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WHEN HEALTHY TURNS HARMFUL: INCREASING UNDERSTANDING OF
POTENTIAL RISK FACTORS AND APPROACHES TO DECREASING
ORTHOREXIC BEHAVIORS

by

Elizabeth King

A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Nutrition and Food Science

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2021

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ABSTRACT

When Healthy Turns Harmful: Increasing Understanding of Potential Risk Factors and
Approaches to Decreasing Orthorexic Behaviors

By

Elizabeth King, Doctorate of Nutrition and Food Sciences

Utah State University, 2021

Major Professor: Dr. Heidi Wengreen

Department: Nutrition, Dietetics, and Food Sciences

Orthorexia Nervosa (ON) is an obsession with consuming “pure” or healthful food to the point that it becomes psychologically and sometimes physically harmful. The main purpose of this dissertation was to evaluate the prevalence of risky eating behaviors (especially those associated with ON) among both young adults and adolescents, and to implement and evaluate the effectiveness of an evidence-based program for adolescents designed to reduce these risky behaviors. Associations between varying degrees of nutrition knowledge, interest in the subject of nutrition, and ON behaviors were explored. ON was found to be positively associated with level of interest in nutrition, though higher levels of nutrition knowledge attenuated this risk.

Since prevalence of ON behaviors in adolescent populations is poorly understood, a psychometric tool validated for adults was evaluated for use in an adolescent population. The Dusseldorf Orthorexia Scale (DOS) is appropriate for use when minor modifications are made to terms used within several items within the tool to ensure all terminology is well-understood by younger individuals. Further, differences between

males and females exist regarding their thoughts and opinions on food and nutrition related questions on the DOS; females often mentioned dieting and body-image related responses, whereas males elicited responses based on eating for sports performance.

Neither prevention nor intervention programs designed to decrease behaviors associated with ON exist in the literature. Two versions of an Intuitive Eating program were implemented among local high schools and compared to a control school. Participants completed surveys before and after program completion. Program acceptability and feasibility of the program were high by both students and teachers. No significant interactions were observed for condition and time, indicating changes in ON behaviors, eating disorder (ED) symptoms or Intuitive Eating (IE) were not based on the condition participants were in. However, gender differences appeared, where boys consistently scored higher than girls at posttest and occasionally pretest. Further, level of interest in nutrition was positively correlated with ON behaviors.

Overall, the studies completed in this dissertation help clarify previously investigated associations of proposed risk factors for ON, identify new potential risk factors, and explore the effectiveness of an approach to decrease these behaviors.

(263 pages)

PUBLIC ABSTRACT

When Healthy Turns Harmful: Increasing Understanding of Potential Risk Factors and
Approaches to Decreasing Orthorexic Behaviors

Elizabeth King

Orthorexia Nervosa (ON) is a relatively new term used to describe individuals who place an excessive value on consuming a “pure” or healthful diet, so much so that their psychological, and potentially physical, health is negatively affected. ON is driven by a focus of consuming high-quality foods rather than limiting the quantity of food. This has sometimes been referred to as “clean eating”, or only consuming “clean” foods. A commonality between ON and other eating disorders (EDs) is that the behaviors are rooted in restriction, where an individual with ON would focus on restricting specific foods, or even entire food groups. The overall objective of the research studies included in this dissertation was to investigate the behaviors associated with ON in young adults and adolescents, and to implement and evaluate the effectiveness of a program for adolescents designed to decrease these behaviors.

The first study investigated the relationship between high or low amounts of nutrition knowledge, how interested an individual was in the subject of nutrition, and ON behaviors. Results of this study show that those who indicate they are more interested in the subject of nutrition may be at a higher risk for practicing behaviors associated with ON, while those who have greater amounts of nutrition knowledge tend to be at a lower risk. Next, given the scarcity of research of this disorder in adolescent populations, the

second study evaluated a test originally designed to measure ON behaviors in adults to determine if it was appropriate for use in adolescents. A secondary aim of this study was to explore gender differences in how adolescents think and talk about food and nutrition. Results showed that with minor modifications to several words used in the tool, this tool would be appropriate for use within adolescents. Further, interesting differences between genders were found, with girls mentioning dieting and body image, and boys mentioning their eating decisions were based on participation in sports.

The final study in this dissertation investigated the effectiveness of an Intuitive Eating (IE) program on decreasing risky eating behaviors among ninth grade high school students, specifically ON behaviors. We tested two versions of the program (single session and multisession) and looked for differences in students' scores between each program compared to a control group who did not receive either program. Our results showed neither program had a significant impact on decreasing either behaviors associated with ON or ED symptoms, or on increasing IE. However, our results showed interesting gender differences, where boys showed fewer ON behaviors and ED symptoms than girls at the follow up test, and greater IE behaviors than girls at the pretest and posttest. Results also showed those who were more interested in the subject of nutrition tended to demonstrate more ON behaviors. This study showed nutrition education may be beneficial in decreasing risky eating behaviors, though more research is needed to determine if IE is an effective approach.

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Elizabeth King

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CHAPTER 1

INTRODUCTION AND BACKGROUND

Abstract

Dietary patterns that emphasize restriction of certain foods or entire food groups based on one's own beliefs or opinions have been linked to development of more serious eating behaviors, such as eating disorders (EDs), later in life. Further, self-imposed dietary restrictions have the potential to lead to nutritional deficiencies and potentially malnutrition. Orthorexia nervosa (ON) is a term used to describe individuals who follow self-prescribed dietary rules guided by internal motivations to achieve ultimate health status through only consuming foods deemed healthy enough. It has been assumed up to this point that level of interest in nutrition positively impacted risk for ON, given that individuals who are more interested in the subject naturally gravitate toward having a greater focus on the quality of their diets. However, no study to date has officially investigated how interest in nutrition affects ON risk. To better understand the role interest in nutrition as well as level of nutrition knowledge play in influencing ON risk, a survey was given to evaluate correlations and any potential mediating relationship between the variables. Further, given the lack of ON research in younger populations who are known to be at a higher risk for disordered eating and eating disorders, a psychometric tool used to measure ON in adults (Düsseldorf Orthorexia Scale) was investigated in a qualitative manner using focus groups to determine face and content validity for potential use in adolescent populations. Finally, an intervention program was implemented in multiple high schools to determine its efficacy in modifying risky

behaviors associated with ON.

Introduction

The prevalence of obesity within the United States continues to rise, with the Centers for Disease Control and Prevention (CDC) estimating that 42.4% of Americans in 2018 were categorized as obese.¹ It is well-known that obesity-related comorbidities including heart disease, type 2 diabetes, some types of cancer, and stroke not only increase an individual's risk for premature death, but are also very costly.² It is unsurprising then, that a large emphasis has been placed on promoting health and decreasing risk for coinciding comorbidities through physical activity and well-balanced, nutritious diet.³ Further, the relationship between dietary patterns and chronic disease prevention is well-studied, and certain dietary patterns emphasizing an increased consumption of fruits, vegetables, fish, whole grains, nuts, seeds, legumes, and vegetable oils have consistently shown to have protective effects on risk for chronic diseases.⁴ For the vast majority of individuals, intentionally shifting the focus to living a healthier lifestyle by increasing the quality of the types of foods being consumed leads to improved dietary patterns, better health outcomes, and improved quality of life.⁵ For others, though, this new focus can migrate into an obsession with healthful eating, a condition that has been termed Orthorexia Nervosa (ON).

Background

This term was originally coined in 1997 by Dr. Steven Bratman, an alternative medicine physician who observed many of his patients becoming overly diet-focused, and experiencing psychological ailments as a result of their dietary beliefs.⁶ Given the link between chronic disease prevention and dietary patterns,¹ Bratman makes the important distinction that most beliefs regarding healthful eating can be observed in a safe manner.⁶ That is, many individuals choose to follow a specific dietary pattern, and that alone does not imply they have ON. Interest in healthy eating precedes the occasional migration toward pathological eating, where disordered eating (DE) behaviors may begin to manifest.⁶ These behaviors include obsessive-compulsive tendencies surrounding food and eating, mental preoccupation in regard to dietary practices, negative physical or emotional states when dietary rules are violated, potential malnutrition or weight loss as a result of restriction, impaired familial or social relationships, and self-worth or body image being reliant on dietary rules being followed.⁷

ON is dangerous, harmful, and all-consuming, yet completely socially acceptable. The obsession with “eating clean” has become extremely trendy, and the practice of assigning morality to food and deeming it as “good” or “bad” is becoming commonplace. Although ON has not been added to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), the attention it has received in the literature, from national associations (e.g., The National Eating Disorder Association), as well as the media⁸ indicate that ON is indeed a condition that is not only becoming a more prevalent issue, but based on the case reports⁹ and personal testimonies of ON that are reported, is also a very real and pressing issue in the lives of those who suffer from it.

To date, there have been multiple psychometric instruments proposed to measure ON, but none have been formally agreed upon.¹⁰ The ORTO-15 is the tool that is predominantly used in ON literature, and many of the issues cited are tied to this tool. These issues include the inability to accurately measure the psychometric properties of ON,^{10,11} the cutoff score being too high,¹² and questions of the validity of how the test was constructed.⁷ The ORTO-15 was created with the intention of being able to measure the prevalence of ON.¹³ However, this begs the question of whether you can actually measure something that has not clearly been defined as an ED and lacks diagnostic criteria. All of these issues demonstrate the need for a tool whose purpose is not to diagnose or determine the prevalence of ON, but more appropriately to identify the characteristics associated with ON that may show that someone exhibiting high amounts of these characteristics has a higher tendency to be orthorexic.¹⁰

Several alternative psychometric instruments have been proposed for use in measuring the behaviors associated with ON, having shown greater reliability and validity than the ORTO-15. These tools include the Eating Habits Questionnaire¹⁴ (EHQ) and Düsseldorf Orthorexia Scale¹⁵ (DOS). In a recent comparison¹⁶ of four common tools used to measure ON, an assessment of model fit revealed that that the DOS and EHQ fit their originally proposed factor structure, however the ORTO-15 did not. Further, the EHQ and DOS were highly correlated, but only a medium size correlation was found with the ORTO-15. Exploratory item analysis of the ORTO-15 elucidated further flaws, indicating the originally proposed scoring procedure may be to blame for the poor psychometric properties. This comparison of tools reiterated the internal reliability of the EHQ and DOS and affirmed the current recommendations to avoid use of the ORTO-15

in measuring ON.

Another large barrier in the study of ON is the use of convenience samples that are predominantly female.¹⁷ Very little is known about ON in adolescents (defined as those 10-19 years of age). To date, only one study has been conducted to investigate this relationship¹⁸ which is surprising considering the alarming statistics of DE among adolescents that have been reported. Studies that have explored the rates of DE behaviors among youth are shockingly high, ranging from 14-57%.¹⁹⁻²² The seriousness of these behaviors lies in the consequences that follow. DE among this age group has been shown to predict future EDs,²³ is a contributing risk factor for suicidal ideation,^{22,24} and leads to an overall reduced quality of life.²² Age of onset for EDs among adolescents is reported to be 11-14 years of age,²⁵ highlighting the importance for rigorous studies to be done investigating how DE, specifically ON, is affecting adolescents.

Study Objectives and Hypothesis

The purpose of this research was to evaluate the prevalence of risky behaviors among both young adults and adolescents, and to implement and evaluate the effectiveness of an evidence-based program for adolescents designed to reduce these risky behaviors.

The objectives and hypotheses of this study include:

1. To survey a sample of undergraduate general education nutrition students to assess relationships between nutrition knowledge, interest, and risk of ON.

