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Title: *Prevalence of Eating Disorders Tendencies, Disordered Eating, and Orthorexia Nervosa Behaviors in Dietetic-Nutrition Students Compared to Biology Students*

The accompanying research report is submitted to the **University of Wisconsin-Stout, Graduate School** in partial completion of the requirements for the

Graduate Degree/ Major: MS Food & Nutritional Sciences

Research Adviser: Dr. Kerry Peterson, RD

Submission Term/Year: January, 2018

Number of Pages: 42

Style Manual Used: American Psychological Association, 6th edition

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Woehrer, Kelly J. *Prevalence of Eating Disorders Tendencies, Disordered Eating, and Orthorexia Nervosa Behaviors in Dietetic-Nutrition Students Compared to Biology Students*

Abstract

Eating disorders (ED) are a problem on university campuses (Leiderman & Triskier, 2004), and may be more evident in dietetic-nutrition (DN) students (Poínhos et al., 2015). Furthermore, Orthorexia Nervosa is an unhealthy obsession with healthy eating (Bratman, 1997). The purpose of this research was to determine the difference in ED tendencies and Orthorexic behaviors in DN students and biology students. Components of the EAT-26 to assess ED tendencies, the ORTO-15 to assess Orthorexic behaviors, and demographic questions, were administered via electronic survey to DN students and biology students in Wisconsin. Forty-five surveys were analyzed (35 DN students; 10 biology students) aged 22.0 ± 4.3 years. The prevalence of ED tendencies was 22.2% overall, 22.9% in DN students, and 20.0% in biology students. The mean EAT-26 score for DN students was 14.31 ± 14.16 and 12.50 ± 12.64 for biology students ($p=0.717$). The prevalence of ON was 88.9% overall, 88.6% in DN students, and 90.0% in biology students. The mean ORTO-15 score for dietetic-nutrition students was 34.83 and 34.10 for biology students ($p=0.633$). There is no significant difference in ED tendencies or Orthorexic behaviors between DN students and biology students per the EAT-26 and ORTO-15. Future studies with larger samples sizes are needed to confirm these findings.

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Chapter I: Introduction

Eating disorders cause the highest mortality rate of any mental illness (Smink, Hoeken, & Hoek, 2012). In a study of college-aged students in the U.S., 3.5% of women and 2.1% of men reported to have an eating disorder (Diemer, Grant, Munn-Chernoff, Patterson, & Duncan, 2015). The Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-V), which is an updated manual that classifies and standardizes all psychiatric and mental conditions, separates eating disorders into five categories: Bulimia Nervosa (BN), Anorexia Nervosa (AN), Binge Eating Disorder (BED), other specified feeding and eating disorder (OSFED), and a residual diagnosis section titled, unspecified feeding and eating disorder (UFED) (American Psychiatric Association, 2013). BN is defined as recurrent episodes of binge eating and subsequent inappropriate compensatory purging behaviors to prevent weight gain. Purging is characterized by extreme measures of calorie burning, or weight loss, such as self-induced vomiting or laxative use (Chaki, Pal, & Bandyopadhyay, 2013). AN is the restriction of food intake resulting in low body weight, which is influenced by fear of gaining weight, becoming fat, or body dissatisfaction, and may involve severe food restriction, or bingeing and purging. BED is characterized by recurrent episodes of binge eating that generally consist of eating until being uncomfortably full. OSFED is a category used to contain all other eating disorders that do not fit into the aforementioned categories, which may encompass a heterogeneous mix of symptoms (American Psychiatric Association, 2013; Schwitzer & Choate, 2015). UFED is a diagnosis code assigned when limited information is available to the clinician. Orthorexia Nervosa (ON) is not classified as an eating disorder per the DSM-V, but is recognized as a form of disordered eating (American Psychiatric Association, 2013). Individuals who suffer from ON are often

fixated with pure, clean, and healthy eating that is taken to an extreme unhealthy level (Bosi, Camur, & Guler, 2007; Brytek-Matera, 2012).

Substantial evidence suggests that college students have the highest risk for development of EDs (Drummond & Hare, 2012; Leiderman & Triskier, 2004; Lofrano-Prado, Prado, Barros, & Souza, 2015). Furthermore, many authors have speculated that unhealthy eating behaviors, which may lead to EDs, are more prevalent in students in a dietetic or nutrition program (Korinth, Schiess, & Westenhofer, 2009; Mealha, Ferreira, Guerra, & Ravasco, 2013; Poínhos et al., 2015). However, there is limited research on the prevalence of ON in dietetic-nutrition (DN) students in the US, as well as a comparison of eating disorder tendencies and Orthorexic behaviors in DN students versus students of other college programs.

Statement of the Problem

Due to pressure to achieve an ideal body image, many young adults have body dissatisfaction (Lofrano-Prado et al., 2015). This may result in unhealthy behaviors that may become an eating disorder. Furthermore, eating disorders are a well-known problem on university campuses (Leiderman & Triskier, 2004). This problem may be more evident in DN students (Korinth et al., 2009; Mealha et al., 2013; Poínhos et al., 2015). Although an abundant amount of research has been performed on DN students in regards to eating disorders, disordered eating, and ON, the findings are mixed. For example, some authors suggest that there is no difference in ED tendencies among DN students (Akdevelioglu & Huseyin, 2010; Harris, Gee, D'acquisto, Ogan, & Pritchett, 2015; Kiziltan & Karabudak, 2008), while others suggest that DN students are more susceptible to developing an eating disorder (Korinth et al., 2009; Mealha et al., 2013; Poínhos et al., 2015).

