity of food is valued above all else, including health effects from such a diet. The proposed diagnostic criteria for ON include obsessive focus on healthy eating, food anxiety, and dietary restrictions, with these behaviors causing clinical impairments (Turner & Lefevre, 2017). There is some overlap between ON, AN, and obsessive-compulsive disorder (OCD). Both AN and ON share traits of perfectionism, cognitive rigidity, and guilt over food transgressions, while OCD and ON share intrusive thoughts and ritualized food preparation. However, while AN

Table 1: Similarities and Differences among Individuals with Orthorexia Nervosa, Anorexia Nervosa, and Obsessive-Compulsive Disorder

Behaviors	ON	AN	OCD
Perfectionism	X	X	
Guilt over food transgressions			
Intrusive thoughts	X	X	X
Focus on food quantity		X	
Focus on food quality	X		
Desire to maximize health	X		
Symptoms associated with dietary restrictions and malnutrition	X	X	
Social isolation	X	X	X
Apparent association with BMI		X	
Ritualized food preparation and focus on contamination	X		X
Unrealistic food beliefs	X		
Cognitive rigidity	X	X	X
Trait Anxiety	X	X	X
Realized that behaviors are excessive/unreasonable			X
Secretive about behaviors		X	X

patients are preoccupied with the quantity of food, ON patients are preoccupied with the quality of food. Orthorexic symptoms are associated with healthy lifestyle choices, but ON is also associated with significant dietary restrictions, malnutrition, and social isolation, although there is no apparent association with BMI (Turner & Lefevre, 2017).

The first diagnostic criteria to appear in the refereed literature, more specifically in a North American Journal, accompanied the Moroze et al. (2015) case study (Dunn & Bratman, 2015). They are as follow.

Criterion A. Obsessional preoccupation with eating "healthy foods", focusing on concerns regarding the quality and composition of meals (two or more of the following):

1. Consuming a nutritionally unbalanced diet due to preoccupying beliefs about food "purity."

2. Preoccupation and worries about eating impure or unhealthy foods, and on the impact of food quality and composition on physical and/or emotional health.

3. Rigid avoidance of foods believed by the patient to be "unhealthy", which may include foods containing any fat, preservatives, food-additives, animal products, or other ingredients considered by the subject to be unhealthy.

4. For individuals who are not food professionals, excessive amount of time spent reading about, acquiring and/or preparing specific types of foods based on their perceived quality and composition.

5. Guilty feelings and worries after transgressions in which "unhealthy" or "impure" foods are consumed.

6. Intolerance of other's food beliefs.

7. Spending excessive amounts of money relative to one's income on foods because of their perceived quality and composition.

Criterion B. The obsessional preoccupation becomes impairing by either of the following:

1. Impairment of physical health due to nutritional imbalances, e.g. developing malnutrition due to unbalanced diet.

2. Severe distress or impairment of social, academic or vocational functioning due to obsessional thoughts and behaviors focusing on patient's beliefs about "healthy" eating.

Criterion C. The disturbance is not merely an exacerbation of the symptoms of another disorder, such as obsessive-compulsive disorder, or of schizophrenia or another psychotic disorder.

Criterion D. The behavior is not better accounted for by the exclusive observation of organized orthodox religious food observance, or when concerns with specialized food

requirements are in relation to professionally diagnosed food allergies or medical conditions requiring a specific diet.

In spite of the fact that the diagnostic criteria are not yet sufficiently verified, Bratman (2017) also proposed a test that allows to establish whether expression of feeding behavior in health education ought to be considered as pathological or not. He suggested a short 10-item questionnaire in a yes/no format, the *Bratman's Orthorexia Test* (BOT) as a screening tool useful for identifying those at risk for ON. If the person answers *yes* to 4 or 5 questions, this means that it is necessary for her/him to relax more in regard to their food. If the person answers *yes* to all questions, then she/he has an important obsession with healthy eating and should examine this behavior with the help of a qualified professional. The Bratman test is purely clinical, and non-validated (Brytek-Matera, 2012). This scale is without basic psychometric properties and was designed as a screening instrument. Bratman has never suggested that these items are scientifically rigorous and created it only as an informal measure. These 10 items, however, are the basis of the ORTHO-15, an instrument designed to detect ON (Dunn & Bratman, 2015).

Measurement of Orthorexia Nervosa

The ORTHO-15 Test. The ORTO-15 (Appendix A) test was developed for the diagnosis of orthorexia based on the existing, brief *Bratman's Orthorexia Test* (Appendix B). The authors, Donini, Marsili, Graziani, Imbriale, and Cannella (2005) used some of the items from Bratman's test and added some new items. It is a 15-item self-report questionnaire that determines the prevalence of highly sensitive behaviors related to health and proper nutrition (Thomas, 2017). Items assess an individual's obsessive attitudes related to the selection, purchase, preparation, and consumption of food that they consider to be healthy. The aim was to develop items that

would assess individuals in terms of emotional and rational aspects. For this reason, some items assess the cognitive-rational domain, some the clinical domain, and others the emotional domain. Each item is answered on a 4-point Likert scale. Individuals are required to answer with "always-often-sometimes-never", to reflect how often they define themselves with these expressions. Items that reflected an orthorexic tendency are scored as "1", and items that reflected a tendency towards normal eating behavior are scored as "4". Scores below 40 in the ORTO-15 test are defined as orthorexic; eating behavior reaches more normal standards as the score increases (Brytek-Matera, 2012).

The ORTO-15 test is partly validated by several researchers; however, significant areas of overlap with other pathological and non-pathological states still exist, making the diagnosis based on these scales somewhat non-specific. Its validity is yet to be established given the lack of strict diagnostic criteria for the condition itself, which also has several psychometric limitations, such as issues with internal consistency, lack of standardization, and cultural variation (Dunn & Bratman, 2015). Furthermore, the high cut-off score of 40 may lead to false positives, arguably rendering the questionnaire unsuitable as a diagnostic tool (Turner & Lefevre, 2017). As a result, modified versions of the ORTO-15 are in use, namely the ORTO-11 and the ORTO-11 Hu, adapted for Hungarian and Turkish populations respectively (Brytek-Matera, 2012). Other studies have also used a cut-off score of 35, yielding more specific results (Turner & Lefevre, 2017). However, they all have the same common shortcomings, with one of the main concerns being that the instruments used to sample prevalence are not taking into account whether eating behavior is becoming clinically significant or inducing medical problems (Dunn & Bratman, 2015).

The Eating Habits Questionnaire (EHQ). A newer scale is the *Eating Habits Questionnaire* (Appendix C), developed in 2013 by David Gleaves, Erin Graham, and Suman Ambwani for the measurement of orthorexia nervosa (Gleaves et al., 2013). It has 21 items and considers behaviors, thought processes, and feelings, that could suggest an abnormal fixation with healthy eating. These include feelings of superior knowledge in this area, the presence of associated maladaptive behaviors, and feelings of control related to food choices and diet. It requires further validation to be widely used as a tool in the diagnosis of orthorexia (Thomas, 2017).

Student-Athletes and Orthorexia Nervosa.