This course being a general education course allowed for varying levels of nutrition knowledge which aided in clarifying the relationship between low and high levels of knowledge and risk of ON, as well as the impact level of interest in nutrition has on ON risk. It was hypothesized that nutrition knowledge would positively impact ON risk, and interest in nutrition would negatively impact ON risk.

2. To conduct focus groups among adolescents to determine the face and content validity of the Dusseldorf Orthorexia Scale (DOS) and determine prevalence of risky eating behaviors among these adolescents. This tool had not previously been used in an adolescent population; thus it was necessary to determine its appropriateness for use in younger individuals. We hypothesized the tool would provide favorable face and content validity, assuming minor modifications may need to be made to adjust for cognitive differences that exist between adolescents and adults.
3. To implement an intervention within high schools designed to reduce DE behaviors, specifically those associated with ON. Further, since this is the first study to evaluate the effectiveness of an intervention designed specifically to alter behaviors associated with ON, the program was built out in length to provide an opportunity to investigate the most appropriate dose needed to modify the harmful behaviors. It was hypothesized that both the single session and multisession program would have a positive impact on risk behaviors, though the multisession was predicted to have a stronger association in reducing these behaviors from before and after the program.

Study Rational and Significance

The significance of this study includes:

- This study is the first to formally evaluate the impact that level of interest in nutrition has on overall ON risk. To date, it has been assumed in the literature that those more interested in nutrition would likely be at a greater risk for ON, though none have measured how interest affects risk.
- This study adds to the small body of evidence surrounding how level of nutrition knowledge impacts ON risk, thus informing future studies on whether nutrition education is an effective risk factor to target.
- This study is the first to qualitatively evaluate face and content validity of a psychometric instrument designed to evaluate behaviors associated with ON before implementing it in a population it has not been used in before.
- This study is the first to implement an early intervention program of variable doses guided by the principles of Intuitive Eating (IE) designed to mitigate the risky behaviors associated with ON.
- This study is the first to investigate the relationship between ON and IE, and adds to the small body of evidence regarding the relationship between ON and DE.

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CHAPTER 2

ORTHOREXIA NERVOSA: A LITERATURE REVIEW

Abstract

Orthorexia Nervosa (ON) is a condition that has been described as a pathological fixation on healthful eating that is regulated by self-imposed dietary rules. The interest in studying these behaviors has grown significantly over time, however, to date there are no formally accepted diagnostic criteria and questions still exist as to whether ON should be recognized as a psychological disorder at all. Some have suggested ON may be a variant of other established psychological disorders, and others believe ON should be recognized as a distinct disorder. This review critically analyzes the current state of published literature on ON, including a discussion of important distinctions between healthful eating and pathological eating, current proposed diagnostic criteria for the disorder, and the clinical relevance of the proposed disorder. Further, the populations these behaviors have been studied in are reviewed, potential psychosocial correlates and associations are discussed, and the strengths, limitations, and barriers of the continued study of ON identified.

Introduction

Healthful eating and high quality diets have long been promoted as ways to decrease risk for many chronic diseases associated with lifestyle behaviors.¹⁻³ Unfortunately, for some individuals this desire to improve their health by way of altering dietary patterns can become an all-consuming preoccupation ultimately leading to social and physical impairments.⁴⁻⁶ This preoccupation with healthful eating was originally described in 1997 by alternative medicine physician Steven Bratman.⁷ He described patients seen in his practice who altered their diets initially to improve health or overcome chronic illness, but who eventually became fixated and obsessed with the quality of the foods they were eating to the point that daily life became negatively impaired.⁷ Bratman coined the term ‘orthorexia nervosa’ (ON), as derived from the Greek prefix "ortho" which translates to "straight" or "correct," and "orexi" which translates to appetite.⁸

The basis of ON is that the purity and quality of one's diet is valued above all else, even possible negative health effects from following such a diet.⁹ The avoidance of certain foods or entire food groups that are considered to be harmful to one's health, as well as the belief that the quality of foods being consumed is more important than familial or other social relationships or customs involving food, are often cited in the literature.¹⁰ There is no widely accepted definition of what determines a “pure” or “clean” diet, as the theories behind why someone chooses to follow a specific eating pattern vary widely. Someone who suffers from ON may have an obsession or a self-imposed aversion to foods with pesticide residues or genetically modified ingredients, or other self-imposed food rules such as limiting fat, sugar, or salt.^{9,10} Other signs and

characteristics include compulsively checking nutrition labels and ingredient lists, obsession about the healthfulness of ingredients, spending excessive time (e.g., hours per day) thinking about foods that may be served during social events, feeling or showing high levels of anxiety when “safe” or “healthy” foods are not available, and/or becoming preoccupied with “clean eating” or “healthy lifestyle” platforms on social media.¹¹

The significance of the behavior lies in the potential consequences that follow an individual’s beliefs. Behaviors associated with ON are similar to other eating disorders, and include nutritional deficiencies potentially leading to malnutrition, medical complications (including digestive problems, hormonal abnormalities, electrolyte imbalances, etc.),¹²⁻¹⁴ social, vocational, or academic impairment, loss of ability to eat intuitively, restriction in the types and amounts of food consumed, and/or self-imposed feelings of guilt or self-loathing.^{15,16} Bratman has previously stated that those who suffer from ON follow self-prescribed diets that tend to be tied to philosophy or theory (e.g., macrobiotic diets, paleo diets, blood type diets, ketogenic diets, raw food diets, etc.) that are often completely devoid of any scientific evidence.⁹ Proponents of these restrictive diets proclaim a range of health benefits the diet may confer on the individual following them, but empirical evidence is undoubtedly lacking.¹⁷⁻¹⁹ This stringent belief in the need to follow said diets can lead to self-punishing or compensatory behaviors such as fasting and greater restriction, or increasing the amount of food rules if their food rules are violated.²⁰ In addition to the aforementioned issues of following such restrictive dietary patterns is the issue that most of the diets repudiate national guidelines for a healthy diet.²¹ The basis for many of these diets is the exclusion of certain foods or even whole food groups, thus leading to the aforementioned potential consequences.

The Difference Between Healthful Eating and ON

To make a clear distinction, healthy eating in and of itself is not harmful, rather it is when the enthusiasm for healthy eating transforms into obsessive behavior.⁹ Bratman has stated there is a clear division between ON as a disorder and adopting a lifestyle of healthy eating. He describes ON as "an emotionally disturbed, self-punishing relationship with food that involves a progressively shrinking universe of foods deemed acceptable. A gradual constriction of many other dimensions of life occurs so that thinking about healthy food can become the central theme of almost every moment of the day, the sword and shield against every kind of anxiety, and the primary source of self-esteem, value and meaning."¹⁸ He goes on to discuss the harmful effects this phenomenon may result in, such as becoming socially isolated, experiencing psychological issues, and possibly negative physical consequences. Bratman has described this change of when following a healthy diet turns into ON as the "tipping point". Essentially this line is the point at which the excessive psychological focus placed on dietary intake begins to deteriorate physical and mental health by inducing self-punishment, fear, and rigidity.¹⁸

One term that has been used to describe someone following a diet focused on consumption of healthy and "pure" foods is "clean eating".²² The terms "clean eating" and "dieting" are often used synonymously in popular media, adding to the confusion about what actually constitutes the term "clean eating",²² however the term is broadly used to describe "eating behaviors that are centered on proper nutrition, restrictive eating patterns, and strict avoidance of foods considered to be unhealthy or impure".²¹ Examples of "clean eating" diets described in the literature include but are not limited to the 'Raw

Food' diet, 'Paleo' diet, and veganism, but the term has also been used to describe the elimination of certain nutrients or food groups such as grains, dairy, gluten, or carbohydrates.^{21,22} It has also been used to describe abstaining from consumption of foods that have been refined or processed, which translates to avoiding food additives, genetically modified organisms (GMO), and/or consuming animal products treated with antibiotics.⁹

The potential issue that arises from these theories is that research has suggested that placing too large of an emphasis on consumption of foods deemed acceptable and unacceptable, or "clean" versus "unclean", can lead to a greater susceptibility to pathological obsessions,²¹⁻²³ and has been said to have the potential to produce consequences similar to that of anorexia.¹⁵ Further, although these diets and alternative eating patterns flaunt profound health benefits (e.g., improving brain and heart health, boosting the immune system, increased life span, decreased inflammation, increased energy levels, etc.),²⁴ they have extremely limited scientific foundations,^{9,17} often contradicting scientifically based national guidelines suggested for health.²¹ Finally, it has been suggested that "clean eating" could conceal disordered eating behaviors and harmful attitudes that exist in an individual, potentially decreasing the likelihood that someone may seek treatment for these behaviors,²² as these behaviors (e.g., strict adherence to a diet, only consuming foods deemed "healthful", striving for optimal health at any cost, etc.) are often seen as more socially acceptable when compared to other EDs.^{21,25}

Complicating the issue further is that research shows individuals often turn to non-science based outlets to gather information about nutrition and health.²⁶⁻²⁸ Allen and colleagues²³ found 25.5% of women sometimes, often, or very often adhered to dietary

advice from a website promoting “clean eating”. Furthermore, those who adhered to the dietary advice they received had significantly higher levels of dietary restraint compared to those who did not adhere to the advice. Despite experiencing higher levels of dietary restraint, those who adhered to “clean eating” information still had a positive view of the eating practices prescribed.²³

Nevin and Vartanian²¹ found that when study participants were presented with a vignette describing a woman following a “clean” diet versus a woman with anorexia, the individual described as following a “clean” diet was evaluated in a more positive light than the individual with anorexia, suggesting that these behaviors may be thought of as less harmful than behaviors practiced in various other EDs. They also found that individuals reading the vignettes described possessing control over behavior and diet was seen as a positive characteristic. Similar to the previous findings, a study by Ambwani and colleagues²² examined the perceptions and associations of this term among young adults and found that the majority of individuals regarded “clean eating” largely in a positive light, even when it is accompanied by functional impairment and emotional distress. They also found those with favorable attitudes toward “clean eating” had scores that moderately correlated with an ED screener, ON measure, and a measure of preoccupation with body weight and fat. Authors suggested this correlation may indicate some overlap between “clean eating” and possible disordered eating behaviors and psychopathology.²²

It is important to consider that in Bratman’s 2017 editorial, he proposes that alternative healthy eating beliefs, such as those mentioned previously, can indeed be adhered to safely, stating that the majority of people following a self-prescribed

alternative diet theory do not have ON.⁹ This emphasizes the need for comprehensive diagnostic criteria to determine what constitutes and separates ON from other disorders, or if it should be considered a distinct disorder at all.