Purpose of the Study

The purpose of this study was to determine the prevalence of eating disorders tendencies, disordered eating, and ON behaviors in DN students compared to students in biology majors in a collection of five Midwest colleges.

Hypothesis

Eating disorder tendencies are prevalent in both the DN group, and the control group. However, students in the DN group will score higher on the EAT-26, indicating higher level of ED tendencies, and lower on the ORTO-15, indicating increased orthorexic behaviors when compared to biology students.

Assumptions of the Study

In regards to the surveys, this study assumed that the questions accurately categorize participants according to the operational definition of an eating disorder and that all necessary questions were included. Furthermore, this study assumed that all survey questions were understood and answered honestly by all participants.

Definition of Terms

Listed below is a definition of terms used throughout this paper to allow for better understanding of their intended meaning.

Anorexia Nervosa (AN). An eating disorder where individuals often limit their food intake due to the fear of being “fat” or gaining weight. The diagnostic criteria for AN per the DSM-V include: persistent restriction of energy intake to reduce body weight; having an intense fear of gaining weight, or performing consistent activities that interferes with weight gain; and having a persistent lack of recognition of a severely low body weight (American Psychiatric Association, 2013).

Binge Eating Disorder (BED). An eating disorder associated with lack of control where individuals consume large quantities of food during a brief period. Unlike BN, individuals who suffer from BED do not try to rid of their binge through vomiting or laxatives (American Psychiatric Association, 2013).

Body dissatisfaction. Negative thoughts and feelings regarding an individual's body and body image (National Eating Disorder Collaboration, 2017).

Bulimia Nervosa (BN). An eating disorder that consists of frequent binge eating that is followed by purging episodes. Purging episodes often consist of induced vomiting or the use of laxatives (American Psychiatric Association, 2013).

Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-V). Published in 2013 by the American Psychiatric Association, the DSM-V is a comprehensive and updated list of psychiatric diagnoses used by researchers and clinicians to classify mental illness.

Disordered eating. Unhealthy eating patterns including but not limited to: restrictive dieting/food intake, skipping meals, compulsive eating, and any signs or symptoms encompassed within the classified eating disorders (National Eating Disorder Collaboration, 2017).

Eating Disorder (ED). Psychological disorder resulting in abnormal eating behaviors and that meets the diagnostic criteria outlined by the DSM-V for anorexia nervosa, bulimia nervosa, binge eating disorder, other specified eating or feeding disorder, or unspecified eating or feeding disorder.

Orthorexia Nervosa (ON). An eating disorder not classified by the DSM-V. It is considered an unhealthy obsession with pure, clean, and healthy eating (Bratman, 1997).

Other Specified Eating and Feeding Disorder (OSEFD). Includes diagnoses atypical AN, BN of low frequency, BED of low frequency, purging disorder, and night eating syndrome (American Psychiatric Association, 2013).

Limitations of the Study

Due to the methods used in this study, reporting bias is an inherent limitation. The use of surveys as a method of collecting data assumes that all participants correctly answered questions. However, data may be unintentionally or intentionally exaggerated or minimized, resulting in inaccurate conclusions. Another limitation of this study is the small sample size. This may be related to the poor return rate of the surveys. The use of relatively local colleges out of convenience may result in a misrepresentation of the population of DN students across the country. Furthermore, the integrity of the ORTO-15 questionnaire has been questioned, as no validity or reliability have been reported (Dunn & Bratman, 2016). A final limitation is that criteria used in this study to categorize participants into an eating disorder group is based off survey evaluation rather than a true medical evaluation. This may result in false positive and false negative categorizations.

Chapter II: Literature Review

This chapter includes an overview of eating disorders, the disordered eating behavior Orthorexia Nervosa (ON), and the associated prevalence in college-aged students. The literature review will conclude with how these disorders affect dietetic- nutrition (DN) students when compared to other students in non-DN related fields.

Eating Disorders and Disordered Eating

The DSM-V differentiates four eating disorders: AN, BN, BED, OSFED, and the residual diagnosis UFED. The DSM-V was released in 2013 and differs from the DSM-IV in that it added BED, and broadened the definitions of AN and BN to reduce the frequency of the DSM-IV category “Eating disorder not otherwise specified,” (Smink, Hoeken, Oldehinkel, & Hoek, 2014). Overall, the lifetime prevalence of any eating disorder, which indicates the percentage of a population that has been diagnosed with the condition at any point in their life (Portney & Watkins, 2009), in women is 5.7%, and 1.2% in men (Smink et al., 2014).