Student-Athletes Mental Wellness. In the modern culture, athletes are most often seen as the definition of health because of their physical strength and strong athletic performance. However, recent studies conducted by the NCAA have highlighted the struggles with mental well-being affecting student-athletes, a population who encounters unique stressors that the general population does not have to deal with, and who are exposed to multiple risk factors within their daily environment (Davoren & Hwang, 2014). Those are consequences of their dual role, and include direct stressors such as time demands, performance pressure and coaching style. When it becomes too much to manage, and as adaptive response to stress, athletes can develop anxiety disorders, obsessive-compulsive disorders, and/or eating disorders (Davoren & Hwang, 2014). Those mental disorders are the most frequent, along with depression and are used as a coping mechanism when one becomes emotionally unstable. Managing both sports and academic demands often results in elevated stress, inadequate sleep, and an inability to participate in other extracurricular activities that help promote overall well-being. Institutional policies such as

athletic scholarships putting a dollar value on performance are other important factors related to the constant pressure that is placed on student-athletes (Kroshus, 2014). This is especially true at the Division I level, where most athletes are being recruited and given financial aid based on performance. Athletic programs spend a lot of time, effort and money every year to bring together the best players to compete for the NCAA Division I Championship. Commits select an institution primarily to play on a specific team, thus majority of their time, effort, energy and focus is placed on performance throughout their college years. In comparison, Division II schools do not have nearly as many scholarships to distribute as Division I institutions do, while Division III schools are not allowed any athletic scholarship. By the same token, many changes are taking place in the modern culture that influence the mental and emotional well-being of today's student-athletes, and coupled with the pressure of their daily routine, can create intense emotional responses. Medias are present more than ever in the world of intercollegiate athletics, following student-athletes' every move and commenting on their actions (Stull, 2014). Moreover, the time, energy and effort put into developing skills in a given sport can result in imbalances in other areas of life. Because of the increased popularity of college sports, more emphasis is put on the athletic component of the dual role and more time is dedicated to training. The motor and social aspects of the brain, and that of eating patterns, impulse control and interpersonal relationships are also affected (Stull, 2014). One of the primary concerns regarding the prevalence of mental illness among student-athletes is that it may affect not only their success in academics and athletics but also their general well-being. In one study done by the NCAA, it was found that the mental health component of being a student-athlete was the number one concern of current student-athletes, as many are suffering in silence (Davoren & Hwang, 2014).

Female Student-Athletes. Research supports the contention that female athletes are a population at risk for disordered eating attitudes and behaviors (Petrie et al., 2009). Compared to males, female athletes are especially at risk in sports that emphasize a thin body or appearance, such as gymnastics and distance running (Bunda & Bratu, 2016). However, within the past decade, the popularity of women's soccer has tremendously increased across the United States, and the sport is shifting towards a bigger focus on appearance. With the constantly increasing presence of media around the sport, many players are now being identified according to the way they look and not necessarily for the way they play on the field. Furthermore, because of the salary gap between the men and women, many players earn majority of their income through sponsorships with clothing companies and model agencies, which emphasize the important of having a specific type of athletic body for soccer. Many college coaches also pressure their athletes to obtain an optimum body composition for performance, and standards in regard to the way one should look to be a good player are inevitable in today's society. More research is needed among women's soccer, which is a population as much at risk for developing disordered eating habits as any other sport. On another note, since the soccer culture is still not as strict on "thinness" than gymnastics, soccer players may be at risk for developing orthorexia as the major risk for developing ON involves a deep interest in improved athletic performance, and not body image. Some specific groups, professions, and activities, including athletes, have been shown in research to have an increased risk of ON (Kiss-Leizer & Rigo, 2018).

Prevalence of symptomatic athletes found in a recent study conducted with female collegiate athletes is higher than previous research and is of concern for several reasons. Although prevalence rates of actual clinical disorders appear to be remaining constant, more female athletes seem to be experiencing and reporting subclinical levels of disordered eating

symptoms. The athletes who are symptomatic may go undetected because of the subclinical level of their symptoms, and athletic staff may be unlikely to recognize signs and symptoms of problematic eating behaviors when those behaviors are not at the clinical levels (Greenleaf et al., 2009). Orthorexic athletes are the ones who are most likely to go under the radar, as the main characteristics for the diagnosis of clinical eating disorders such as anorexia nervosa and bulimia nervosa, the desire to be thin, are often absent in female soccer athletes. They are focused on performance and will do whatever it takes to eat good and train harder. Since orthorexia nervosa is not yet classified as a clinical eating disorder but is as damaging for their health, well-being and performance as any other mental illnesses, it is important to conduct more research describing this new phenomenon among the athletic population.

Along with hard training and effort motivation, talent and the athlete's personality are very important and have the power to shape performance (Bunda & Bratu, 2016). Dedication, discipline, passion, motivation and a strong desire to excel are necessary characteristics of successful athletes. Female student-athletes tend to be competitive, very perfectionist and simultaneously results-oriented, all important facets of one's personality to be an elite soccer player. However, those similar traits found in very successful female student-athletes are also predictors of orthorexia nervosa. That powerful desire that pushes athletes to go above and beyond in the pursuit of their goals can become dangerous and depending on one's environment and genetic makeup can lead to the development of disordered eating habits (Bunda & Bratu, 2016). Whether or not an athlete will reach the tipping point depends on how under pressure the individual can prove to be able to make right choices when it comes to his health (Bunda & Bratu, 2016). Being an elite athlete requires one to be obsessive about the sport and everything

that is associated with it. There is a clear risk in going to the extreme of the spectrum and developing orthorexia nervosa among this population.

The Sports Culture. Studies showed that orthorexia nervosa might be shaped by culture (Gramaglia et al., 2017). Accordingly, the sports culture plays an important role in shaping the mind and beliefs of student-athletes. Characteristics of the sports culture can leave athletes more vulnerable to the development of eating disorders, including the inclusion of exercise in the most recent definition of orthorexia nervosa. Athletes follow a very extensive training schedule along with specific diets for peak performance in their sport. Training several hours every day requires proper fueling of their body, and proper nutrition definitively gives athletes a performance edge over the ones who do not focus on the quality and density of nutrients of the food they consume. On the other hand, balance is important, and hours of training also means athletes need to eat many calories. If the focus on eating healthy food become to obsessive, it is very easy to fall into the problem of not eating enough to sustain athletic performance. In addition, extra training can be seen as hard work and be normalized when truly it might reach a point where it should be clinically diagnosed as orthorexia, as it become obsessive, out of control, and affects many aspects of one's life. Those athletes easily pass under the radar as these behaviors are normalized within the sport culture and environment. This is where the sports culture makes it challenging to diagnose an athlete who exhibits orthorexic behaviors since they are thought to go above and beyond to try and reach perfection. On another note, the culture of toughness in sports goes against opening up about weaknesses and struggles (Bunda & Bratu, 2016).

Finally, the sports culture allows for and encourages selective exposure. With that being said, just like social media users choose which account they wish to follow, and so are then continually exposed to the type of content these accounts produce (Turner & Lefevre, 2017),

student-athletes choose the type of people they interact with on a daily basis. This limited exposure in turn may lead to users believing a behavior is more prevalent or normal than is actually the case and may lead to perceived social pressures to conform to such behaviors (Turner & Lefevre, 2017).