Diagnostic Criteria for ON

The investigation of ON in the scientific literature began in 2004 when Donini and colleagues proposed diagnostic criteria and aimed to identify its prevalence in a general Italian adult population.²⁹ Since then, it has continued to gain attention in the literature (see Figure 2-1), with the majority of studies being conducted in Europe.⁴

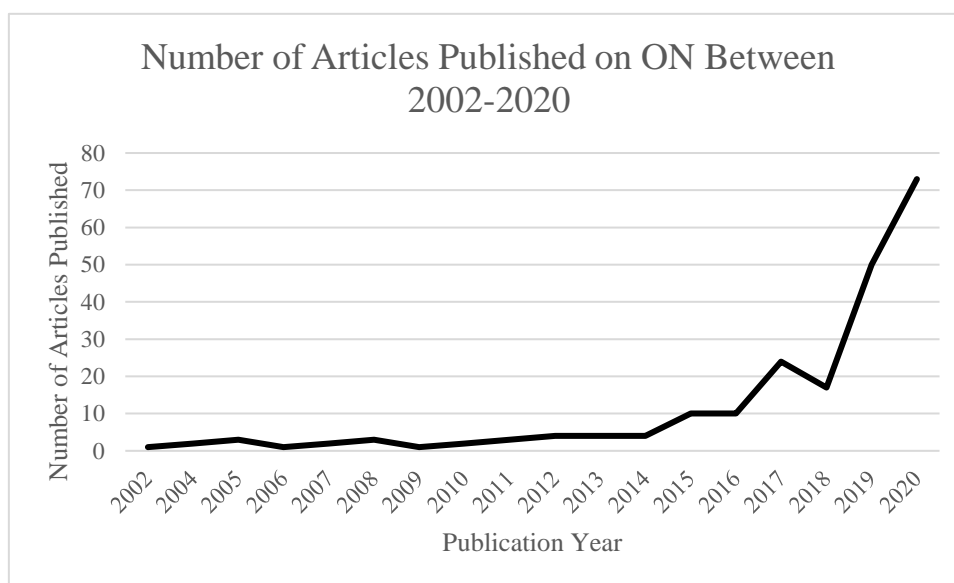


Fig. 2-1 Number of Articles Published on ON Between 2002-2020

ON is not yet recognized as an eating disorder (ED) in the Diagnostic Manual of Mental Disorders (DSM-5), therefore set diagnostic criteria do not exist. However, several researchers have proposed diagnostic criteria.^{8,14,30,31} The criteria proposed by Moroze et al.¹⁴ have been cited as being able to acknowledge the Obsessive Compulsive Disorder (OCD) characteristics ON is thought to have, but other authors criticized the criteria for their inability to address the role of weight loss in ON.^{8,32} The criteria have also been cited as having excessively stringent specification on one particular diet theory, rather than understanding that individuals with ON present with more fluid dietary theories.⁸ Barthels and colleagues³³ proposed diagnostic criteria adding that insight into potential illness being experienced by an individual is not necessary, and included that the desire for weight loss must be absent.³¹ Contrary to this suggestion, several recent publications support that weight preoccupation and adherence to the thin-ideal may play an important role in ON.³⁴⁻³⁷

The most recent proposed diagnostic criteria for ON (Table 2-1) were detailed in a literature review conducted by Bratman and Dunn.⁸ This criteria cited issues found with the 2015 Moroze et al. criteria, and stated that new criteria were needed in order to improve the conceptualization of ON. It is their thought that with better criteria, better measures will follow.⁸ The criteria developed by Bratman and Dunn were developed based off of the authors' review of "published case histories, narrative descriptions presented by eating disorder professionals, and several hundred self-reports of ON sent to a website maintained by one of the authors".⁸ These criteria were also discussed and agreed upon amongst eating disorder professionals from U.S., Norway, Poland, Sweden, Australia, Italy, and Germany.

Table 2-1. Bratman and Dunn⁸ 2016 Proposed ON Diagnostic Criteria

Criterion A: Obsessive focus on “healthy” eating, as defined by a dietary theory or set of beliefs whose specific details may vary; marked by exaggerated emotional distress in relationship to food choices perceived as unhealthy; weight loss may ensue as a result of dietary choices, but this is not the primary goal. As evidenced by the following:

1. Compulsive behavior and/or mental preoccupation regarding affirmative and restrictive dietary practices² believed by the individual to promote optimum health.³
2. Violation of self-imposed dietary rules causes exaggerated fear of disease, sense of personal impurity and/or negative physical sensations, accompanied by anxiety and shame.
3. Dietary restrictions escalate over time, and may come to include elimination of entire food groups and involve progressively more frequent and/or severe “cleanses” (partial fasts) regarded as purifying or detoxifying. This escalation commonly leads to weight loss, but the desire to lose weight is absent, hidden or subordinated to ideation about healthy eating.

Criterion B: The compulsive behavior and mental preoccupation becomes clinically impairing by any of the following:

1. Malnutrition, severe weight loss or other medical complications from restricted diet.
 2. Intrapersonal distress or impairment of social, academic or vocational functioning secondary to beliefs or behaviors about healthy diet.
 3. Positive body image, self-worth, identity and/or satisfaction excessively dependent on compliance with self-defined “healthy” eating behavior.
-

² Dietary practices may include use of concentrated “food supplements.”

³ Exercise performance and/or fit body image may be regarded as an aspect or indicator of health.

Other traits commonly cited in the literature include: "obsessive focus on food choice, planning, purchase, preparation, and consumption; food regarded primarily as a source of health rather than pleasure; distress or disgust when in proximity to prohibited foods; exaggerated faith that inclusion or elimination of particular kinds of food can prevent or cure disease or positively affect daily well-being; periodic shifts in dietary beliefs while other processes persist unchanged; moral judgment of others based on

dietary choices; body image distortion around sense of physical "impurity" rather than weight; and persistent belief that dietary practices are health-promoting despite evidence of malnutrition".⁸

Although to date no official set of diagnostic criteria have been agreed upon, researchers tend to agree on the core characteristics of ON- namely that it is characterized by high amounts of distress when not eating healthfully, obsessive behavior over planning and preparing healthy meals, and a feeling of superiority compared to others not following the same type of controlled diet.^{38,39} In 2016, the Orthorexia Nervosa Task Force (ON-TF) was created by researchers studying ON,⁴⁰ and after completing an in depth literature review two key features were outlined that should be present among ON diagnostic criteria. First, an obsession around dietary practices with the goal of achieving optimal well-being and health characterized by inflexibility in eating, and persistent thoughts and compulsions around food, and second consequent impairments from dietary practices, namely medical or psychological issues, significant distress, and/or impairment in other important areas of an individual's life and functioning.³⁰

Review of Psychometric Tools Used to Measure ON

Bratman Orthorexia Test (BOT)

Characteristics of the various tools used to measure ON can be found in Table 2-2. The BOT was the first measure created to evaluate ON, and was created by Steven Bratman which was published in his book *Health Food Junkies: Orthorexia Nervosa: Overcoming the Obsession with Healthy Eating*.⁶ This test has 10 items and uses a simple

yes/no format. The tool is based on characteristics Bratman recognized in his practice as a physician, not on any proposed diagnostic criteria. No formal methodology was used to create this tool, and no psychometric properties (e.g., validity, reliability, cutoff score, reference groups, etc.) were established as it was created as an informal measure of behavior associated with ON. Bratman has since stated this tool was never intended to diagnose ON, but rather to be used as a screening tool to help an individual determine if they have come close to, or have already crossed the line into an unhealthy obsession with health and clean eating.^{8,18} The main criticisms of the BOT include the original items not having been validated,⁸ and the lack of a scoring system for the test.⁴¹

ORTO-15

The vast majority of studies of ON use the ORTO-15, a tool created in 2005 by Donini et al.³⁸ in an attempt to identify ON in an Italian sample and ultimately diagnose the disorder. The ORTO-15 questionnaire consists of 15 multiple-choice items, with the BOT serving as the basis for the test. Six of the 10 original items from the BOT were used, and nine additional items were created.³⁸ The scoring system for the test was based off the researcher's belief that the Latin sample they were studying was "socially more dialectic" than an Anglo-Saxon one, thus instead of a yes/no format the scoring was expanded to a 1 to 4 scale Likert-type scale (always, often, sometimes, never) that asked a series of questions regarding food preferences and dietary habits.^{8,38} Answers that were more indicative of ON tendencies were given a score of 1, while answers that indicated healthier eating behaviors were given a 4 (lower scores indicated higher risk for ON). The validation of the tool involved a sample of 121 subjects. Predictive capability for the

test was done through calculating efficacy, sensitivity, specificity, positive predictive value, and negative predictive value.³⁸ Donini et al.³⁸ used Student t-tests and ANOVA to determine the differences in group means. They found the test was valid at a threshold of 40 points,³⁸ however subsequent studies have suggested a threshold of 35 is more appropriate due to the higher cutoff likely leading to too many false positives.⁴² Indeed, Ramacciotti et al.⁴² found that when a cutoff of 35 versus 40 was used, prevalence in a general adult population decreased from 57.6% to 11.9%. Several other researchers have also voiced concerns regarding psychometric limitations of the tool.^{41,43,44}

Researchers have also cited issues with scoring the ORTO-15. Roncero et al.⁴⁴ studied a Spanish population using the ORTO-15 and found that the recoding of several questions (1 and 13) that Donini et al.³⁸ specify to do offered higher correlations with the questions when they were not reversed, indicating the current instruction for reverse coding may be problematic.⁴⁴ Alvarenga and colleagues have also cited problems with the scoring scheme of this tool.⁴⁵ In regard to construct validity, Roncero et al.⁴⁴ stated that rather than measuring ON and the severity of behaviors that accompany, this tool is limited only to detecting people who are on a diet. Similar to Roncero et al.,⁴⁴ others have also questioned the construct validity of the tool.^{8,14,17,41,43} Additionally, this tool is cited to have a mean Cronbach's alpha ranging from 0.14 (unacceptable)⁴⁶ to 0.83 (acceptable),³² suggesting questionable internal consistency. Prevalence rates using this tool also vary drastically, from as low as 6.9% to upwards of 86%.^{38,47}

Dunn and Bratman⁸ discuss the limitations regarding the construction of the test, stating that "there is inadequate evidence that the authors followed a traditional approach of test construction."⁸ Development of construct validity is not clearly articulated, the

creation of an item pool is not discussed, standardization methods are absent, and no basic psychometric properties are provided; all are essential features of test construction.⁴⁸⁻⁵¹

Since this tool was validated in an Italian population, there have been many who have raised concerns regarding the discrepancy between cultures that this tool was validated in. The issue of whether a tool built for an Italian population is appropriate for use in every population has been questioned. This tool has been used in multiple countries (Turkey, Hungary, Spanish, Poland, German, U.S., etc.) outside of the Italian sample it was validated in, raising question to whether this validity translates to other populations as well. Geisinger studied the issues presented that influence the normative interpretation when translation and adaptation occur on an assessment tool.⁵² Geisinger mentions the importance of following certain steps when adapting and translating a tool for a different population than it was intended for. He states the obligation to use standardized scoring schemes, development of a manual and/or other documents for user of the tool, as well as a training manual for people using the tool.⁵² None of these elements are mentioned in the studies that have adapted the ORTO-15 for use in populations other than Italian populations. Furthermore, the adapted versions of this test that have been used have discarded various items from the original ORTO-15 based on their own theories about the tool and their population. Geisinger gives further cautions when translating assessment tools into another language. He states the need for clear and concise directions, the potential need to adjust the format based on the culture (e.g., true/false, yes/no, etc.), and the need for standardizing vocabulary used based on the population the tool is being translated for.⁵² It is unclear if the researchers adapting this

tool took these things into consideration for the populations they were studying.

Adding to the complexity of the situation is that many translated and modified versions of the ORTO-15 exist. These tools vary in the amount of description that is given regarding the translation and modification process of the tools. Ultimately, considering all of the aforementioned limitations, the ORTO-15 has been said to be an unsound measure.⁵³ Continued use will likely only be a detriment to future studies of ON, potentially leading to inflated prevalence rates and inaccurate findings altogether.