AN is a condition in which individuals severely restrict food intake due to a fear of gaining weight. Individuals with AN have a preoccupation with maintaining a low body weight (American Psychiatric Association, 2013). The two types of AN include intake restriction, and binge eating/purging, where binge eating and purging involves eating large amounts of food then going through extreme measures of calorie burning or weight loss such as self-induced vomiting or laxative use. The diagnostic criteria for AN per the DSM-V include: persistent restriction of energy intake to reduce body weight; having an intense fear of gaining weight, or performing consistent activities that interferes with weight gain; and having a persistent lack of recognition of a severely low body weight of 15% below their normal body weight expected for their height (American Psychiatric Association, 2013; Parekh, 2017). The average prevalence of AN, per the

DSM-IV criteria was 0.3% in females (Hoek & van Hoeken, 2003), however due to the expansion of the diagnostic criteria in the DSM-V, the average prevalence rate increased to 1.7% (Smink et al., 2014). A study by Mustelin et al. (2016) reported lifetime prevalence rate of AN as high as 3.6% using the DSM-V criteria. Furthermore, AN has the highest mortality rate of any other ED at 0.51% per year (Sullivan, 1995; Smink et al., 2012). Crow et al., (2009) reports that the overall mortality rate for AN is 4%.

BN is an eating disorder that is associated with bingeing and purging. Individuals who suffer from this disorder consume large amounts of food in a small-time frame which is followed by compensatory behaviors. Compensatory behaviors consist of induced vomiting, the misuse of laxatives, diuretics, medications, and/or excessive exercise. Individuals who suffer from BN are often underweight, normal weight, overweight, or even obese (American Psychiatric Association, 2013). This diagnosis differs from AN in that there is no weight or Body Mass Index (BMI) criteria. Diagnostic criteria for BN, per the DSM-V, consists of individuals bingeing and performing compensatory behaviors on average once a week for three months (National Eating Disorder Association, 2016). Hoek & van Hoeken (2003), identify prevalence rates of BN as 1.0% for females and 0.1% for males per the DSM-IV criteria. However, as the DSM-V relaxed the diagnostic criteria, the prevalence was reported to be 2.3% in women (Smink et al., 2012), while there was no reported change in men (Smink et al., 2014). Many medical complications are associated with BN including alterations in electrolyte and acid base balances, and persistent gastric acid reflux which can be caused by excessive vomiting. These symptoms and conditions can eventually lead to dysphagia and dyspepsia (Westmoreland, Krantz, & Mehler, 2016). Excessive vomiting can cause cheilitis and oral mucositis as well as enamel erosion of the teeth due to the frequent presence of stomach acid (Uhlen, Tveit, Stenhagen, &

Mulic, 2014). Crow et al., (2009) reports that the overall mortality rate for BN is 3.9% and Smink et al., (2012) reports annual mortality rate to be 0.17% per year.

BED is a condition that involves recurrent, and persistent episodes of uncontrolled binge eating (American Psychiatric Association, 2013). Binge eating consists of eating an amount of food that is larger than most people would eat in a short period of time, under similar circumstances. This is usually associated with eating until uncomfortably full, eating when not physically hungry, eating alone due to embarrassment, and feeling disgusted with oneself or guilty following eating. The other diagnostic criteria include marked distress regarding binge eating, and absence of compensatory behaviors such as purging (American Psychiatric Association, 2013). Because purging is absent, obesity is associated with BED (Smink et al., 2012). BED is the most common ED in the female population with a lifetime prevalence of 2.3%, while the lifetime prevalence in men is 0.7% (Smink et al., 2014). The mortality rate of BED is 0.33% per year (Smink et al., 2012).

Other Specified Eating and Feeding Disorders (OSEFD) is an eating disorder category in the DSM-V that replaced the category “eating disorder not otherwise specified” (EDNOS) in the DSM-IV. It includes diagnoses such as atypical AN, BN of low frequency, BED of low frequency, purging disorder, and night eating syndrome (American Psychiatric Association, 2013). Along with the residual category Unspecified Feeding and Eating Disorders, these diagnoses are the least prevalent, making up about 15.5% of all eating disorders. This percentage is a significant decrease from the DSM-IV category EDNOS, which was found to be 64.4% (Smink et al., 2014).

Although not distinctly classified as an eating disorder, Orthorexia Nervosa (ON) is a form of disordered eating (American Psychiatric Association, 2013) that has recently been the

focus of extensive research (Bosi et al., 2007; Brytek-Matera, 2012; Dunn, Gibbs, Whitney, & Starosta, 2015; Ercan, 2016). This ED is classified as an obsession with pure and healthy eating that can have subsequent effects such as: nutrition-related medical conditions that are life threatening, significant weight loss, and psychological instability. Individuals who suffer from ON often avoid certain foods such as Genetically-Modified Organisms (GMO's), highly processed foods, or foods containing pesticides (Brytek-Matera, 2012; Bosi et al., 2007). Currently, there is no validated diagnostic criteria for ON, and no universally-accepted definition as it is difficult to differentiate between healthful eating and pathological healthful eating (Dunn et al., 2015; Ercan, 2016). Therefore, Dunn and Bratman (2016) propose the following diagnostic criterion: 1. Compulsive behavior and/or mental preoccupation with diet believed by the individual to be optimally healthy; 2. Belief that food outside of self-imposed dietary rules is impure and will have negative physical effects, associated with shame and guilt; and 3. Progression of this behavior over time resulting in avoidance of food groups, and severe "cleanses" considered to be physiologically detoxifying.