In summary, the unique characteristics of college soccer female student-athletes, the role the sports environment plays in influencing normal norms for such athletes in the overview of ON, especially in Division I, leads to need for researching the prevalence of orthorexic behaviors among the collegiate athletic population. Mental illness such as ON might not only affect athletes' academic and athletic success, but most importantly their general well-being. While their athletic role might normalize orthorexic behavior now, it is important to realize that once their competitive days are over, ON tendencies may not instantly disappear. Sports might be a good outlet for it now, but it will become detrimental to one's life when eating for performance is not a need anymore, and one will not be able to disguise an eating disorder with such reasons. It may become even more obsessive, as the underlying issues will remain but what, on the outside served as hiding it, will not.

METHODS

Approval for this study was obtained from Missouri State University IRB (Feb 28, 2019; IRB-FY2019-367), (Appendix D).

The purpose of this study was to describe the prevalence of orthorexia nervosa in female student-athletes competing in Division I of the NCAA. Specifically, this population was thought to be at risk because of the athletes' personality traits, unique environment, and the influence of the sports culture. Additionally, diagnosis criteria approaches, traits, and environmental characteristics of disordered eating related to the prevalence of orthorexia were compiled. A description of the research design, subject selection, research instrument, survey procedure, and methods of analysis are discussed in this chapter.

Participants

Participants were recruited from the Missouri State Women's Soccer Team, an elite women's soccer program in NCAA Division I. Athletes were 18 to 24 years of age and currently on the team roster. Twenty-two athletes were eligible to participate in the study. The number of players who responded to the survey affected the sample size. However, after accounting for attrition, since it was most likely that not all eligible female athletes would take part in the study, the sample size (n=18) remained large enough to assure reliability of the results.

Sampling Procedure

Purposive sampling was used for this research study. The sampling frame remained the same as the target population, due to the accessibility of the Missouri State Women's Soccer

Team through coaching connections. This method was most appropriate for the type of research being conducted, as a certain segment of the population exhibiting specific characteristics was needed. These traits were extremely critical to the purpose and results of the investigation. They include competitiveness, discipline, hard work ethic, a high desire to perform, a diet for performance, perfectionism, obsessive thoughts and behavior patterns, being in the environment of a top college program on a daily basis, and immersion in a culture of athletic excellence and toughness. Such factors were most likely to be found in highly competitive female athletes playing for top soccer programs in the country due to the high emphasis these organizations place on sports, in comparison with academic achievements. NCAA Division I programs can afford spending a lot of money on athletic scholarships to recruit players, reinforcing athletes' commitment to their sport, the importance of performance, skill development, and competition. On the other hand, those same characteristics might not be present in NCAA Division II and III female soccer players, resulting in diminution of the meaningful, needed characteristics in lower division teams.

Data Collection

As part of the descriptive purpose of this study, survey research was utilized. This study determined the views and practices of elite female collegiate soccer players concerning their eating and training behaviors through administration of a questionnaire. The information obtained provides a basis for making comparisons and determining trends regarding orthorexia nervosa among the athletic population. Female soccer players at Missouri State University were asked to participate. Prior to data collection, the approval was obtained from the school's

Institutional Review Board for Human Subjects Research and athletic department. Data collection took place via web-based surveys through SurveyMonkey during the spring semester.

Measures

Self-report questionnaires were used as a means of data collection. The surveys used in this study consisted of the provision of consent to participate, the ORTO-15 test and the Eating Habits Questionnaire.

The ORTO-15 test was designed to determine the prevalence of highly sensitive behavior related to health and proper nutrition by evaluating the emotional and rational aspects of their brain (Thomas, 2017). The 15 items assessed student-athletes' obsessive attitudes related to the selection, purchase, preparation, and consumption of food that they consider being healthy. Each item was answered on a 4-point Likert scale. Individuals were required to answer with "always-often-sometimes-never", to reflect how often they define themselves with these expressions. Items that reflected an orthorexic tendency are scored as "1", and items that reflected a tendency towards normal eating behavior are scored as "4". Scores below 40 points in the ORTO-15 test are defined as orthorexic; eating behavior reaches more normal standards as the score increases (Brytek-Matera, 2012). A cut-off score of 35 was used for this study in order to avoid false-positive results, and thus get a clear picture of the prevalence of orthorexic tendencies among female collegiate student-athletes. The ORTO-15 test has been partially validated by several researchers (Donini et al., 2005). However, validity is yet to be established due to the lack of strict diagnosis criteria for the condition itself (Thomas, 2017).

The Eating Habits Questionnaire assessed cognitions, behaviors, and feelings related to an abnormal fixation on healthy eating and exercise (Thomas, 2017). In recent studies, the

instrument displayed good internal consistency and test-retest reliability. This 21-item self-report inventory measured the following symptoms of orthorexia nervosa: (a) knowledge of healthy eating (5 items, e.g., "The way my food is prepared is important in my diet"; α=0.900); (b) problems associated with healthy eating (12 items, e.g., "I have difficulty finding restaurants that serve the foods I eat"; α=0.820); and (c) feeling positively about healthy eating (4 items, e.g., "I have mad efforts to eat more healthily over time"; α=0.860) (Brytek-Matera et al, 2018). Each of the 21 items was answered on a 4-point Likert scale. Participants were required to answer each statement with "false, slightly true, mainly true, very true", marking what best fit their current eating habits. *False* was scored as 4, *slightly* as 3, *mainly true* as 2, and *very true* as 1. Lower scores indicated a higher presence of orthorexic behaviors.

Both instruments measured different psychological and behavioral aspects that might affect the development of orthorexia nervosa. Including both questionnaires into the survey resulted in the collection of more complete and reliable data about the prevalence of orthorexia nervosa among collegiate female soccer players.

Furthermore, additional items were created specifically for the purpose of this study (Appendix E). To measure athletic identity, participants were asked to rate on a scale of 0 to100 how much of their identity was defined by being a collegiate soccer player. Participants were asked to select whether they were trying to lose weight, maintain weight, or gain weight. Another questioned assessed what they valued most among health, performance or thinness. Student-athletes were asked about any dietary style they would identify themselves with, as well as their reasons for following a special diet. A wide variety of response options were available, and they were asked to check all that applied. Furthermore, participants were asked if their eating habits changed since becoming a college division 1 student-athlete. Two more open-ended questions

were also asked: what does living a healthy life means to you? And what drives you to eat the way you do? Finally, peer perception and influence was assessed by asking participants how their friends, coaches and family view their eating habits. This was an open-ended question.

Analysis Procedures

This study investigated the prevalence of ON in top female student-athletes by studying a possible sample of 22 women's soccer players in the NCAA Division I. Participants were evaluated in terms of their behaviors concerning various aspects of diet and training, and the control it has over their life, including cognitions, actions, and feelings about the mentioned topics.