Eating Habits Questionnaire (EHQ)

The EHQ was developed in 2013 and conceptualizes ON in terms of an “overwhelming preoccupation on eating healthfully”.⁵⁴ The foundation for this tool is based on Bratman and Knight’s analysis of ON.⁶ Gleaves et al.⁵⁴ began with an initial pool of 160 items, of which 59 were agreed upon unanimously by four trained graduate students in clinical psychology.⁵⁵ The questionnaire was administered to 174 undergraduate students, and exploratory factor analyses was performed which revealed three factors (healthy eating behaviors, problems associated with healthy eating, and feeling positively about healthy eating).⁵⁴ Twenty-four of the 59 items were deleted due to similar content, theoretical inconsistency, or lack of interpretation ease.⁵⁵ The remaining 35 items were administered to 213 undergraduates, which after further confirmatory factor analysis was shortened to 21 items. The test is scored based on a Likert-type scale (“false, not at all true” to “very true”). Higher scores are associated with more risky dietary behaviors.

The total composite Cronbach's alpha score was 0.90 and test-retest reliability of r

= 0.81.⁵⁵ Good construct validity was also supported by the results of the exploratory and confirmatory factor analysis. Convergent and discriminant validity were also supported by evidence from analysis of correlations ($\alpha = .87$ to $.91$) between the three subscales (knowledge of healthy eating, problems associated with healthy eating, and feeling positively about healthy eating). Gleaves et al.⁵⁴ also found that EHQ scores correlated with OCD tendencies, of which the ORTO-15 was criticized for lacking. The EHQ was found to produce reliable and valid data in terms of measuring ON symptomology. Authors of the EHQ issued recommendations for the tool, in that it may be used to "identify cases in which individuals exhibit problematic preoccupations with healthy eating", as well as in English-speaking U.S. samples. Thus, another strength of this tool is that it was created and validated in a U.S. population and is more appropriate for use than tools created outside the U.S. and used in non-English speaking samples.

After initial validation, the EHQ has been used in several subsequent studies. Aims of the studies vary, but include assessing relationships between ON and exercise,⁵⁶ ON and perceived body fat and muscularity,⁵⁷ and the influence of ON on the motivation to practice special diets.^{58,59} The criticisms of the EHQ are far fewer than that of the ORTO-15, with only one study pointing out that criterion-related validity was never measured during the initial validation of the tool.⁵⁵

Düsseldorf Orthorexia Scale (DOS)

The DOS was developed in Germany in 2015.³³ This tool was originally validated in an online sample (n=1340) with multi-stage item and factor-analytical selection methods. Internal consistency (Cronbach's $\alpha = .84$) and retest reliability ($r = .79$) were

favorable. The single-factor model of the DOS consists of 10 items which use a four-point Likert scale (“this applies to me” to “this does not apply to me”), with higher scores indicating a higher risk for ON. Since its original validation it has been translated to English,⁶⁰ Spanish,⁶¹ and Chinese,⁶² and subsequent validation measures show satisfactory internal consistency ($\alpha = .88$, $\alpha = .84$, and $\alpha = .80$, respectively).

Several studies have used the DOS to explore relationships between ON and personality traits,⁶³ somatoform disorders,⁶⁴ patients diagnosed with anorexia nervosa (AN),⁶⁵ individuals following a vegan or vegetarian diet,⁶⁶ exercise addiction,⁶⁷ as well as the overall clinical relevance of ON.⁶³ It has also been used to determine prevalence of ON among several different populations, including university students^{68,69} and a general adult population in Germany.⁷⁰ The main criticism of the tool was identified in a study analyzing individuals with AN, where it was suggested that the DOS may not be able to distinguish between individuals with ON and AN since nearly all patients mean score was at the cutoff point indicative that ON behaviors were being practiced.⁶⁵

Barcelona Orthorexia Scale (BOS)

The BOS was developed in 2018 by Bauer and colleagues⁷¹ and is the first measure to integrate the most recent proposed diagnostic criteria by Dunn and Bratman.⁸ During initial item pool creation, an expert review was conducted with experts in the field of eating disorders (both English and Spanish speaking experts were included). A total of three rounds were completed with the experts which resulted in both English and Spanish versions of the 64-item scale including six constructs (cognitive, emotional, behavioral, negative consequences on health, negative consequences on social and

academic functioning, and differential diagnosis). Currently no psychometric outcomes exist, further studies would be warranted to evaluate validity and reliability.⁷¹ Authors of the BOS did identify a number of limitations with the tool, including the use of general ED specialists to develop the tool, and differences between levels of knowledge surrounding ON among the Spanish and English experts who collaborated together on the tool.⁷²

Teruel Orthorexia Scale (TOS)

The TOS was constructed by Barrada and Roncero⁷³ in 2018. The items on the TOS were derived from an in-depth literature review of ON which resulted in 93 items. Upon further refining and deletion of duplicate items, 17 questions were included in the final version of the TOS. Responses are scored on a 4-point Likert scale (completely disagree to completely agree). Interestingly, authors identified the final version was best represented by a two-factor model indicating ON may have two separate dimensions, namely “healthy orthorexia” (HeOr), and “orthorexia nervosa” (OrNe). This is the first tool that has addressed the limitation of previous tools, in that it may be able to distinguish between individuals who enjoy healthy eating in a way that is not pathological and those who have crossed the line into practicing harmful pathological eating behaviors. Initial psychometric measures showed good internal consistency for both dimensions ($\alpha=0.85$ for HeOr, $\alpha=0.81$ for OrNe). The TOS has been used in several subsequent studies since its initial validation.^{35,74–77} Currently, the only proposed limitation of the TOS is the lack of larger and more ethnically diverse samples this tool has been used within.⁷⁶

Table 2-2. Review of psychometric tests used to measure ON, adapted and updated from Valente, Syurina, and Donini⁷²

| | Author | Year | Country | Populations Used in | No. of Items | Language Adaptations | No. of Studies Used | Cited criticisms |
|---------|---|------------|---------|---|--------------|--|---------------------|--|
| BOT | Bratman and Knight ⁶ | 2000 | USA | University students; Adults; Vegetarians; Dietetic Students; Dietitians. | 10 | German, ⁷⁸ Swedish, ⁷⁹ Greek ⁸⁰ | 7 | Developed as a self-assessment not intended to diagnose ON, ⁹ lack of a scoring system for the test, ⁴¹ overall lack of psychometric validation. ⁷⁹⁻⁸¹ |
| ORTO-15 | Donini et al. ³⁸ | 2004, 2005 | Italy | University students; Adults; Medical students; Dietetic students; Medical doctors; Organic food consumers; Breast cancer patients; Athletes; Vegans/vegetarians; ED patients; Adolescents; Dietitians; Yoga practitioners; Performance artists. | 15 | English, ⁸² Arabic, ⁸³ German, ⁸⁴ Spanish, ⁸⁵ Hungarian, ⁴³ Polish, ⁸⁶ Turkish ⁸⁷ | 60 | Inconsistent validity and reliability, ^{8,30,41} overestimation of prevalence, ^{47,88,89} unable to distinguish between pathological and non-pathological eating behavior. ^{8,90} |
| EHQ | Gleaves, Ambwani and Graham ⁵⁴ | 2013 | USA | Adults; Organic food consumers; Vegans/vegetarians; University students; Athletes. | 21 | - | 10 | Variable criterion-related validity. ⁵⁵ |
| DOS | Barthels, Meyer, and Pietrowsky ³³ | 2015 | Germany | Adults; University students; Patients with somatoform disorders; Gym attendees; ED patients; Nutrition students; Vegans/vegetarians. | 10 | English, ⁶⁰ Spanish, ⁶¹ Chinese ⁶² | 10 | May not be able to distinguish between AN and ON. ⁶⁵ |
| BOS | Bauer et al. ⁷¹ | 2018 | Spain | - | 64 | - | - | No subsequent validation studies. ⁷² |
| TOS | Barrada and Rocero ⁷³ | 2018 | Spain | Adults; University students; Yoga practitioners; | 17 | - | 5 | Lack of validation in larger and ethnically diverse samples. ⁷⁶ |

Clinical Relevance of ON

A considerable reason ON is not present in the DSM-5 is that it has not been accepted or acknowledged as a separate or distinct eating disorder.⁸⁸ All mental disorders that have diagnostic criteria are characterized by having clinically relevant distress which results in debilitations in important areas of life (e.g., social, educational, or occupational settings).^{91,92} All proposed disorders are subject to rigorous scientific validation procedures to become recognized. This process includes 1) a clinical description of the proposed disorder, 2) the development and validation of assessment tools to measure the disorder, 3) proof of a differential diagnosis to show the disorder is indeed distinct enough on its own, and finally, follow up studies and family studies to determine potential underlying genetic contributors.^{92,93} Evidence of clinical impairments, differential diagnosis, family studies, and a generally accepted gold-standard psychometric measure are lacking in the ON literature.⁹² In the current edition of the DSM, eating disorders are categorized into eight divisions; Pica, Rumination Disorder (RD), Avoidant/Restrictive Food Intake Disorder (ARFID), Anorexia Nervosa (AN), Bulimia Nervosa (BN), Binge Eating Disorder (BED), Other Specified Feeding or Eating Disorder (OSFED), and unspecified feeding or eating disorder (UFED).⁹⁴ There has been speculation as to whether ON is actually an eating disorder at all, as some researchers and professionals believe ON may be better classified as a subset of obsessive-compulsive disorder (OCD), while others believe it may only be a subset of AN, and therefore is undeserving of its own distinct diagnosis.¹⁷ Some researchers have also suggested ON should be considered a risk factor for future eating disorders, rather than classifying it as

its own eating disorder.⁹⁵ Others also suggest ON should not be considered a new mental disorder, but rather a lifestyle choice or behavioral condition.⁹²

Interestingly, in a study done by Segura-Garcia and colleagues, ON symptoms were prevalent among a group of eating disorder patients during treatment in a clinical setting, and symptoms tended to increase after treatment.²⁵ These researchers suggested that ON seemed to be associated with the clinical improvement of AN, as well as the migration toward less severe forms of eating disorders. They attributed the increase of ON behaviors post-treatment as a potential compensatory behavior, as individuals may be simultaneously looking for a way to continue to have control over food where the focus is now on the quality of food versus the quantity. Barthels et al.⁶⁵ expounded on this idea, suggesting that ON may serve as a coping mechanism for individuals with AN, as ON behaviors allow them to continue to maintain strict control and be highly selective with their food choices. Dunn and colleagues⁹⁶ found that individuals who practiced ON behaviors scored within a range on an ED measure that indicates an individual may have an ED, and those in the ON group had scores that were non-statistically different to that of individuals who reported having an ED.

Common traits shared between ON and AN include perfectionism, high amounts of anxiety, strict control over diet, and heightened need to exercise self-control.⁹⁷ Further, individuals with ON and AN tend to envision their adherence to their diet as having high self-control, and diverting from the diet as failure of self-control. Individuals with AN or ON also tend to deny any functional or other impairments that come as a result of their disorder.⁶ Regarding traits shared with OCD, individuals with ON tend to have compulsive tendencies such as "recurrent, intrusive thoughts about food and health at

inappropriate times, inflated concern over contamination and impurity, and a strong need to arrange food and eat in a ritualized manner".¹⁷ Others have suggested that ON may be a variant of a currently recognized eating disorder known as the avoidant/restrictive food intake disorder (ARFID).⁸⁸ Moroze et al.¹⁴ have expressed that according to the DSM-5 criteria, ON would indeed be most appropriately categorized as ARFID, as this disorder was meant to encompass a broad range of etiologies.