ON differs from the previously mentioned EDs in that it involves a preoccupation with the quality of food rather than the quantity of food. Dunn and Bratman (2016) suggests that ON is a distinctly different ED compared to other EDs identified in the DSM-V and, while ON may not be categorized as an eating disorder per the DSM-V, the evidence suggests that the health consequences are very similar. The preoccupation of eating only pure foods can dominate one's life and lead to social isolation (Bosi et al., 2007). Furthermore, this severely restricted diet, characterized by a need of high control, can negatively affect an individual's physical, emotional and mental status due to the stress of maintaining the diet (Bratman, 1997). To determine prevalence of ON on college campuses, 458 college aged students completed a four-part

questionnaire that assessed demographic and anthropometric data, as well sensitivity to healthy eating via the ORTO-15, their nutritional knowledge, and obsessive compulsive behaviors (Ercan, Ok, Kiziltan, & Saka, 2016). The ORTO-15 is a 15 question self-reported questionnaire that identifies individual's sensitivity to healthy eating. Results of the study indicated that as many as 60% of the participants could be classified as having ON. These results demonstrate the high prevalence of disordered eating in the college environment that may not be detected through the standard diagnostic criteria for eating disorders.

Disordered Eating in the College Environment

College students have the highest risk for development and diagnosis of an eating disorder (Drummond & Hare, 2012; Lofrano-Prado et al., 2015). For example, about 19%-30% of college aged women in the United States are affected by BN, as it is the most prevalent of the categorized eating disorders (American Psychiatric Association, 2000). Of students with EDs, 86% report the onset at the age of 20, and 43% between the ages of 16 and 20 (National Association of Anorexia Nervosa and other Eating Disorders, 2000). This may be due to the observations of increased body image dissatisfaction and disordered eating behavior during college (Juarascio et al., 2011). In a study performed by Lofrano-Prado et al., (2015), 408 college students enrolled in the first semester of a health science program completed four different surveys that evaluated symptoms of eating disorders and body image dissatisfaction. The results from the study showed that body dissatisfaction was a significant risk factor in college students to developing AN, BN and BED, especially in females. Students with body image dissatisfaction were 22 times more likely to develop AN and 25 times more likely to develop BN (Lofrano-Prado et al., 2015). The proposed reasoning for this include a strong sociocultural pressure to be thin as well as influence from the media which, in turn, affect

psychological and physical health (Leiderman & Triskier, 2004). In a study by Neyman, Morris, Clark, & Silliman (2014), 448 participants completed the ORTO-15 questionnaire to determine the prevalence of ON tendencies. Out of all the participants, 81% scored less than 40 on the questionnaire, indicating ON tendencies. These data suggest the majority college aged students are susceptible to developing ON. College is an important developmental period for students with regards to eating and health habits. Therefore this time period is essential for recognizing risk factors for eating disorders and disordered eating, and establishing preventative measures.

Young adults between the ages of 18 to 25 are experiencing an important developmental period, in which they are exploring and establishing health habits and beliefs, including eating and weight control conditions. Abnormal eating behaviors can be triggered by inaccurate perceptions of body weight, especially in stressful situations, which are common in college. Stress may be a trigger for an underlying psychological predisposing factor for an ED (Tavolacci et al., 2015). Disordered eating and EDs demonstrate a positive correlation with mental health illnesses such as anxiety and depression (Fragkos & Frangos 2013). In fact, in a position statement released by the Academy of Eating Disorders, Klump, Bulik, Kaye, Treasure, & Tyson, (2009) state that EDs are biologically based, like other psychological illnesses, and should be considered as such. Beiter et al. (2015) found that stress rates have increased among college students. For example, the authors report that in a specific university counseling center, a 231% increase in yearly visits and 173% increase in total clients was noted over the past four years. The transition itself from high school into college has been reported as a factor for increased stress and has been associated with appetite disturbance (Lee, Olson, Locke, Michelson, & Odes, 2009). For this reason, as stress increases on college campuses, we can anticipate the rate of EDs and disordered eating increasing as well.

Disordered Eating by DN Students

According to Korinth et al. (2009), students in dietetic and exercise science related fields may be more concerned about body shape and appearance compared to students in other majors. Research investigating if DN students are at increased risk for developing an eating disorder is robust, but the findings are equivocal. Generally, students in DN programs do not have a higher prevalence of EDs compared to students of other majors, however they do have higher tendencies towards ED behaviors per the DSM-V, as well as ON (Korinth et al., 2009; Mealha et al., 2013; Poínhos et al., 2015). In a study by Poínhos et al., (2015) 154 undergraduate nutrition students were surveyed, along with 263 other degree-seeking undergraduate students via their attended classes. Data were collected using a variety of questionnaires including the Dutch Eating Behavior Questionnaire, the flexible and rigid control of eating behavior subscales, the Binge Eating Scale, and the General Eating Self-Efficacy Scale. Results indicated that dietetic students had a higher level of caloric restriction compared to non-dietetic. Furthermore, they found that female nutrition students had higher levels of binge eating compared to male dietetic students and other degree-seeking students (Poínhos et al., 2015). Likewise, in a study performed by Korinth et al. (2009), 219 nutrition students were recruited of which, 123 were undergraduate freshmen, and 96 were undergraduate upperclassmen (seventh semester or higher). The control group consisted of other degree-seeking undergrads, 68 freshmen and 46 upperclassmen. A questionnaire was used to assess demographics, dietary restraint, disinhibition, and healthy food choices. Results indicated that DN students showed higher levels of caloric restraint as a means of losing or preventing weight gain when compared to other degree-seeking students. These results suggest that there is a relationship between DN students and disordered eating patterns such as binge eating and caloric restriction more often than

students of other majors. A similar study was performed by Bo et al. (2014), in which eating patterns and body dysmorphia were compared between DN students (n=53), exercise and sports science students (n=200), and biology students (n=187) via the ORTO-15, the Eating Attitudes Test-26, and a Muscle-Dysmorphic-Disorder Inventory. The authors found that DN students were twice as likely to be classified as having an ED when compared to each of the other groups. Additionally, DN students dieted more frequently, and females predominantly showed more traits of eating disorders, (Bo et al., 2014).