The data collected from the online survey consisted of two separate scores, one from the ORTO-15 test and one from the Eating Habits Questionnaire. All items in the ORTHO-15 and EHQ scales were summed separately to create an ORTHO-15 summed score and an EHQ summed score. For both instruments, lower scores indicated greater orthorexic behaviors (Poyraz, 2015). Both variables of interest were examined descriptively to better understand the phenomenon within this population. The psychometrics of both the ORTHO-15 and the EHQ were analyzed for validity and reliability. Further, the two key variables of interest were correlated to determine if a relationship exists. The items related to peer perceptions and influences and motivations for food choices were examined to determine if there were mean differences between those characteristic items and the ORTO-15 as well as the EHQ.

The univariate statistics were analyzed first, reporting the frequencies and percentages of the demographic variables and characteristics variables as well as for the ORTO-15 and EHQ scores, while also examining the mean and standard deviation of the summed scores. Bivariate

correlations between the ORTHO-15 and EHQ scores were analyzed. The mean differences between the ORTHO-15 and EHQ summed scores, respectively, were assessed between weight status, motives for diet, and athletic identity independently with each of the ORTHO-15 and EHQ summed scores. The means in ORTHO-15 and EHQ summed scores, respectively, between groups who valued health, performance or thinness the most were assessed to determine whether any of those means were statistically significantly different from each other. The standard alpha value of 0.050 was utilized. The open ended-questions assessing participants' meaning of health and purpose for eating the way they do were qualitatively analyzed by grouping responses into themes to determine trends.

RESULTS

A total of 22 student-athletes received access to the online survey and a total of 19 questionnaires were completed. One participant indicated previous diagnosis and treatment for orthorexia nervosa, thus the final sample for this study was 18 female student-athletes with no previous diagnosis or treatment for an eating disorder. The response rate was of 86%. The study included 7 freshmen, 5 sophomores, 5 juniors and 1 senior.

Regarding orthorexia nervosa behaviors, thinking that there is unhealthy food on the market and that consuming healthy food may improve appearance were endorsed the most often among this population, based on the number of athletes who answered "always" or "often" (n=14), followed by spending more money to have healthier food (n=13) (Table 2).

Table 2: Frequency of Female Student-Athletes Engaging in Orthorexic Behaviors (ORTHO-15)

ORTHO-15 Variables	Always	Often	Sometimes	Never
When eating, do you pay attention to the calories of the food?	6	4	6	2
When you go in a food shop do you feel confused?	9	7	1	1
In the last 3 months, did the thought of food worry you?	1	1	8	8
Are your eating choices conditioned by your worry about your health status?	2	3	10	3
Is the taste of food more important than the quality when you evaluate food?	0	13	3	2
Are you willing to spend more money to have healthier food?	3	10	5	0

Table 2 continued: Frequency of Female Student-Athletes Engaging in Orthorexic Behaviors (ORTHO-15)

ORTHO-15 Variables	Always	Often	Sometimes	Never
Does the thought about food worry you more than three hours a day?	1	0	3	14
Do you allow yourself any eating transgressions?	1	13	2	2
Do you think your mood affects your eating behavior?	1	11	3	3
Do you think that the conviction to eat only healthy food increases self-esteem?	2	6	9	1
Do you think that eating healthy food changes your life-style?	1	9	7	1
Do you think that consuming healthy food may improve your appearance?	3	11	4	0
Do you feel guilty when transgressing?	1	4	11	2
Do you think that on the market there is also unhealthy food?	9	5	4	0
At present, are you alone when having meals?	5	2	10	1

Regarding eating habits, feeling great when eating healthily was endorsed the most often among this population, based on the number of athletes who answered “mostly true” or “very true” (n=14), followed by feeling in control when eating healthily (n=13), and increased efforts to eat more healthily over time (n=11) (Table 3).

Table 3: Frequency of Female Student-Athletes Engaging in Orthorexic Behaviors (EHQ)

Eating Habits Questionnaire Variables	VT	MT	ST	F
I am more informed than others about healthy eating.	2	6	8	2
I turn down social offers that involve eating unhealthy food.	0	1	9	8
The way my food is prepared is important in my diet.	1	7	8	2
I follow a diet with many rules.	1	2	3	12
My eating habits are superior to others.	1	2	8	7
I am distracted by thoughts of eating healthily.	0	1	11	6
I only eat what my diet allows.	0	0	4	14
My healthy eating is a significant source of stress in my relationships.	0	0	4	14
I have made efforts to eat more healthily over time.	4	7	7	0
My diet affects the type of employment I would take.	0	1	3	14
My diet is better than other people's diets.	0	5	9	4
I feel in control when I eat healthily.	2	11	3	2
In the past year, friends or family members have told me that I'm overly concerned with eating healthily.	0	0	2	16
I have difficulty finding restaurants that serve the foods I eat.	0	0	4	14
Eating the way I do gives me a sense of satisfaction.	2	4	9	3
Few foods are healthy for me to eat.	0	0	2	16

Table 3 continued: Frequency of Female Student-Athletes Engaging in Orthorexic Behaviors (EHQ)

Eating Habits Questionnaire Variables	VT	MT	ST	F
I got out less since I began eating healthily.	0	1	6	11
I spend more than three hours a day thinking about healthy food.	0	1	2	15
I feel great when I eat healthily.	10	4	3	1
I follow a health-food diet rigidly.	0	2	7	9
I prepare food in the most healthful way.	0	5	11	2

In interpreting the results, it is important to mention that the ORTHO-15 and the EHQ use a reversed scale, so low scores mean high orthorexic tendencies and high scores mean low tendencies. When examining orthorexia nervosa with the ORTHO-15, a cut-off score of 35 is used to assess the prevalence of orthorexic tendencies among individuals who take the test. Thus, a summed score was created for every individual with a possible range of 15 to 60. Among this sample, the actual range was of 20 to 49. The mean was 39.94 with a standard deviation of 6.44. The reliability of the ORTHO-15 scale was 0.833. Based on these numbers, two athletes would be below the threshold of that 35, and therefore be considered having high orthorexic tendencies. For the Eating Habits Questionnaire, the possible range for each individual was from 21 to 84. Among this sample, the actual range was of 56 to 76. The mean was 66.67 with a standard deviation of 6.90. The reliability scaled 0.754 (Table 4).

In term of athletic identity, student-athletes responded that about 62% of their identity was defined by them being a collegiate soccer player, with responses ranging from 30 to 95%. Seven participants were trying to lose weight (38.9%), eleven were trying to maintain weight

Table 4: ORTHO-15 and EHQ Summed Scores (n=18)

	Actual Range	Mean	S.D.
ORTHO-15	20-49	39.94	6.44
EHQ	56-76	66.67	6.90

(61.1%), and no one was trying to gain weight. When asked what they valued the most, 8 indicated health, 8 indicated performance, and 2 indicated thinness.

One of the purposes of the study was to examine the relationship between the ORTHO-15 and the EHQ. Bivariate analyses were run using the sum scores for both the ORTHO-15 and EHQ, and the correlation coefficient was 0.595 ($p = 0.007$).

Furthermore, items related to motivations, values, and athletic identity, along with peers, coaches and family perception and influence on food-related behaviors were examined to determine if there were mean differences between those characteristic items and the ORTO-15 as well as the EHQ summed scores. Several independent t-tests were run to assess those differences and their significance across items.