Although similarities between the previously mentioned disorders exist, there are also subtle differences between them, alluding to the possibility that ON may actually be a distinct disorder. An important distinction between ON and AN is the motivation that drives the disordered eating behavior. The main motivator in AN is a preoccupation with body image and fear of becoming obese which drives changes eating habits in order to avoid weight gain, and ultimately to lose weight.⁸⁸ ON typically begins with noble intentions, with individuals changing their eating habits to become healthier or to consume foods that are more "pure" or natural.⁶ According to Bratman, individuals with AN typically hide their behaviors, while individuals with orthorexia tend to boast about their behaviors.⁶ Further, an important distinguishing factor among ON and OCD is the nature of the obsessions in each disorder, given that OCD driven obsessions tend to be ego-dystonic versus ON driven obsessions which tend to be ego-syntonic.¹⁷ The largest distinguishing factor between ON and other EDs is the focus on quality of food rather than quantity, with the overarching motivation being health.

Due to the amount of discussion surrounding whether ON should be recognized as a separate clinical disorder, several research studies and reviews have been conducted in hopes of trying to shed light on this issue. A recent study by Lucka et al.⁹⁸ evaluating 864

adolescents and young adults concluded that ON is not a separate clinically relevant disorder and does not belong as a subclass within OCD, but rather would fit better being categorized as a disorder that belongs on the ED spectrum. Bartel and colleagues⁹⁹ findings also support that ON would be appropriate to be classified on the ED spectrum, stating more research is necessary to determine whether ON is an antecedent to an ED, or a disorder that may evolve from an already existing ED. In another study among 713 subjects, Strahler and colleagues⁶³ and Goutaudier and Rousseau¹⁰⁰ concluded that there is clinical relevance of ON behaviors, though there was strong overlap with other mental health measures and disorders suggesting it may not be a distinct disorder. Strahler and Stark⁹² recently published a narrative review on this issue, and recommended that based on current evidence, researchers should be cautious when labeling ON as an illness.

In regard to the larger picture of this debate, it has been proposed that, similar to other mental disorders, the treatment and recognition of ON should be based on the impact the behaviors are having in an individual's life, as the majority of mental disorders present on a spectrum and the degree to which someone may be affected will vary.^{92,101} Further, it is worth noting that there is much debate in the field of psychology as to whether it is appropriate to identify mental disorders as distinct categories (as was used in previous versions of the DSM) rather than dimensional conditions.¹⁰² This dimensional approach allows clinicians to diagnose disorders based on severity of the condition rather than if the condition is simply present or not. Dimensional diagnostic criteria are not present for all disorders in the current DSM, but the disorders that do include measures of severity focus more on symptom management, aiding in the creation of a more personalized treatment plan.¹⁰³

Attitudes and Opinions Surrounding ON

Many new conditions (such as ON) have been proposed to be included into the DSM-5. In a 2011 opinion poll given to 111 professionals in the field of eating disorders, it was found that of the four "new" (not recognized by the DSM-5) disorders presented to the professionals that ON was the "best known".¹⁰⁴ Approximately one-fourth of the professionals attributed ON to be a product of the media. Of the respondents, 66.7% admitted to having observed ON in their practice, and worth noting were the 68.5% of professionals that felt ON was deserving of more attention. More recently, in 2019 Reynolds and McMahon¹⁰⁵ surveyed 52 health professionals and 71% responded stating ON should be recognized as a distinct clinical disorder. In a mixed-methods study¹⁰⁶ conducted among Dutch health professionals (psychologists, dietitians, physiotherapists, and psychiatrists), 78% stated they thought ON was deserving of its own diagnosis. Of the mental health professionals who were interviewed (n=15), their responses indicated they believed ON to be prevalent among the general population.

Research regarding attitudes and social perceptions about orthorexia is limited. However, a study by Simpson and Mazzeo¹⁰⁷ was done with the aim of examining the beliefs that are associated with ON. The author's goals were to be able to provide research that would lead to the development of better educational efforts about nutrition, as well as to be able to address misconceptions about "healthy eating". They also wanted to compare the attitudes that are associated with various types of eating disorders to understand how stigma is involved with different eating derangements. Thus, psychology students (n=505) were administered various vignettes illustrating a woman with AN, BN, binge eating disorder (BED), or ON. They were then asked a series of questions

regarding the vignette. The results were interesting, in that the participants viewed individuals with ON as "less likely to improve with treatment" than those with BN, and "less likely to be able to pull themselves together if they wanted to" than individuals with BED. The authors mentioned that because ON was seen as "less likely to evoke sympathy" than the other DSM-5 EDs, that people who actually suffer from ON may be more unlikely to ask for assistance or compassion. They suggested that the potential impairments that ON elicits may be underestimated.¹⁰⁷

The researchers hypothesized that ON would be seen as the most desirable eating disorder, and this was partially confirmed through the respondent's expression of more admiration of ON related behaviors, as well as more acceptance of ON compared to BN and AN.¹⁰⁷ These results are worrisome, as they allude to the issue of this condition being more socially acceptability. Our society tends to encourage adherence to a strict diet and limiting intake of certain foods is praised.¹⁰⁷ According to Simpson and Mazzeo,¹⁰⁷ people who have more strict eating patterns and "rules" may be more likely to gain the admiration of others for their adherence to such a diet. It is well known that media and medical professionals encourage diet modification to include a greater intake of quality foods¹⁰⁸ which in and of itself is a positive thing. However, this becomes an issue for individuals who are already at risk and have tendencies for orthorexic behaviors. The positive reinforcement of their abnormal restrictive behaviors from others coupled with the tendency of our society to encourage restriction and favor the practice of diet modification could potentially trigger someone who is at risk for orthorexia to begin the downward spiral that lies within the disorder. Simpson and Mazzeo¹⁰⁷ also concluded in their research that attitudes and beliefs that are associated with orthorexia are similar to,

if not more negative than attitudes associated with other eating disorders in the DSM-5.¹⁰⁷ Although this study was limited in its sample size, the results are significant in the sense that ON is indeed a condition that is deserving of continued attention.

In addition to the previously mentioned study, a more recent study conducted by Nevin and Vartanian²¹ was conducted on the stigma associated with "clean eating" and ON. The study design was similar to Simpson and Mazzeo's¹⁰⁷ in that study participants were also presented with vignettes, though this study differed in that it specifically depicted the women in the vignettes as following a "clean" diet compared to a woman with AN, as well as a control (where minimal information about the individual was provided). The researchers found ON was evaluated more negatively than the control, but less negatively than the vignette describing a woman with anorexia. The authors iterated the potential negative consequences following a "clean" diet may have on an individual, as well as the social stigma that may be attached to ON. The researchers discussed the theory that the negative attitudes of other people may aggravate social impairments someone with ON is facing due to their disordered eating.²¹

Populations ON Has Been Studied In

The vast majority of research on ON has been correlational and has included convenience samples mainly composed of university students from various countries. However, several specific populations (e.g., athletes, ED patients, and health-related professions/academic programs) have gained more attention due to hypotheses that they may potentially be at a greater risk for ON. These populations are said to be at a higher

risk due to various factors such as pre-existing values motivating healthful eating and/or perfectionistic personality characteristics.⁴ The following information on specific populations and risk factors studied is an extension of McComb and Mills'⁴ 2019 review of psychosocial risk factors by including recent studies published between January 2019 and November 2020.

Athletes. Research shows that in general athletes are at a higher risk for EDs, especially when they are involved in weight-based sports and leanness is encouraged (e.g., wrestling, gymnastics, cross-country, etc).^{109,110} Athletes experience high amounts of pressure maintaining or changing body composition to optimize their performance.¹⁰⁹ Nutrition is greatly emphasized in athletics, as altering diet can directly affect performance as well as body composition. Several studies have been conducted on athletes' risk for ON. Bert et al.¹¹¹ conducted a cross-sectional survey among local endurance sports participants (n=549) and identified a correlation between high EHQ scores (indicating ON behaviors being practiced) and those who participated in endurance sports for greater than 150 minutes per week. Interestingly, no correlation was found among ORTO-15 scores and endurance sports participation.

Similarly, Clifford and Blyth¹¹² evaluated student athletes and non-student athletes and found no difference in scores between groups using the ORTO-15. However, there was a difference in scores between those who exercised for greater than 10 hours per week compared to those who exercised less than 10 hours indicating there may be a dose-dependent relationship between ON and exercise. Segura and colleagues¹¹³ found a high prevalence of ON behaviors among athletes (n=577) and using multivariate logistic regression showed these behaviors were predicted by a history of dieting, age, level of

competition, and high scores on several additional ED measures. The results of these studies suggest that athletes may indeed be at a higher risk for ON, though all used the ORTO-15 that is associated with many psychometric limitations. Further studies are warranted to investigate this relationship.

Previous ED Diagnosis. Individuals diagnosed with EDs have also been an area of investigation in the ON literature. According to a recent review⁴ of psychosocial contributors to ON, disordered eating habits and a history of an ED are consistently shown to be a reliable predictors of orthorexia. All five studies conducted on individuals with a history of an ED showed a higher likelihood of having ON.^{25,37,88,96,114} It is fairly well-established that there is a high prevalence of comorbid ON among ED patients. Gramaglia et al.⁸⁸ found, among Polish and Italian women with AN, that 85.6% and 60.9% were subsequently practicing ON behaviors, respectively. Brytek-Matera and colleagues¹¹⁴ show 82.7% of ED patients scored in the high-risk range for ON. Segura-Garcia and colleagues²⁵ found 28% of AN patients also had ON, and further that ON behaviors increased among ED patients even three years after completing treatment. This finding was interesting given that a clinical improvement in AN and BN did not equate to the disappearance of all disordered eating or ED behaviors, but rather a subsequent increase in unfavorable ON behaviors. Given the increase in ON behaviors after clinical treatment, these authors suggested that ON may signify a less-severe form of EDs. Barthels et al.⁶⁵ found that among patients with AN, ON seemed to serve as a coping mechanism and a means to maintain control and autonomy. These findings together suggest that although ON may be a less severe form of an ED, disordered eating behaviors are still being practiced and could potentially prolong clinical improvements

and/or recovery if being used as a way to cope.

Individuals in Health-Related Fields. Intuitively, individuals currently practicing in a health-related field (e.g., registered dietitians, medical doctors, etc.) and students enrolled in health-related academic programs (e.g., medical, nutrition, and exercise-science students) have been an area of interest in the field of ON. Registered dietitians (RDs) have been said to be at higher risk for EDs^{115,116} given that their profession revolves around food and nutrition, and they may be subject to higher amounts of self-inflicted stress to maintain an “ideal” body weight or physical appearance and consume a “perfect” diet.⁴⁵ A recent study¹¹⁶ conducted in 2017 among American RDs indicated 49.5% were at risk for ON, and 12.9% were at risk for an ED, with 8.2% self-identifying as having been treated for an ED. ON has also been studied in RDs in other countries, with prevalence of these behaviors appearing in 41.9% of Turkish RDs¹¹⁷ and 12.8% of Austrian RDs,⁷⁸ with another 34.9% indicating they practiced some ON behaviors. In a sample of Brazilian RDs, ON behaviors manifested primarily in making food choices that were motivated by concern about health status, eating for nutritional components of the food rather than taste, restricting food items that were considered to be transgressions, and consumption of food for appearance based reasons.⁴⁵

The large discrepancy in prevalence in these behaviors is likely due to flaws in psychometric instruments used, given that the lifetime prevalence of EDs in the general population is said to range from 1-8.4%.^{118,119} Further investigation of these behaviors is appropriate given that RDs are directly involved in prescribing nutrition advice to individuals, and there is a potential for personal bias to influence treatment and recommendations given. However, because prevalence rates vary so widely among

health-professions, and are similar to that of the general population depending on the study,⁸⁴ it has yet to be determined if belonging to a health-related field is a risk factor for ON.⁴

Several studies^{120–122} have indicated medical professionals and medical students may be at a higher risk for abnormal eating behaviors and EDs which has led to a handful of studies looking to determine risk for ON specifically.^{97,123,124} It has been said that individuals within the medical field may have “highly sensitive behavior towards healthy and proper nutrition”¹²⁴, and that practicing in the field of medicine may induce stress related to serving as a role-model in terms of physical appearance and lifestyle habits.¹²⁴ A study among Turkish medical students showed 21.1% were at high risk for ON, while 57.5% were at moderate risk.⁹⁷ Most recently in 2019, Lebanese medical students (n=627) were randomly sampled and although point prevalence was not determined, findings showed ON behaviors positively correlated with ED behaviors, but a negative correlation was shown for anxiety and psychological distress.¹²³ Due to the paucity of studies in this population, it has yet to be determined if studying or practicing medicine is a risk factor for ON.