Conversely, a study performed by Mealha et al. (2013), found that there was no significant difference in the prevalence of eating disorders in DN students compared to other health and non-health degree students. However, they also report that DN students had twice the prevalence of psychological and behavioral characteristics associated with EDs. These results may indicate that nutrition students display behaviors and tendencies that could put them at risk for developing an ED. The authors of this study used the EAT-26 questionnaire, designed to identify eating disorder tendencies and not diagnoses, therefore it is unclear if these participants have an ED, unless previously diagnosed.

In regards to ON, Dunn and Bratman (2016) revealed after a systematic review that there is a 40-90% prevalence of ON in college students internationally. Additionally, de Souza and Rodrigues (2014) found in a study of 150 female nutrition students, 88.7% (n=133) displayed Orthorexic behaviors based off the ORTO-15 questionnaire. However, when compared to other degree-seeking students, Korinth et al. (2009), did not find any significant difference in Orthorexic tendencies in DN students. Furthermore, there were no significant differences in ON between students of DN programs versus students of exercise science, or biology majors (Bo et al., 2014). These data show that ON has a strong prevalence internationally. Interestingly, DN

students who were earlier on in their curriculum scored higher on the ORTO-15 compared to upper class DN students, suggesting upper classmen may have higher levels of Orthorexic tendencies. However, these findings contradict those of Brown, Larsen, Nyland, & Eggett (2013), in that nutrition students earlier on in the curriculum have poor eating competence compared to upper-class students. Eating competence, measured by the Satter Model of Eating Competence, is a method of quantifying attitudes and behaviors towards healthful eating. Individuals who score less than a 32 out of 48 on the Satter Eating Competence Inventory are classified as not eating competent (Satter, 2007). These individuals might display low food acceptance, poor eating attitudes and context, as well as patterns of highly self-regulated food intake. Poor eating competence is correlated with poor diet quality, and is also shown to be more evident in DN students who also reported to have an ED (Brown et al., 2013). These findings support the fact that eating competence may play a role in disordered eating behaviors, especially in DN students.

Summary

Although an abundant amount of research has been performed on DN students with regards to eating disorders, disordered eating, and ON, the findings are mixed. Additionally, there is limited research investigating the prevalence of Orthorexia Nervosa in college, and specifically, DN students. Furthermore, while there is an abundant amount of studies performed internationally, very few studies have compared the prevalence of eating disorders and ON in DN students to that in non-DN students in the United States. Therefore, the purpose of this research is to examine the overall prevalence of eating disorder tendencies and ON behaviors in DN students and students in biology programs, as well as to assess the difference in prevalence

of eating disorders and ON in between DN students and biology students in five Wisconsin state colleges.

Chapter III: Methodology

The purpose of this study was to determine the prevalence of eating disorders tendencies, disordered eating, and ON behaviors in DN students compared to students in biology majors.

The following is an explanation of the sample selection, instrumentation, and data collection and analysis. Prior to beginning, all procedures were approved by the Institutional Review Board for the Protection of Human Subjects at University of Wisconsin-Stout, and the University of Wisconsin-Green Bay as required (Appendix A).

Subject Selection and Description

Male and female students were recruited from five state colleges within Wisconsin. The state colleges that were involved in the study included University of Wisconsin Stout, University of Wisconsin Stevens Point, University of Wisconsin Madison, University of Wisconsin Green Bay, and University of Wisconsin Milwaukee because they all encompass a DN program. Inclusion criteria included college students enrolled in a DN program and students enrolled in a biology program with an age range of 18 to 40. Biology students were chosen as the control for the study for convenience as the target was a large sample size, and all universities chosen encompass a biology undergraduate program. There were no specific populations excluded from this study.

Instrumentation

The survey instrumentation used in this study was a combination of 3 questionnaires: the ORTO-15, the Eating Attitudes Test-26 (EAT), and a general demographics questionnaire. The ORTO-15 is a questionnaire comprised of 15 closed multiple choice items that aim to test for the diagnosis of orthorexia (Donini, Marsili, Graziani, Imbriale, & Cannella, 2005). The questionnaire uses the likert scale ranging from one to four indicating level of agreement for

each of the 15 items. The cut-off scale proposed by Donini et al., (2005) is 40, where lower scores indicate normal eating behaviors. These authors found 100% sensitivity when examining and identifying orthorexia in participants and 73.6% specificity, indicating a perfect test for ruling out the condition (orthorexia) when the score is less than 40 and an excellent test for ruling in the condition when the score is greater than 40.