Two independent t-tests were run to examine the mean differences in summed ORTHO-15 and EHQ test scores between participants who were trying to lose weight and those who were maintaining weight. Participants trying to lose weight had lower ORTHO-15 and EHQ scores

than those who were maintaining weight. This is statistically significant since both p-values are less than 0.050 (Table 5).

Two independent t-tests were run to examine the mean differences in summed ORTHO-15 and EHQ test scores between participants with high athletic identity and those with low athletic identity. Participants who responded that they identified themselves as being a collegiate soccer player by 60% and above were classified as having high athletic identity, and the ones

Table 5: Mean differences in summed test scores between those who are trying to lose weight and maintain weight

	Lose Weight (n=7)	S.D.	Maintain Weight (n=11)	S.D.	P Value
ORTHO-15	35.43	7.63	42.82	3.49	0.012
EHQ	63.00	6.88	69.00	3.92	0.031

who responded less than 60% were classified as having low athletic identity. With p-values of 0.354 and 0.685, respectively, the mean differences are not statistically significant (Table 6).

Table 6: Mean differences in summed test scores between those with high and low athletic identity

	High Athletic Identity (n=12)	S.D.	Low Athletic Identity (n=6)	S.D.	P Value
ORTHO-15	38.92	7.15	42.00	4.56	0.354
EHQ	66.25	6.61	67.50	4.59	0.685

Two independent t-tests were run to examine the mean differences in summed ORTHO-15 and EHQ test scores between participants who were following a special diet for general health or performance reasons, and those who were not following a special diet. Participants who were following a diet for medical reasons were excluded. The mean differences were not statistically significant since the p-values were more than 0.050 (Table 7).

Independent ANOVA tests were run to compare the means in summed ORTHO-15 and EHQ test scores between groups of participants who valued health, performance or thinness the

Table 7: Mean differences in summed test scores and reasons for following a special diet

	Health/Performance (n=9)	S.D.	Not following a special diet (n=8)	S.D.	P Value
ORTHO-15	38.00	8.50	41.63	2.77	0.268
EHQ	66.89	6.75	67.00	5.40	0.971

most. There were no statistically significant differences between group means as determined by one-way ANOVA ($F(2,15) = 1.099$, $p = 0.359$), and one-way ANOVA ($F(2,15) = 2.350$, $p = 0.129$) (Table 8).

The following results were reported out of a sample of 19 completed questionnaires, including the participant who had previously been diagnosed with and received treatment for an eating disorder. Themes were pulled from the data, and similar responses were summed.

When asked about what living a healthy life meant to them, the two key themes that

Table 8: Mean differences in summed scores among personal health values.

	Between Groups	Within Groups	P Value
ORTHO-15	45.04	41.63	0.359
EHQ	70.63	30.05	0.129

emerged were related to nutrients and performance. Participants responded, “eating well, getting all essential nutrients” the most often (n=9), followed by “being active” (n=7). “Living healthy means getting a balanced meal as often as I can and not over or under eating. Being active and relieving stress in all areas of my life”, answered one of the participants. Another participant said “eating as well as you can, exercising, and keeping mental/ social health in check”.

When asked about what drives them to eat the way they do, the most endorsed theme was “performance” (n=9). The second most popular theme was “health and longevity” (n=5). A student-athlete answered “I try to eat healthy because it makes me feel better physically, and it allows me to perform better”, while another responded, “I want to live a long healthy life to have the energy to do the things I want to do in life”.

When asked about how their peers viewed their eating habits, half of the participants endorsed a “positively, healthy” theme (n=9). A participant wrote, “They know I eat a lot of healthy food”. Another student-athletes mentioned, “I usually eat worse around peers, a lot of social activities with friends involve eating.” When asked about how their coaches viewed their eating habits, the most endorsed theme was, again, “positively, healthy” (n=8). “Coaches encourage healthy eating, as well as making sure I am eating enough”, answered a participant.

When asked about how their family viewed their eating habits, the most endorsed theme among participants was “healthy” (n=8), followed by “indifferent” (n=5). Two participants responded that their family influenced their food-related behaviors.

When asked about how their eating habits have changed since becoming a Division I student-athlete, the key theme that emerges was performance related. A majority of participants answered they learned that food is fuel and impact their performance (n=11), as a result eating better or more of certain aliments.

Although she was excluded from the statistical analysis, the student-athlete who had previously been diagnosed with and received treatment for orthorexia nervosa shared valuable qualitative data that is worth mentioning. When asked about what living a healthy life meant to her, “freedom” was her response. When asked about what drives her to eat the way she does, she mentioned, “Trust in my body”, before adding how

> “Trust is so overridden by noise from social media and coaches basing performance solely on fitness level. It is like missing the critical foundation of a peaceful and somewhat disconnected relationship with food that allows for performance and mood to flow from.”

When asked how peers and family viewed her eating habits, she responded that her friends did not know what was going on inside her brain, while her parents have been supportive throughout the diagnosis and recovery process. When asked about how coaches viewed her eating habits, she wrote that “Coaches cared a lot about me but were ignorant to the recovery and wellness patterns that are required and not taught by dieticians with no knowledge on eating disorders.” Finally, when asked about how her eating habits have changed since becoming a Division I student-athlete, she responded that college was restricting, rigid, and based on performance. She insisted that she couldn’t tell she was running on fumes until her senior year, and that it still wasn’t enough to break her down for a while.

DISCUSSION

The aim of the current study was to explore eating behavior and the prevalence of orthorexia nervosa tendencies among female collegiate soccer players in the NCAA Division I. The mean scores of participants for the ORTHO-15 and the EHQ were 39.94 ± 6.44 and 66.67 ± 6.90 respectively. Low scores for these scales show a tendency for orthorexia and high scores indicate a decreased risk for the condition. In the literature, cutoffs scores of 35 and 40 have both been used, meaning that ORTHO-15 test scores below those numbers would be defined as orthorexic; eating behavior reaches more normal standards as the score increases (Brytek-Matera, 2012). In the present study, based on the 35 cutoff score used, 2 athletes would be below the threshold and thus considered having high orthorexic tendencies. It is interesting to note that the number of participants at high risks for ON raises to 8 if a cutoff score of 40 points is used. In this case, the mean would be under the cutoff score, suggesting high orthorexic tendencies among female collegiate student-athletes. This is of great important because although false positive results should be avoided, a higher cutoff score would pull in more at risk students, which would allow for professional to identify those at risk and potentially intervene before too healthy becomes unhealthy and a medical issue.

In the current study, data suggests a significant positive correlation between ORTHO-15 scores and EHQ scores ($r = 0.595$, $p = 0.007$). This indicates that as tendencies for highly sensitive behavior related to health and proper nutrition increase so does an abnormal fixation on healthy eating and exercise. As ORTHO-15 scores get lower, indicating higher prevalence of orthorexic behaviors, EHQ scores also get lower, indicating a positive correlation between eating attitude and risks for orthorexia nervosa. This is good news as even in the absence of using the

ORTHO-15, there is another measure for possibly identifying those at risk. The EHQ is less sensitive since it is not related to the direct diagnosis or identification of an eating disorder, and therefore could be a good substitute assessment tool to identify those at risk before their eating behaviors become problematic so as to intervene at an early stage.