Regarding students studying nutrition and nutrition related majors, a small number of studies have been conducted to determine if a relationship exists between risk for orthorexia and being involved with the field of nutrition. Korinth et al.¹²⁵ found that German students in nutrition showed higher dietary restraint when compared with a control group of educational science and engineering students. ON risk tended to be higher in the beginning of the students' education, but seemed to decrease over time. An important consideration regarding this study is that nutrition knowledge was not actually

measured, but rather was presumed to be greater for the students in higher semesters of their education. These findings are similar to Depa and colleagues⁶⁹ who found nutrition science students in early semesters of their program were practicing more ON behaviors than students in later semesters, indicating ON risk may be positively affected by nutrition education. Contrary to the previous findings, Sanlier et al.¹²⁶ found no association between ON risk and education level, or those enrolled in health science courses (e.g., nutrition, dietetics, nursing, and physiotherapy).

Review of Proposed Psychosocial Risk Factors

Demographic

Age. Age has been studied in regard to its potential role in contributing to ON risk. Current literature is mixed regarding age as a risk factor. Among medical students in Turkey (ages 16-29), those who were under 21 years of age tended to be at greater risk for practicing behaviors associated with ON.⁹⁷ Being younger in age has also been shown to be a risk factor for ON among several other populations, including German⁶⁷ and Portuguese¹²⁷ gym members, Italian athletes,¹¹³ and general student populations in both Italy¹²⁸ and Croatia.¹²⁹ Though associations were found between younger individuals and ON risk in these populations, it is important to note that effect sizes were small.⁴ Contrarily, other researchers have found ON risk to be higher in older individuals. Donini et al.²⁹ and Varga et al.,⁴³ concluded ON behaviors were being practiced more often as age increased in Italian and Hungarian samples, respectively. Others have found no relationship between age and ON risk at all.^{4,47,69,81,89,130} It is worth noting that much of

the literature surrounding ON has been conducted among younger populations, indicating more research would be appropriate in more diverse age groups to be able to better understand the role age may play in ON development and/or risk.

Gender. Similar to various other characteristics studied in regard to correlations with ON, findings regarding gender and its relation to ON risk are also mixed and are thus inconclusive. Contrary to other established EDs, earlier ON literature suggested men were at higher risk than women.¹³¹ This elevated risk among men was seen in Turkish medical students,⁹⁷ a general Swedish student population,¹³² and a general Italian adult population.²⁹ As the field has progressed, a greater number of studies have reported higher ON rates among women than men,^{36,84,126,128,133-135} though McComb and Mills⁴ point out that the populations studied were predominantly female (58%-74.6%) which likely skewed the results. Complicating this narrative further are the findings that show no association between gender and ON risk. According to McComb and Mills' recent literature review,⁴ no relationship was found between gender and ON among several culturally diverse regions, including Italy,¹³⁶ Germany,⁶⁹ Australia,^{37,89} Croatia,¹²⁹ Greece,⁸⁰ the United Kingdom,¹¹² Poland,¹³⁷ and the United States.^{55,81,90,138} A recent meta-analysis¹³¹ evaluated gender differences with a slightly different approach, where the impact of gender on ON risk was evaluated per psychometric measure used versus simply trying to identify if an relationship was present. Interestingly, studies using the DOS showed a greater tendency toward ON among women than men, though the effect sizes were small. Further, overall healthy eating was found to be comparable between genders, while pathological healthful eating was slightly more elevated in females. This further emphasizes the need to continue rigorous evaluation of psychometric instruments

given the differences seen between each tool. More research is needed to determine if gender influences an individuals' risk for ON.

Socioeconomic Status. Some have hypothesized that a higher socioeconomic status (SES) may increase an individuals' risk for ON, given that they may have greater financial capabilities to purchase high quality food items.^{4,139} Likewise, education has also been cited to be a risk factor for ON, since those with higher education levels may have more avenues to obtain knowledge regarding food and nutrition.⁴ The findings from studies published on SES and education levels as risk factors for ON are inconsistent. Recently in 2017, Barnes and Caltabiano³⁷ found an increased risk of ON among individuals who had obtained a bachelor's degree versus those with a high school diploma. Though this was not a main outcome of this study, a medium sized effect was found. Several groups reported no relationship between education level and ON risk among several populations including RDs,¹¹⁷ medical students,⁹⁷ performance artists,¹³⁰ or a general adult population.²⁹ Hyrnik and colleagues¹³⁹ found a positive correlation between risk for ON among adolescents who had a high family income. This was the first report in the literature of this relationship, however, so it should be interpreted with caution.

Personality Characteristics

It is fairly well established that distinguishable personality traits can be tied to the etiology, behavioral expression, and ongoing practice of an ED.¹⁴⁰ Similar to other EDs, ON has been examined in the context of its relation to individual personality characteristics. Some of these personality traits include obsessive-compulsiveness,

perfectionism, and narcissism.

Obsessive-Compulsive Behaviors. Whereas much of the ON literature has resulted in mixed conclusions regarding relationships between various factors and ON, studies have consistently found that a positive relationship exists between ON behaviors and tendencies toward obsessive-compulsive practices. This is fairly intuitive, given that the premise of ON is based on an obsession regarding consumption of healthful foods. One study found Turkish dietitians exhibited higher amounts of obsessive traits around food and this was associated with a higher risk for ON.¹¹⁷ Other populations have also shown higher ON risk is correlated with obsessive compulsiveness, such as Italian athletes,¹¹³ students in the US,^{56,81,138} and Spanish adults.^{44,73} One study found a relationship between ED patients who exhibited high amounts of ON behaviors and high rates of obsessiveness surrounding preparation of food and food rituals versus those not practicing ON behaviors and this was a large effect.²⁵ Interestingly, McComb and Mills⁴ point out that obsessive tendencies found in these studies were not only in regard to food practices, but various other types of compulsions such as worries about contamination which induced excessive washing, obsessive thoughts about self-harm, and dressing preoccupations were all indicative of a greater risk for ON. Bartel and colleagues⁹⁹ expounded on this, stating that although correlations do exist, the associations with other obsessive-compulsive tendencies were notably smaller than when compared to food related preoccupations. Evaluating this topic in the literature as a whole, it appears evident that individuals who are at a higher risk for obsessive-compulsiveness are indeed at a greater risk for ON compared to those who are not preoccupied with obsessive-compulsive behaviors and thoughts.⁴

Perfectionism. Perfectionism as a personality characteristic has also been studied in regard to its impact on ON risk. Similar to obsessive-compulsiveness, a propensity toward perfectionism has also shown consistent positive relationships for an increased risk for ON. A sample of college students that were evaluated showed that even after controlling for gender and Body Mass Index (BMI), perfectionism was positively correlated with ON behaviors.⁵⁵ Similarly, Barnes and Caltabiano³⁷ found higher levels of perfectionism positively correlated with ON behaviors. Several other groups reiterated these findings^{36,99,138,141} with one using qualitative analysis to explore this association.¹⁴² This qualitative analysis examined individuals' lived experiences with ON, and researchers posited that based on their findings the relentless pursuit of achieving perfection within ones diet may be a key catalyst in the progression of ON. Results showed that based on individuals' responses, the pursuit of perfection lead to debilitating diet and exercise standards in their lives.

Narcissism. To date only one study has examined the relationship between narcissism and ON. Oberle and colleagues⁵⁵ found that narcissism was positively associated with all subscales on the EHQ measuring ON behaviors (behaviors, problems, and feelings) among a sample of US college students. These results should be interpreted with caution until further studies corroborate the findings.

Diet and Eating Related Factors

A variety of diet-related factors have commonly been researched within the field of ON, the reason being the basis of ON being tied to purity and quality of an individual's diet. The areas that have most often been investigated are practicing self-prescribed diets,

following a vegetarian or vegan style of eating, adhering to an organic or “clean” style of eating, using dietary supplements, and practicing disordered eating behaviors or having been previously diagnosed with an ED.

History of Dieting. Similar to other established EDs, a history of dieting or current adherence to a self-prescribed diet consistently demonstrates positive associations between higher tendencies toward ON, and dieting as a risk factor is able to predict ON.⁴ McComb and Mills⁴ point out that this holds true across many cultures, including German, Spanish, Australian, Turkish, Italian, and Hungarian samples. Several groups have evaluated dietary patterns thought to be associated with ON and have found that tendencies toward ON were associated with greater and more frequent consumption of fruits, vegetables, nuts, and seeds, and lower consumption of foods with high amounts of sugar, fat, and refined products.^{34,143} More specifically, Grammatikopoulou and colleagues⁸⁰ found those with higher ON tendencies also tended to avoid saturated fats or animal products. In addition to actual dietary patterns and foods being consumed, certain dietary behaviors have also been investigated. In a study done among Italian athletes, those who aimed to avoid certain types of foods were at higher risk for ON.¹¹³ Missbach and colleagues⁸⁴ also found a positive association with ON among individuals who spent greater amounts of time preparing their meals and among those who ate based on a rigid eating schedule. An overall restriction of food and calories was also found to positively predict ON among several groups.^{59,89}

Current or Past ED. Not surprisingly, individuals with a history of an ED, or those currently practicing disordered eating behaviors have consistently been found to be at a greater risk for ON. Though few studies have been conducted within clinical settings

among populations diagnosed with EDs, several have found ON to be comorbid with other EDs. Among Italian patients with either AN or BN, 28% were found to display high amounts of ON symptomology.²⁵ Interestingly, ON symptomology tended to increase after ED treatment, with 58% of patients showing an increase in ON behaviors even three years after treatment. Another study showed 82.7% of Polish individuals diagnosed with EDs displayed a strong preoccupation with a health food intake.¹¹⁴ Further, ON behaviors were negatively predicted by eating pathology, weight concern, health orientation, and appearance orientation.