The EAT is a 26-item, self-report questionnaire designed by Garner, Olmsted, Bohr, & Garfinkel, (1982), aimed at identifying those at risk for eating disorders. As this is questionnaire is copyrighted, permission was obtained for use (Appendix B). While it is not a diagnostic test, it is widely used as a screening tool. The 26 items are statements related to various diet and nutrition related concerns in which the participant marks level of agreement as: always, usually, often, sometimes or never. Questions are scored on a point scale from 0-75, where 19 is set as the cut-off. The proposed cut-off score indicates that the individual has dysfunctional eating behaviors.

The general demographics questionnaire was developed to assess basic information including gender, school related major/program, and year in their program. The survey was administered electronically via the November, 2017 version of Qualtrics survey software (Qualtrics, Provo, UT). The comprehensive survey is located in Appendix C.

Data Collection Procedures

Faculty and staff at the five state colleges, who served as the head of either DN or biology programs, were emailed and asked to forward an email to all students in the respective program using the blind copy function. The 10 program directors consist of 5 DN directors, and 5 biology program directors. Approximately 400 students, consisting of DN students and biology students received the link to the qualtrics survey via email. The email content served as

informed consent, and initiation of the survey indicated subject consent to participate. The survey was available for 30 days and reminders were sent on one occasion. Following the return of as many surveys as possible, the responses were quantified and scored via Statistical Package for the Social Sciences (SPSS), Statistics 24 software for data analysis.

Data Analysis

Statistical software was used for all data assessment to compare ORTO-15 and EAT scores between DN students and students of other degrees. Scoring rubrics were provided by the authors for the respective questionnaire. Test scores were quantified manually and entered directly into SPSS. Descriptive statistics including measures of central tendency and variance were analyzed using SPSS. An independent t-test was used to compare differences in scores from the ORTO-15 and the EAT between DN and biology students. Data are reported as means \pm SD. A $P < 0.05$ was considered significant.

Limitations

The primary limitation in this study is the small sample size and unequal group sizes, which are related to the poor return rate of surveys. Additionally, the use of only local state colleges affects the ability to generalize to the greater population. Surveys were completed independently by the subjects. Therefore, data collection could also be affected if subjects misunderstood survey questions or were not able to accurately recall past experiences.

Another limitation was the use of the ORTO-15 questionnaire, as no validity and reliability properties have been determined. Furthermore, Dunn & Bratman (2016) report that a cutoff score of 40 is too high, creating a high number of false positives. It is unlikely the prevalence of a poorly understood condition is as high as 88.7% (Dunn et al., 2015).

A final limitation is that criteria used in this study to categorize participants into an eating disorder group is based off survey evaluation rather than a true medical evaluation. This may result in false positive and false negative categorizations.

Chapter IV: Results

Of the approximate 400 students contacted via their program director, 47 returned surveys. Of the initial 47 participants surveyed, 2 were excluded from the data analysis due to incomplete questionnaires. Following the exclusion, the data were analyzed between DN students (n=35), and students of other majors (n=10). Descriptive statistics for each group are located in table 1 and described below.

Table 1

Descriptive Statistics for DN and Biology Students Surveyed

	DN students	Biology students
N	35	10
Age (mean)	21.83 ± 4.03	22.80 ± 5.18
Female (n)	34	8
Male (n)	1	2
Reported ED Diagnosis (n)	5	0
Food Allergy (n)	34	1
Year in school		
First (n)	4	0
Second (n)	10	2
Third (n)	7	3
Fourth (n)	8	1
Fifth or higher (n)	4	0
Graduate students (n)	2	4
Collegiate athlete (n)	5	3

The EAT-26 was the instrument used to identify individuals at risk for ED's. Using a cut-off score of ≥ 20 , the total prevalence of disordered eating tendencies in all participants was 22.2%. The prevalence of disordered eating tendencies in DN students was 22.9%, while the prevalence in biology students was 20.0%. The mean EAT-26 score was similar between the two groups, with a mean score of 14.31 ± 14.16 in DN students and 12.50 ± 12.64 for students of other degrees ($p=0.717$).

The ORTO-15 is the survey instrument designed to diagnose ON. Using a cut-off score of <40 , the total prevalence of ON in all participants was 88.9%. The prevalence of ON in DN students was 88.6%, while the prevalence in biology students was 90.0% per the ORTO-15. There was no difference in the mean ORTO-15 scores for DN students (34.83 ± 4.42) compared to students in other degree programs (34.10 ± 3.41) ($p=0.633$).

In summary, results from the present study suggest that there is no difference in eating disorder tendencies or Orthorexic behaviors per the EAT-26 and the ORTO-15, respectively, between DN students and biology students.

Chapter V: Discussion

Eating disorders are shown to have a high prevalence on college campuses (Smink et al., 2012; Leiderman & Triskier, 2004; Drummond & Hare, 2012; Lofrano-Prado et al., 2015).

Many authors have speculated that tendencies towards eating disorders may be more prevalent in DN students when compared to students in other programs (Korinth et al., 2009; Mealha, et al., 2013; Poínhos et al., 2015.). Other authors have found that there is no significant difference in eating disorder tendencies between DN students and students of other majors (Akdevelioglu & Huseyin, 2010; Harris et al., 2015; Kiziltan & Karabudak, 2008). Due to the mixed results, this study attempted to determine if there is a difference between DN students and students of other majors in regards to eating disorder tendencies as measured by the EAT-26.