The present study found that student-athletes trying to lose weight had statistically significantly lower ORTHO-15 and EHQ scores compared to student-athletes trying to maintain weight. This goes against what is thought about the ORTHO-15, which is that weight loss is not the goal. However, when examining this specific population, combining healthy eating with the drastic amounts of physical activity and the sports culture, weight loss may become a goal despite what has previously been reported about orthorexia nervosa. The reason for trying to lose weight was not measured in this study but should be considered as it could be for performance as much as aesthetic motives. Furthermore, it is important to account for the increasing popularity and media presence surrounding elite women's soccer players in the United States. It can be assumed that female athletes are being judged based on the way they look rather than for the way they play the game. Numerous players earn majority of their income through sponsorships with clothing companies and model agencies, given the significant salary gap between male and female athletes in the sport, which puts even more pressure on those athletes to look a certain way and may affect their desire to lose weight. On the other side, the majority was trying to maintain weight (n=11), which aligns with results indicating that losing weight is not their main objective, health and performance being the main factors driving their eating behaviors.

No significant correlation was found between athletic identity and summed test scores, although participants strongly identified with being collegiate soccer players. Student-athletes with high athletic identity did not have significantly lower ORTHO-15 and EHQ scores than the

ones with low athletic identity. This was surprising given the researcher assumes that student-athletes with a higher athletic identity have a tendency to be more aggressive with behaviors thought to improve performance.

The current study highlighted behaviors exhibited by student-athletes that can have orthorexic implication, such as thinking that there is unhealthy food on the market and willingness to spend more money to have healthier food. Student-athletes should be careful with the degree of obsession they put on those behaviors. This study also suggests that student-athletes feel great and in control when eating healthily and have increased their efforts to eat more healthily over time. This can be a positive factor in terms of performance and long-term health, but also becomes of orthorexic nature when it starts taking over one's life. This highlights the challenge in diagnosing orthorexia nervosa, as this kind of disordered eating starts with good intention in the pursuit of health.

Open-ended questions also gave good insights in the mind of student-athletes. Consistent with the characteristics of their environment, is important for them to eat as well as they can. Performance and health stood out as the main factors driving their eating behaviors, in comparison with thinness for those suffering with anorexia nervosa. Furthermore, student-athletes are being seen by the researcher as healthy eaters by their friends and family, so once again the behavior becomes easily normalized no matter the extent or obsession that can take place around it. Along the same line, within the sports culture, this study is assumed to reinforce that coaches encourage healthy eating as well as eating enough of good aliments. This is again assumed where the challenge comes from in term of ON diagnosis, since one can still eat enough of what could be considered healthy but be missing important nutrients necessary for a balanced diet. This is why the researcher believes education is vital and is a must for every high-level

athletic program. The researcher has experience both as an athlete and a coach and can attest to the need for mental toughness and to do whatever it takes to perform; however, the researcher also believes that attitude can be misunderstood from a dietary standpoint if the education isn't there for student-athletes and opens a door for athletes manifesting orthorexic behaviors to pass under the radar of eating disorder diagnosis. Orthorexic behaviors can be seen as "being disciplined" with one's diet, even when it becomes obsessive.

In the present study, the most important change in student-athletes' eating habits since they started their collegiate career is being more intentional about eating better aliments, due to the realization that food is fuel and directly impact their performance. This shift in mentality is important and a necessity in maximizing both potential and performance for the elite athlete. However, this can become problematic and take orthorexic proportions if taken too seriously. Within the sports culture of diet and performance, it is assumed that athletes obsess about details that can eventually lead to decrease in performance and to serious health problems.

In this study, the student-athlete who had previously been diagnosed with and received treatment for an eating disorder raised some important points confirming some factors within the sports culture and the environment to which student-athletes are often exposed. While this particular student was not included in the quantitative analyses, her insights help to better understand the significant relationships that exist especially between the ORTHO-15 and the EHQ. It was mentioned that trust is overridden by noise from social media, in addition to pressure from coaches to constantly maintain high fitness level and performance. This suggests that the diet culture presented on a multitude of social media platforms highly influences the way female athletes eat. Such diets can lead to many health issues linked with one's metabolism, adrenal glands and menstrual cycle, which will all in turn decrease performance, overall health,

and affect long-term quality of life. Based on this student-athlete's insight, the current study also supported the rigidity and restricting aspect of eating behavior within college sports, and the importance, once again, placed on performance. The fact that she couldn't tell how she was running on fumes until her senior year, and that it still wasn't enough to break her down for a while highlight some of the prevalent characteristics of the competitive athlete, such as strong dedication, perseverance, and mental toughness allowing them to push pass their limits – which is thought to contribute to the development of orthorexia nervosa. This suggests that student-athletes are indeed a population at risk for the development of this new phenomenon.

Data Limitations

All data was self-reported and thereby subject to socially desirable responding. However, several steps were taken to encourage honest responding by the participants: No coaches or athletic department personnel were present during data collection, and participants were informed of the confidential nature of their responses. Furthermore, orthorexia nervosa is a relatively new phenomenon and a limited amount of research was available on the subject. Consequently, diagnosis criteria haven't been officially validated. In addition, the response rate affected the validity of the study. Although majority of the players on the Missouri State University Women's Soccer Team participated in the study, data from athletes in all Division I soccer teams could not be obtained. Therefore, the results would be different if athletes from each team would have been represented equally. The small sample size affected the external validity, thus limiting the generalizability of the results to a broader population. Lastly, the exclusivity of the sample, female soccer players from an elite Division 1 collegiate women's

soccer programs in the NCAA, could be viewed as a limitation but research among this sport was needed. A larger sample would have allowed for greater generalizability of the results.

Recommendations for Future Research

Moving forward, in future research, it will be crucial to figure out the most appropriate cutoff score to avoid false positive/negative results and get the most accurate picture of the prevalence of orthorexia nervosa behaviors among female college student-athletes (or simply within the athletic population). The challenge with the diagnosis of ON remains important as healthy eating is a behavior athletes should have yet too healthy becomes problematic. Specifically among student-athletes, it is a coach's or athletic trainer's responsibility to protect athletes; therefore, knowledge of appropriate screening tools to indicate unhealthy diets is crucial. Finally, this study needs to be replicated with other soccer teams and additional sports on other campuses to truly understand the scope of orthorexia nervosa among college female athletes.

In conclusion, given the rates of at-risk student athletes for orthorexia nervosa, from this study, it is vital to build a solid and trusting relationship between the coaching staff, the athletic trainers and the dietetics staff so that those students who are at risk do not go under the radar and those that are identified get the comprehensive help needed. Furthermore, education about orthorexia nervosa is key for these student-athletes especially given the link with performance, obsession and the health focus of athletes. Finally, the screening criteria used by many athletic programs needs to be revised so as not to rely solely on objective data, like weight and the presence or absence of menstruation, to screen for problematic dietary issues among college female athletes. Screening tools like the EHQ or the ORTHO-15 may help to facilitate

identifying those at-risk student athletes so that they can get connected with appropriate resources before their behaviors become problematic.