In a non-clinical online sample³⁷ (n=220), history of an ED was found to be the strongest predictor of ON. In another non-clinical online cohort,⁸⁴ current self-reported EDs correlated with higher ON tendencies compared to those who did not report EDs. In a study⁹⁶ including both clinical and non-clinical samples, individuals who self-identified as having ON scored no differently on a clinically-validated ED measure than individuals reporting other diagnosed EDs. Further, the individuals who self-identified with ON had significantly higher scores compared to the non-clinical group. More research is needed to determine whether ON precedes an ED, happens as a result of having an ED, or coexists with ED's.³⁴

Veganism/Vegetarianism. One of the areas that has been highly researched and debated within the field is the potential relationship between individuals practicing vegetarianism or veganism and risk for ON. Matera and colleagues⁵⁹ point out that there are several overlaps between veganism, vegetarianism, and ON. These similarities include the basis for food selection in all cases being an overt focus on healthy and organic foods, focusing on the quality of foods being consumed, altering food intake

based on specific nutrition rules, and rigidity and inflexibility in an individual's eating habits. Up to this point, the evidence to support a relationship between ON and veganism/vegetarianism is largely inconsistent. A recent literature review¹⁴⁴ found these styles of eating were associated with ON in 11 out of the 14 studies included, although the majority (64%) used the ORTO-15 to evaluate ON. The most recent studies conducted that have used the DOS and EHQ have consistently found these dietary patterns to be associated with a higher risk for ON.^{59,66,70,145,146} Further, this relationship has been studied in a variety of demographics, including Polish,^{59,147} German,^{66,70,84} Spanish,⁴⁷ Italian,^{128,148} and American^{60,82} populations, all of which showed ON tendencies were higher in vegans/vegetarians than non-vegans/vegetarians.

In contrast to studies that have shown a correlation, Dunn et al.⁹⁰ found ON behaviors were more common among those with no dietary restrictions when compared to vegans in a U.S. sample. Turner and Lefevre¹⁴⁹ also failed to find a relationship between ON and those following vegan/vegetarian diets, as did Çiçekoğlu and Tunçay.¹⁵⁰ Interestingly, Çiçekoğlu and Tunçay¹⁵⁰ investigated motivations behind individuals following a vegan/vegetarian diet and found ethical reasons versus an obsession with healthy eating was the most common reason mentioned for following the diet. Though studies are not unanimous, the vast majority of studies show a positive correlation between ON risk and adhering to a vegan/vegetarian dietary pattern.

Organic versus Non-organic. Two studies have evaluated the impact choosing primarily organically grown foods has on ON risk. Barnett and colleagues⁵⁸ investigated whether individuals participating in “alternative food networks” (AFN) (individuals who participate with producers/sellers of organic, local/regional, or “sustainably grown” food

products) were at an increased risk for ON and found although those who engaged in AFN's were more likely to report ON tendencies as measured by the ORTO-15, they were not necessarily at a higher risk for engaging in other disordered eating behaviors. Interestingly, it was found that individuals who self-reported following a special diet were significantly more likely to engage in AFN's, had greater tendency toward ON, and reported an ED more often. This is intuitive, as a history or current practice of dieting is consistently a strong predictor of ON. A more recent study by Voglino et al.¹⁵¹ found that individuals who shopped at organic-only stores had higher ORTO-15 and EHQ scores indicating more propensity toward ON compared to individuals who didn't shop at organic-only stores. However, these results should be interpreted with caution as the predictors for ON varied between ON measures used, as well as a 40 versus 35 cutoff point for the ORTO-15. More studies are necessary to determine if consuming organic foods is directly associated with an increased for ON, or rather if it is just a sub-factor within an individual having an overly restrictive diet which has already been established as a consistent predictor of ON.

Dietary Supplement Use. Several studies have investigated dietary supplement use, as individuals who are taking them typically perceive their use with greater overall health and wellness,¹⁵² thus researchers hypothesize the use of supplements may have the potential to play a role in an individual's risk for ON. While Karakus et al.¹⁵³ found no association among individuals who used nutritional supplements and ON, Selçuk and Çevik¹⁵⁴ found supplement use was positively associated with a greater tendency toward ON. Oberle and colleagues¹⁵⁵ also investigated supplement use in an online survey among US participants and found those with greater ON symptoms used supplements

more often than the control group. They also pointed out that those who used supplements were driven to use them mainly to improve physical and mental health, but interestingly, in general the individuals experienced more negative physical symptoms. The authors hypothesized the negative symptoms experienced could possibly be attributed to the severe dietary restrictions being practiced. Given the paucity of studies exploring the relationship between supplements and ON and the mixed results therein, further research is needed to determine if supplement use may mediate the risk for ON.

Body Image, Weight, and Appearance Related Factors

BMI. The relationship between ON and BMI continues to be discussed within the conversation surrounding ON, though a consensus on its link to ON risk has not been agreed upon to date. Some have reported lower BMIs to be related to ON, others have found higher BMIs are associated with ON. However, the vast majority have found no relationship at all.

An evaluation of individuals following vegetarian versus omnivorous dietary patterns revealed vegetarians were more likely to engage in ON behaviors and tended to have lower BMIs than omnivores.¹⁴⁵ Lower BMI predicting ON has also been found in several other studies.^{116,128} In relation to studies finding lower BMI being associated with higher ON risk, a greater proportion of studies have shown that higher BMI more often predicts ON. A sample of Polish youth (n=864) indicated that those with higher ON behaviors had higher BMI's (M=21.62 +/- 2.99 vs M=21.56 +/- 3.15).¹⁵⁶ The authors' interpretation of their findings stating a "proven correlation between ON and BMI" should be interpreted with caution given that the difference between BMIs among high

ON risk and low ON risk individuals, although significant, was marginal at best. These findings were supported in a sample of Polish, Spanish, and Italian adults,¹³⁵ as well as a convenience sample of university students⁵⁵, Turkish medical students,⁹⁷ and Greek dietetic students.⁸⁰

In regard to studies finding only weak associations, a large sample of French adults (n=2065) evaluated by the EHQ revealed that the relationship between ON and BMI was poor, and that BMI, whether high or low, only predicted ON risk to a small degree. Further, as evidenced by the ‘Rigid Eating Behavior’ subscale of the EHQ, restrictive dieting may only reduce BMI to very limited extent.¹⁵⁷ Barthels and colleagues⁷⁴ found women who practiced more restrained and emotional eating had increased BMI, though total ON scores were not associated with BMI. Others have also failed to find significant associations between ON and BMI.^{57,68,73,126,130,143,148,149,153,158}

A significant limitation of these studies is the use of self-reported height and weight measurements which are subject to reporting bias from participants. None of the studies investigating BMI and its association with ON used objective measures (e.g., dual-energy x-ray absorptiometry (DXA), bioelectrical impedance analysis (BIA), or magnetic resonance imaging (MRI)). Despite this, given the sheer quantity of studies showing no relationship between BMI and ON, it appears reasonable to infer that BMI is likely not a strong predictor of ON risk.

Thin-ideal Internalization. Several additional studies^{159–161} have been published since McComb’s 2019 review⁴ and have added to the paucity of evidence surrounding thin-ideal internalization serving as a risk factor for ON. DeBois and Chatfield¹⁵⁹ found that among individuals who self-identified as having ON, weight control and thin-ideal

internalization was a primary motivator in increasing dietary restrictions overtime. This is in contrast to the current proposed diagnostic criteria⁸ that suggest weight-related concerns are absent in individuals with ON. White and colleagues¹⁶⁰ added to these findings, revealing that in their analysis of male college students that thin and athletic internalization was related to higher levels of ON symptomology. Further, Tóth-Király et al.¹⁶¹ supported the previous findings in an analysis of young adults (n=710), showing that ON was predicted by thinness and muscular internalization. These association were first studied in 2007 by Eriksson et al., who also found that among both men and women internalization of thin ideals predicted higher scores on the BOT. However, it should be noted that the BOT has never been validated and was never meant to serve as a diagnostic measure, but rather as an informal measure to help individuals determine if they may be practicing risky behaviors. All of these results together suggest thin-ideal internalization may likely be a consistent predictor of ON.

Drive for Thinness. Drive for thinness is recognized as a risk factor for disordered eating and EDs,¹⁶² and has been studied regarding its relation to ON. A recent 2020 analysis of this potential relationship by Domingues and Carmo⁷⁵ revealed that among yoga practitioners, drive for thinness was a main predictor of ON. Bona and colleagues¹⁶³ further supported this relationship, showing that among Hungarian gym goers drive for thinness was associated with higher ON risk. Parra-Fernandez et al.³⁶ offered additional support, finding that among University students drive for thinness positively predicted ORTO-11 scores. These results provide added support to the idea that ON may share similarities between other recognized EDs in terms of risk factors.^{37,148}

Body Image. The influence of body image and ON risk continues to be contradictory, despite numerous studies that have investigated the relationship. However, a greater number of studies have found either no relationship or an inverse relationship between ON and factors related to body image. Among a general sample (n=921), individuals showing higher amounts of ON behaviors scored higher on health and fitness-related areas, appearance evaluation, and body areas satisfaction on body image measures compared to individuals displaying higher ED behaviors, indicating ON behaviors coincided with positive body image attitudes.¹⁶⁴ It is important to note that this sample was primarily females (84.6%) which could have influenced the results. In He and colleagues⁶² evaluation of body image among an elderly Chinese population, they found ON behaviors were positively associated with body appreciation and life satisfaction, and negatively to body dissatisfaction. This is the first study to evaluate ON in elderly individuals, and interestingly the associations that typically exist in younger populations (e.g., psychological distress and disordered eating symptomology) were non-existent in this population. More studies are certainly warranted to determine if ON behaviors may actually have a protective effect in older individuals. Another study¹³⁶ investigating body uneasiness among an Italian student population found a negative association between ON and pathological body image discomfort and obsessive compulsive behaviors among females, and fewer pathological eating patterns among males. Further, a clinical sample of women diagnosed with EDs also showed ON behaviors were negatively predicted by appearance orientation and weight concern.¹¹⁴

Contrary to these studies, Barnes and Caltabiano³⁷ found among online participants that appearance orientation, overweight preoccupation, self-classified weight,

and poor body areas satisfaction were higher among those with greater ON behaviors. These results support the idea of similarities existing between ON and other EDs, such as AN and BN, where body image concerns are also present. Similarly, among a Polish student population, female individuals with greater propensity toward ON had lower body area satisfaction and appearance evaluation, and were more likely to concentrate on dieting, restrain their eating, and be preoccupied with being overweight.¹³⁷ These associations did not exist for males. An Australian sample⁸⁹ of University students found body shape preoccupation to be associated with greater ON behaviors. These results together may indicate that those with greater levels of body image preoccupation, and over-valuation of appearance and weight may be at higher risk for ON. Current literature is still somewhat divided, with some showing higher levels of body satisfaction correlating with ON, and others showing higher levels of anxiety around appearance and weight status in individuals with higher amounts of ON behaviors.

Lifestyle Related Factors

Social media. Use of social media platforms has been an interesting area of study in regard to ON risk, as it has been linked to several other negative mental health issues and impaired overall wellbeing among adolescents, such as depression, anxiety, disordered eating, and poor body image.^{165,166} Research suggests that social media perpetuates these problems by creating false and unrealistic realities, ideals, and standards by which individuals compare themselves to. These falsehoods then broaden the gap between how individuals view themselves and where they feel they should be, creating an environment for obsession to achieve the narrative they envision.^{165,167}

Turner and Lefevre¹⁴⁹ investigated several social media platforms (*e.g.*, Instagram, Twitter, Facebook, Pinterest, Tumblr, Google+, and LinkedIn), and found that frequent users of Instagram had the highest tendency toward ON among all platforms studied. Twitter was shown to produce a small protective effect against ON. Use of other platforms did not show any conclusive associations. Though the associations seen among Instagram users was strong, a large limitation of this study was the inability to distinguish between interactions between social media platforms, thus the results are only correlational in nature. Santarossa and colleagues¹⁶⁸ expanded the exploration of Instagram in a qualitative analysis of the dialogue surrounding the hashtag #Orthorexia. They found hashtags that were most often associated with ON were ‘love’, and ‘EDrecovery’, indicating the conversation may be more positive than negative, and a greater emphasis may be on recovering from the disordered eating behaviors.