The findings of this study compare to those of Akdevelioglu & Huseyin, (2010), Kiziltan and Karabudak, (2008), and Harris et al., (2015), in that no difference in eating disorder tendencies was found between DN students, and students of other majors. In a study with 577 university students in Turkey, Akdevelioglu & Huseyin, (2010), found no difference ($p = 0.147$) in ED tendencies using the EAT-40 between students in a Food and Nutrition Education group and students in other majors. In a study with 568 female students, Kiziltan and Karabudak, (2008) found an overall prevalence of eating disorder tendencies of 19.0% using the EAT-26. The authors also found no difference in EAT-26 scores between DN students ($n = 248$), and non-DN students ($n = 320$) ($p = 0.160$). Harris et al., (2015), used a sample of 83 female college students in the US and reports a prevalence of eating disorder tendencies per the EAT-26 of 19.4% in the nutrition group ($n = 31$). These authors found no significant difference between DN students, exercise science students, and other degree seeking students ($p = 0.15$) when using the EAT-26. These results are similar to the current study, in that an overall prevalence of eating

disorder tendencies per the EAT-26 was found to be 22.2%, and no difference was noted in EAT-26 scores between DN students and biology students ($p=0.717$).

ON is a relatively new condition termed by Steven Bratman (1997) that is not recognized by the DSM-V as an eating disorder. This condition involves a pathological obsession with pure and healthful eating that may result in nutrition-related medical conditions (Brytek-Matera, 2012). The prevalence of this condition may be as high as 90% in college students internationally (Dunn & Bratman, 2016). Very few studies have compared the prevalence of ON between DN students and students of other majors in the United States. The results of this study suggest that there is no significant difference in the prevalence of Orthorexic Nervosa (ON) tendencies between DN students in Midwestern colleges, and students in other majors. These findings are comparable to those of Korinth et al., (2009), in which no significant difference was found between nutrition students, and students of other majors in Germany. Furthermore, this study found ON prevalence in DN students to be 88.6%, which is comparable to a study by de Souza and Rodriguez, (2014), in which a prevalence of 88.7% was found in DN students in a Chilean university measured by the ORTO-15 with a cut off score of 40.

Donini et al. (2005) reports that the ORTO-15 has a sensitivity of 100%, and a specificity of 73.6% when the cut-off score of 40 is used. A limitation of the current study is brought forth when the content validity of the ORTO-15 is questioned. For example, Dunn et al. (2015) points out that it is difficult to tell the difference between frequent healthful eating, and pathological healthful eating. Furthermore, he reports that it is unlikely the prevalence of a poorly understood condition is as high as 88.7%.

Limitations

An obvious limitation of the current study is the small sample size. While the current study aimed to recruit 200 total participants, a total of 47 returned surveys, which reduces the statistical power. Furthermore, following the exclusion of two participants due to incomplete questionnaires, the DN group consisted of 35 participants, and the students of other majors group consisted of 10 participants creating a significant mismatch in group size.

Further investigation is needed with a larger sample size to determine the difference between DN students, and students of other majors in regards to eating disorder tendencies.

Conclusions

Results from this study suggest that there is no difference in Orthorexic tendencies between DN students and students of other degrees per the ORTO-15. The prevalence of ON in both DN students and biology students was 88.9%, which suggests that these Orthorexic behaviors are common among these majors, when identified using the ORTO-15. Furthermore, there was no difference in disordered eating behaviors between DN students, and students of other degrees per the EAT-26. A total prevalence of 22.9% of DN students and biology students scoring above 19 on the EAT-26 suggests that a large portion of students in these majors may be at risk for developing EDs.

Recommendations

Future research may investigate the onset of eating disorders, and whether a college program/curriculum directly contributes to the development or severity of these disorders. To improve sample size, it may be beneficial to directly hand out pen and paper surveys to a class, rather than email electronic surveys that may be easily disregarded. Furthermore, as the validity

of the ORTO-15 has not been established, a validated questionnaire for screening ON is needed to more accurately determine the prevalence of this condition.

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Appendix A: Institutional Review Board Approval Letter



Office of Research and Sponsored Programs
 152 Vocational Rehabilitation
 University of Wisconsin-Stout
 P.O. Box 790
 Menomonie, WI 54751-0790
 Phone: 715-232-1126

October 16, 2017

Kelly Woehrer
 Food and Nutrition
 University of Wisconsin-Stout

RE: Prevalence of Eating Disorder Tendencies, Disordered Eating and Orthorexia Nervosa Behaviors in Dietetic-Nutrition Students Compared to Biology Students

Dear Kelly,

In accordance with Federal Regulations, your project, "*Prevalence of Eating Disorder Tendencies, Disordered Eating and Orthorexia Nervosa Behaviors in Dietetic-Nutrition Students Compared to Biology Students*" was reviewed on **October 16, 2017**, by a member of the Institutional Review Board and was approved under Expedited Review through **October 15, 2018**. If a renewal is needed, it is to be submitted at least 10 working days prior to the approvals end date.