REFERENCES

Anxiety and Depression Association of America. (2017-a). Eating disorders. Retrieved from https://adaa.org/eating-disorders

Anxiety and Depression Association of America. (2017-b). Generalized anxiety disorder (GAD). Retrieved from https://adaa.org/understanding-anxiety/generalized-anxiety-disorder-gad

Anxiety and Depression Association of America. (2017-c). Obsessive-compulsive disorder (OCD). Retrieved from https://adaa.org/obsessive-compulsive-disorder

Bratman, S. (2017). Orthorexia. Retrieved from http://www.orthorexia.com

Brytek-Matera, A. (2012). Orthorexia nervosa - an eating disorder, obsessive-compulsive disorder or disturbed eating habit? *Archives of Psychiatry and Psychotherapy* (1), 55-60.

Brytek-Matera, A., Czepczor-Bernat, K., Jurzak, H., Kornacka, M., and Kolodziejczyk, N. (2018). Strict health-oriented eating patterns (orthorexic eating behaviors) and their connection with a vegetarian and vegan diet. *Eating and Weight Disorders - Studies on Anorexia, Bulimia, and Obesity* (23), 1-12.

Bunda, M.-C., and Bratu, D.-E. (2016). Eating disorders and performance sports. *Romanian Journal of Cognitive Behavioral Therapy and Hypnosis, 3*(2).

Chard, C. A., Hilzendegen, C., Barthels, F., and Stroebele-Benschop, N. (2018). Psychometric evaluation of the english version of the dusseldorf orthorexia scale (DOS) and the prevalence of orthorexia nervosa among a U.S. student sample. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*.

Cicekoglu, P., Tuncay, G. Y. (2017). A comparison of eating attitudes between vegans/vegetarians and nonvegans/nonvegetarians in terms of orthorexia nervosa. *Archives of Psychiatric Nursing*, 32(2), 200-205.

Cowden, S. (2018). Obsessive-compulsive disorder and eating disorders. Retrieved from https://www.verywellmind.com/obsessive-compulsive-disorder-and-eating-disorders-1138191

Davoren, A. K., and Hwang, N. G. (2014). Depression and anxiety prevalence in student-athletes. In G. T. Brown (Ed.), *Mind, Body and Sport: Understanding and Supporting Student-Athletes Mental Wellness* (pp. 38,39). Indianapolis, IN: The National Collegiate Athletic Association.

Donini, L., Marsili, D., Graziani, M., Imbriale, M., and Cannella, C. (2005). Orthorexia nervosa: validation of a diagnosis questionnaire. *Eating and Weight Disorders – Studies on Anorexia, Bulimia and Obesity,* 10(2), e28-e32. http://dx.doi.org/10.1007/bf03327537.

Dunn, T. M., and Bratman, S. (2015). On orthorexia nervosa: a review of the literature and proposed diagnostic criteria. *Eating Behaviors, 21*, 11-17.

Gleaves, David and C. Graham, Erin and Ambwani, Suman. (2013). Measuring "orthorexia." Development of the eating habits questionnaire. *The International Journal of Educational and Psychological Assessment. 12.*

Gramaglia, C., Brytek-Matera, A., Rogoza, R., and Zeppegno, P. (2017*).* Orthorexia and anorexia nervosa: two distinct phenomena? A cross-cultural comparison of orthorexic behaviours in clinical and non-clinical samples. *BMC Psychiatry*, 17, 75.

Greenleaf, C., Petrie, T. A., Carter, J., and Reel, J. J. (2009). Female collegiate athletes: prevalence of eating disorders and disorders eating behaviors. *Journal of American College Health, 57*(5), 489-495.

Håman, L., Barker-Ruchti, N., Patriksson, G., and Lindgren, E.-C. (2015). Orthorexia nervosa: an integrative literature review of a lifestyle syndrome. *International Journal of Qualitative Studies on Health and Well-Being*, 10, 10.3402/qhw.v10.26799.

Kiss-Leizer, M., and Rigo, A. (2018). People behind unhealthy obsession to healthy food: the personality profile of tendency to orthorexia nervosa. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*.

Koven, N. S., and Abry, A. W. (2015). The clinical basis of orthorexia nervosa: emerging perspectives*. Neuropsychiatric Disease and Treatment*, 11, 385–394.

Kroshus, E. (2014). Risk factors in the sport environment. In G. T. Brown (Ed.), *Mind, Body and Sport: Understanding and Supporting Student-Athlete Mental Wellness* (pp. 73-75). Indiana, IN.: The National Collegiate Athletic Association.

Muhlhein, L. (2017). Perfectionism in eating disorders. Retrieved from https://www.verywellmind.com/perfectionism-in-anorexia-nervosa-1138391

Nevin, S. M., and Vartanian, L. R. (2017). The stigma of clean dieting and orthorexia nervosa*. Journal of Eating Disorders*, 5, 37.

Olejniczak, D., Bugajec, D., Panczyk, M., Brytek-Matera, A., Religioni, U., Czerw, A., and Staniszewska, A. (2017). Analysis concerning nutritional behaviors in the context of the risk of orthorexia. *Neuropsychiatric Disease and Treatment*, 13, 543–550.

Petrie, T. A., Greenleaf, C., Reel, J., and Carter, J. (2009). Personality and psychological factors as predictors of disordered eating among female collegiate athletes. *Eating Disorders, 17*, 302-321.

Poyraz, C. A. (2015). Relationship between orthorexia and obsessive-compulsive symptoms in patients with generalized anxiety disorder, panic disorder and obsessive compulsive disorder. doi:10.5455/NYS.20160324065040

Rudolph, S. (2017). The connection between exercise addiction and orthorexia nervosa in german fitness sports. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*.

Schapmann, S. (2018). How perfectionism drives eating disorders. Retrieved from https://www.recoveryranch.com/articles/eating-disorders/how-perfectionism-drives-eating-disorders/

Shanwal, V. K., and Dasgupta, P. (2014). Emotional intelligence: a management tool for orthorexia nervosa. *Indian Journal of Health and Well Being*.

Stull, T. (2014). The psychiatrist perspective. In G. T. Brown (Ed.), *Mind, Body and Sport: Understanding and Supporting Student-Athlete Mental Wellness* (pp. 21-23). Indianapolis, IN: The National Collegiate Athletic Association.

Thomas, L. (2017). Diagnostic criteria for orthorexia. Retrieved from https://www.news-medical.net/health/Diagnostic-Criteria-for-Orthorexia.aspx

Tsoukanelis, E. A. (2009). Obsessed with health. *Green Living*. Retrieved from https://emagazine.com/obsessed-with-health/

Turner, P. G., and Lefevre, C. E. (2017). Instagram use is linked to increased symptoms of orthorexia nervosa. *Eating and Weight Disorders, 22*, 277-284.

Vandereycken, W. (2011). Media hype, diagnostic fad or genuine disorder? Professionals' opinions about night eating syndrome, orthorexia, muscle dysmorphia, and emetophobia. *Eating Disorders* (19), 145-155. doi:10.1080/10640266.2011.551634

APPENDIX A: ORTHO-15 Test

ORTO-15				
	Always	**Often**	**Sometimes**	**Never**
1) When eating, do you pay attention to the calories of the food?	O	O	O	O
2) When you go in a food shop do you feel confused?	O	O	O	O
3) In the last 3 months, did the thought of food worry you?	O	O	O	O
4) Are your eating choices conditioned by your worry about your health status?	O	O	O	O
5) Is the taste of food more important than the quality when you evaluate food?	O	O	O	O
6) Are you willing to spend more money to have healthier food?	O	O	O	O
7) Does the thought about food worry you for more than three hours a day?	O	O	O	O
8) Do you allow yourself any eating transgressions?	O	O	O	O
9) Do you think your mood affects your eating behavior?	O	O	O	O
10) Do you think that the conviction to eat only healthy food increases self-esteem?	O	O	O	O
11) Do you think that eating healthy food changes your life-style?	O	O	O	O
12) Do you think that consuming healthy food may improve your appearance?	O	O	O	O
13) Do you feel guilty when transgressing?	O	O	O	O
14) Do you think that on the market there is also unhealthy food?	O	O	O	O
15) At present, are you alone when having meals?	O	O	O	O

SCORING GRID FOR ORTO-15 TEST RESPONSES				
ITEMS	**RESPONSES**			
	Always	**Often**	**Sometimes**	**Never**
2-5-8-9	4	3	2	1
3-4-6-7-10-11-12-14-15	1	2	3	4
1-13	2	4	3	1

APPENDIX B: Bratman's Orthorexia Test

Bratman's Orthorexia Test:
Answer the following questions to see if your healthy diet has consuming too much of your life.

1. Do you spend more than three hours a day thinking about healthy food? (Scoring note: for four hours, give yourself 2 points.)
2. Are you already planning tomorrow's healthy menu today?*
3. Do you care more about the virtue of what you eat than the pleasure you receive from eating it?
4. Has the quality of your life decreased since the quality of your diet has increased?
5. Do you keep getting stricter with yourself?
6. Do you feel an increased sense of self-esteem when you are eating "right" and look down on others whose diets are not, in your eyes, healthy?
7. Do you skip foods you enjoy just to eat the "right" foods?**
8. Does your diet make it difficult for you to eat away from home?
9. Are you becoming socially isolated?
10. Do you feel guilty or hate yourself when you stray from your diet?
11. When you eat the "good" foods, do you feel a peaceful sense of total control?

Scoring - Give yourself one point for each "yes" answer.

- 2-3 points: You may have a mild case of orthorexia. Be aware of your behavior.
- 4-9 points: You may have a moderate case of orthorexia. You may need to relax your diet standards.
- 10 points: You are obsessed with your healthy diet. You may need to seek professional help.

**This does not mean planning a week's menus so that you can shop for food once a week. Many people who work full time must do this to make time for other activities.*

*** This means compulsively, whether there is a good reason or not. Obviously someone who is trying to lose 20 pounds of body fat will need to use some self-control.*

APPENDIX C: Eating Habits Questionnaire

EATING HABITS QUESTIONNAIRE

Please answer the following questions by circling the response that best fits your current eating habits.

F = False, not at all true ST = Slightly true MT = Mainly true VT = Very true

1. I am more informed than others about healthy eating.	F	ST	MT	VT
2. I turn down social offers that involve eating unhealthy food.	F	ST	MT	VT
3. The way my food is prepared is important in my diet.	F	ST	MT	VT
4. I follow a diet with many rules.	F	ST	MT	VT
5. My eating habits are superior to others.	F	ST	MT	VT
6. I am distracted by thoughts of eating healthily.	F	ST	MT	VT
7. I only eat what my diet allows.	F	ST	MT	VT
8. My healthy eating is a significant source of stress in my relationships.	F	ST	MT	VT
9. I have made efforts to eat more healthily over time.	F	ST	MT	VT
10. My diet affects the type of employment I would take.	F	ST	MT	VT
11. My diet is better than other people's diets.	F	ST	MT	VT
12. I feel in control when I eat healthily.	F	ST	MT	VT
13. In the past year, friends or family members have told me that I'm overly concerned with eating healthily.	F	ST	MT	VT
14. I have difficulty finding restaurants that serve the foods I eat.	F	ST	MT	VT
15. Eating the way I do gives me a sense of satisfaction.	F	ST	MT	VT
16. Few foods are healthy for me to eat.	F	ST	MT	VT
17. I go out less since I began eating healthily.	F	ST	MT	VT
18. I spend more than three hours a day thinking about healthy food.	F	ST	MT	VT
19. I feel great when I eat healthily.	F	ST	MT	VT
20. I follow a health-food diet rigidly.	F	ST	MT	VT
21. I prepare food in the most healthful way.	F	ST	MT	VT

APPENDIX D: IRB Approval

IRB-FY2019-367 - Initial: Exempt

irb@missouristate.edu
Thu 2/28/2019 10:09 AM
To: Bard Martel, Maryse <Maryse112@live.missouristate.edu>;
Novik, Melinda G <MelindaNovik@MissouriState.edu>

To:
Melinda Novik
Kinesiology
Melinda Novik

Date: Feb 28, 2019 8:09 AM PST

RE: Notice of IRB Exemption
Study #: IRB-FY2019-367
Study Title: Orthorexia Nervosa Among Collegiate Female Student-Athletes

This submission has been reviewed by the Missouri State University Institutional Review Board (IRB) and was determined to be exempt from further review.

Investigator's Responsibilities:

You are required to obtain IRB approval for any changes to any aspect of this study before they can be implemented. Should any adverse event or unanticipated problem involving risks to subjects or others occur it must be reported immediately to the IRB.

This study was reviewed in accordance with federal regulations governing human subjects research, including those found at 45 CFR 46 (Common Rule), 45 CFR 164 (HIPAA), 21 CFR 50 & 56 (FDA), and 40 CFR 26 (EPA), where applicable.

Researchers Associated with this Project:
PI: Melinda Novik
Co-PI: Melinda Novik
Primary Contact: Maryse Bard-Martel
Other Investigators: Daniela Novotny, Maryse Bard-Martel, Sara Powell

APPENDIX E: Additional Survey Items

4. How much of your identity is defined by you being a collegiate soccer player?

0% 100%

7. Are you currently trying to:

Lose weight Maintain weight Gain weight

13. Which of the following do you value the most?

Health Performance Thinness

14. What does living a healthy life mean to you?

15. What drives you to eat the way you do?

16. How do your peers, coaches and family view your eating habits?

Peers

Coaches

Family

17. Do you follow a special diet for any of the following reasons. Check all that apply.

- [ ] Food Allergy
- [ ] Food Intolerance
- [ ] Medical Condition (ex: IBS)
- [ ] Ethical Beliefs (ex: environment, animals, etc.)
- [ ] Religious beliefs related to food.
- [ ] General Health
- [ ] Performance
- [ ] I do not follow a special diet.

18. Which of the following personal dietary styles would you identify yourself with?

- [ ] Vegan
- [ ] Vegetarian
- [ ] Lactose Free
- [ ] Dairy Free
- [ ] Sugar Free
- [ ] Gluten Free
- [ ] Paleo
- [ ] Raw
- [ ] Ketogenic
- [ ] I do not follow any dietary restrictions.

21. How have your eating habits changed since becoming a division 1 student-athlete?