If you are conducting an **online** survey/interview, please copy and paste the following message to the top of the form: **"This research has been approved by the UW-Stout IRB as required by the Code of Federal regulations Title 45 Part 46."**

Responsibilities for Principal Investigators of IRB-approved research:

1. No subjects may be involved in any study procedure prior to the IRB approval date or after the expiration date. (Principal Investigators and Sponsors are responsible for initiating Continuing Review proceedings.)
2. All unanticipated or serious adverse events must be reported to the IRB.
3. All protocol modifications must be IRB approved prior to implementation, unless they are intended to reduce risk.
4. All protocol deviations must be reported to the IRB.
5. All recruitment materials and methods must be approved by the IRB prior to being used.
6. Federal regulations require IRB review of ongoing projects on an annual basis.

Thank you for your cooperation with the IRB and best wishes with your project.

Should you have any questions regarding this letter or need further assistance, please contact the IRB office at 715-232-1126 or email buchanane@uwstout.edu.

Sincerely,

A black rectangular redaction box covering the signature of Elizabeth Buchanan.

Elizabeth Buchanan
 Interim Director of Office of Research and Sponsored Programs and Human Protections Administrator,
 UW-Stout Institutional Review Board for the Protection of Human Subjects in Research (IRB)

CC: Kerry Peterson

***NOTE: This is the only notice you will receive – no paper copy will be sent.**

UNIVERSITY of WISCONSIN
GREEN BAY

January 2, 2018

Dear Kelly Woehner,

On behalf of the UW–Green Bay Institutional Review Board (IRB) for the protection of human research participants, I am pleased to inform you that your request for access to Nutritional Science and Biology students on the UW-Green Bay campus for your research proposal entitled, "**Prevalence of eating disorders tendencies, disordered eating, and orthorexia nervosa behaviors in dietetic-nutrition students compared to biology students**" has been approved.

Your research has been approved as **Expedited** because there are only minimal risks involved.

Your research has been approved for a period extending through the expiration date of your protocol approval at UW-Stout.

Thank you for your efforts to ensure the safety and respect of human subjects. If you have any questions or concerns, please contact me or another member of the IRB.

Congratulations and good luck with your research!

Regards,

Illene N. Cupit

Illene N. Cupit, Chair,
Institutional Review Board
UW-Green Bay

Appendix B: Permission to use EAT-26 questionnaire

To Whom it May Concern,

Thank you for your request to use the EAT-26. The EAT-26 is protected under copyright; however, all fees and royalties have been waived because it has been our wish for others to have free access to the test.

1) If you are requesting to use a physical copy of the EAT-26, please consider this letter as granting you permission to reproduce the test for the purpose suggested in your e-mail as long as the EAT-26 is cited properly. The correct citation is: 'The EAT-26 has been reproduced with permission. Garner et al. (1982). The Eating Attitudes Test: Psychometric features and clinical correlates. Psychological Medicine, 12, 871-878.'

You can download a copy of the scoring instructions and the test on the homepage of the EAT-26 website. If you use the written version of the test, it is recommended that you provide respondents with the link to the EAT-26 website (www.eat-26.com) so that they can learn more about the test.

2) If you wish to put a link on your website to the EAT-26, you can embed either of the links below and users will be to take the test anonymously and then submit it for immediate and anonymous scoring intended to encourage people to seek professional help when appropriate.

The link below does not identify the EAT-26 website but makes it appear like your website is administering the EAT-26 and providing feedback. However, if you use the EAT-26 link in this way, it is recommended that you provide respondents with the link to the EAT-26 website to provide them with further information on the scoring and interpretation of the test (www.eat-26.com).

Link not identifying the EAT-26 website: <http://eat-26.com/Form/index.php?iframe=true>

Alternatively, you can direct respondents to the EAT-26 website from your webpage. The test will be administered the same way with anonymous feedback but since they are on the EAT-26 webpage, respondents can navigate to other areas of the website for further information. The link for this variation in the test administration is:

Link identifying the EAT-26 website: <http://eat-26.com/Form/index.php>

Again, thank you for requesting permission to use the EAT-26. If you intend on publishing your work, please send me your results so that they can be included in a research database being developed on the EAT-26 website (www.eat-26.com).

Best wishes,

David M. Garner, Ph.D.
eat-26.com Website Administrator
President,
River Centre Clinic

**5465 Main Street
Sylvania, OH 43560**

**Direct Line: 419-276-8000
e-mail: dmgamer@gmail.com
web: www.river-centre.org**

Appendix C: Survey Instrument

DEMOGRAPHIC FORM

Q1: Please indicate your age. _____

Q2: What gender do you identify with?

- Female (1)
- Male (2)
- Other (3)

Q3 if other, please list.

Q4: What is your general area of study?

- Dietetics/nutrition (1)
- Biology (2)
- Other (3)

Q5 if other, please list.

Q6: What year are you in college?

- First year (1)
- Second year (2)
- Third year (3)
- Fourth year (4)
- Fifth year or more (5)
- Graduate student (6)

Q7: Are you a collegiate athlete apart from intramurals?

- Yes (1)
- No (2)
- I don't know (3)

Q8: Have you ever been diagnosed with, or told that you have a food allergy (eg. Celiacs Disease, peanut allergy, etc.) by a medical doctor?

- Yes (1)
- No (2)
- I don't know (3)

Q9: Have you ever been diagnosed with an eating disorder by a medical doctor?

- Yes (1)
- No (2)