A study¹⁶¹ investigating the potential mediating role of several sociocultural attitudes surrounding appearance played in the contribution to ON found that media pressure influenced ON by means of need for fulfillment and health anxiety. Further, a recent qualitative study¹⁶⁹ which included individuals who self-identified as having ON (n=9) attributed social media as a societal influence in the development of ON, explaining that the means in which social media contributes to ON risk is that it may act as a “conduit for extreme health ideologies”. McGovern et al.,¹⁷⁰ also found that among individuals who self-identified as having recovered from ON (n=8), social media and the internet played a role in the development of ON which was attributed to the vast amount of nutrition information available (whether credible or not), though they also add that social media may serve as a base for recovery from these behaviors depending on the

content being viewed. More research is needed to distinguish between social media content that is harmful and may lead to ON behaviors, versus content that may serve as protective.

Strengths and Limitations of Current Literature

Literature surrounding ON has continued to develop overtime and interest in studying this proposed disorder has certainly increased over the years. Our understanding of ON to date has become more clear, though many questions remain unanswered at this point. A major limitation of the current literature is the lack of consensus on acceptable diagnostic criteria. This is problematic, given that establishing and defining criteria is a fundamental component in being able to measure a condition.¹⁷¹ Literature on ON is still in an infancy stage compared to other established EDs, and more high quality research is needed to better understand the factors that contribute to ON, as well as the criteria that would accurately represent ON as a disorder. To date, Dunn and Bratman's⁸ 2016 proposed diagnostic criteria are the most commonly accepted, though recently published research suggest these criteria may not be entirely accurate, and therefore may exclude some individuals practicing behaviors related to ON. For example, the criteria suggest weight loss may be a result of practicing ON behaviors, but is not the primary goal. Given the contradictory findings on motivations for ON,^{37,75,79,159,161} more work should be done in order to determine whether the goal of losing weight should be absent from criteria (as is currently proposed). This could potentially be accounted for by creating a sub-category within diagnostic criteria where appearance or weight-related factors are taken into consideration to a greater degree, rather than excluding individual's altogether

who present with these motivations. This would aid in aligning ON diagnostic criteria with current views on psychological disorders,¹⁰² in that behaviors likely fall within a continuum rather than a distinct categories (i.e., the condition is present or the condition is not present).

Further, previous proposed criteria have suggested several other factors be present in order to diagnose ON, including evidence for escalation of the dietary restrictions over time, and excessive amounts of time or money devoted to preparing their diet.³⁰ More research is needed to conceptualize behaviors and psychosocial risk factors associated with ON to determine whether the current proposed criteria are indeed acceptable for use.

Given the lack of consensus on diagnostic criteria, the debate on the individuality of ON compared to other EDs continues. The difficulty in answering this question lies in the similarities between ON and other psychological and eating disorders (e.g., OCD, AN, and ARFID). However, evidence has accumulated that identifies succinct differences between ON and other disorders, including the apparent external motivations driving ON behaviors (i.e., achieving a greater health status), the ego-syntonic nature of the disorder, and overall focus on quality of food versus quantity. It does, however, seem evident that internal motivations for ON are likely highly similar to other EDs in striving to maintain control at any cost. Continued development of studies discerning between ON and other EDs and psychological disorders remains an important factor in elevating the field and ongoing establishment of clinical relevance. A promising element of the commonly accepted diagnostic criteria is the inclusion of clinical impairments as a result of ON.

As reviews^{8,30,41} on this topic have brought to light, a large barrier of the

continued study of ON is the need for better tools to accurately measure the disorder, given that the majority of the literature continues to use the ORTO-15 which has been cited many times to have significant psychometric flaws. This has created largely unreliable prevalence rates ranging from 1-90% which is highly contradictory compared to that of current estimations of other EDs.¹¹⁹ The wide range of prevalence makes sense, given that one of the main arguments against the ORTO-15 is its inability to distinguish between pathologically harmful eating behaviors and healthful eating. Furthermore, psychometric review of this tool in various studies has revealed highly inconsistent reliability rates (Cronbach's alphas ranging from 0.18-0.85, deeming the average Cronbach's alpha of 0.63 among studies lower than the traditionally accepted 0.70).⁴ As many others in the field have stated,^{4,41,43,53} use of the ORTO-15 should be discontinued in order to focus on the development of new tools, or improvement of existing tools that have more favorable psychometric properties (e.g., DOS, EHQ, and TOS). Improved psychometric instruments will aid in establishing more reliable prevalence rates, identification of risk factors and potentially high risk populations, and lead to the establishment of evidence-based treatment strategies.⁸

Another limitation, as McComb and Mills⁴ suggest, is ON literature being largely composed of convenience samples (e.g., University students) that are also predominantly female (up to 70%). This greatly limits generalizability to other populations and genders. Research also sparse in adolescent populations and elderly populations. Further, published literature has primarily included populations of European descent. More research is needed to determine if and how these behaviors are impacting other races and ethnicities.

Literature within the field of ON does have several strengths worth noting. Much of the recent literature has been devoted to both psychometric validation of existing psychometric instruments in diverse populations, and development of new instruments in order to better measure the constructs of ON. Results have been promising, especially in regard to the tools addressing the main limitation of the ORTO-15's lack of ability to distinguish between clinical symptomology and healthful eating.

Though many risk factors studied have produced inconclusive results, several reliable predictors of ON have been identified, many of which are similar to other EDs. A history of dieting, individuals who currently followed a self-prescribed diet, and disordered eating behaviors were consistently associated with greater ON risk, regardless of the psychometric instrument used. This association translates to the practice of these behaviors putting an individual at a higher risk for ON. However, because studies to date have been largely correlational in nature, and it is well understood that correlation does not imply causation. As McComb and Mills⁴ articulate, without longitudinal research it is impossible to fully understand the directionality of the relationships, as well as potential moderating factors that may exist. It is still unknown at this point whether practicing ON behaviors precedes the development of an established ED such as AN or BN, or even if dieting and disordered eating behaviors could potentially predict future ON. The state of research in ON would benefit from more long-term studies aiming to determine the direction of these relationships.

Several body-image related factors have also been consistently tied to an increased risk for ON, including drive for thinness and thin-ideal internalization. These factors, similar to dieting and disordered eating, are also established risk factors for other

EDs.¹⁷² Again, this begs the question as to whether the most recently proposed diagnostic criteria are entirely reliable and accurate, given that weight loss is considered a consequence of practicing ON behaviors rather than a direct motivation. The studies^{35,99,127} that have investigated the motivation behind individuals practicing these behaviors which has shed some light on answering this question. In Depa and colleagues³⁵ evaluation of motivations behind food choices among Spanish university students, they found motives differed between those considered to have “healthy ON” and pathological ON. Individuals scoring in the range consistent with ON described food choices being motivated by weight control (e.g., “is low in calories”), sensorial appeal (e.g., “tastes good”), and affect regulation (e.g., “helps me relax”), while individuals with “healthy ON” stated food choices were inspired by health content (e.g., “keeps me healthy”) and price of food (e.g., “is cheap”). Continued evaluation of the motivation of individuals practicing these behaviors will aid in better understanding how perception of weight status and motivations for weight changes may influence risk for ON.

Though the number of studies evaluating personality traits is smaller than that of other psychosocial risk factors studied, several traits including perfectionism and OCD behaviors have shown to be reliable predictors of ON. Individuals with perfectionistic personality traits consistently scored higher on ON measures indicating the practice of ON behaviors. This is not surprising given that perfectionism is also implicated in the development and maintenance of other EDs, and is also implicated in OCD.^{173,174}

Intuitively, overlap between OCD and ON behaviors presented mainly in the form of obsessions and compulsions related to food, such as obsession with food intake, choices, and preparation, and compulsions with weighing and measuring food.⁵ The

current proposed diagnostic criteria⁸ align with these findings, taking into consideration both obsessive and compulsive tendencies in regard to restrictive dietary practices being present in order to diagnose ON. An interesting expansion of the ideas on the interrelatedness of OCD and ON was made by Koven and colleagues¹⁷ who suggested that ON may overlap more closely with a separate disorder on the OCD spectrum known as obsessive compulsive personality disorder (OCPD). Although both OCD and OCPD are obsessive and compulsive in nature, OCD is characterized as an anxiety disorder, while OCPD is a personality disorder characterized by a pattern of preoccupation with details, perfectionism that negatively influences ability to complete tasks, and a rigid, inflexible mindset.^{94,175} Further, OCPD has shown stronger associations with EDs compared to OCD in several studies.¹⁷⁶ To date, no studies have been published aiming to evaluate the relationship of OCPD and ON, so similarities between the disorders are purely speculative. Future studies should aim to further clarify this relationship in order to better understand and identify populations who are at higher risk for ON.

Finally, another strength worth noting is the ON task force established in 2016³⁰ that has created specific aims to clarify and more consistently define diagnostic criteria to continue moving the field forward. These aims include: synthesizing available literature on risk factors, comorbidities, and clinical relevance; determine which, if any, DSM category ON fits most closely with; continue to create high quality qualitative research and case-studies to better understand ON at the individual level; validate an improved psychometric instrument to measure ON; and determine a more accurate prevalence of ON across diverse populations. The aims developed summarize the aforementioned issues that are central to barriers that exist in studying ON.

Conclusion

The study of ON has advanced significantly over the last 20 years and continues to move forward with current research aiming to address barriers identified in the literature. While this field has made significant progress, many questions remain unanswered. More work is needed to establish universally accepted diagnostic criteria, which will lead to the improvement of existing psychometric measures to better identify prevalence of ON in a variety of populations. Several reliable risk factors for ON have been identified, though the literature remains largely correlational. Longitudinal studies will aid in elevating the study of ON to better understand the etiology, development, and maintenance of ON over time. Ultimately, addressing the limitations identified within this literature review and others' work will lead to better recognition of individuals practicing harmful behaviors associated with ON, and thus bridge the gap between establishing evidence-based strategies to treat these individuals, leading to a decrease in the risk for the development of clinically significant problems.

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CHAPTER 3

ASSOCIATIONS BETWEEN LEVEL OF INTEREST IN NUTRITION,
KNOWLEDGE OF NUTRITION, AND PREVALENCE OF ORTHOREXIA TRAITS
AMONG UNDERGRADUATE STUDENTS

Abstract

Objective: Orthorexia is an unhealthy obsession with “proper”, “clean”, or “healthful” eating. The objective of this study was to examine associations between level of interest in nutrition, knowledge of nutrition, and prevalence of orthorexia traits in a population of college students enrolled in a general education nutrition course.

Methods: Of the 579 students enrolled in the class during Spring semester of 2018, 221 (38%) completed an online survey. The survey was completed during weeks 8-9 of the 15-week semester.

Results: Of the students in the class, 94% reported being interested in the subject of nutrition. The average nutrition knowledge score was 8.7 out of 12 (standard deviation (SD) 1.4, range 0 - 12). The average of the summed 29 orthorexia traits was 63.4 (SD 12.4; range = 41 - 102); lower scores indicated less agreeance with practicing ON behaviors. The degree of interest in the subject of nutrition was positively associated with prevalence of orthorexia traits ($r = .43$, $p < .0001$), but not nutrition knowledge ($p > .05$). Nutrition knowledge was inversely associated with prevalence of orthorexia traits ($r = -.19$, $p = .005$). No associations were found between age, sex, year in school, or BMI and orthorexia traits.

Conclusions: Interest in nutrition is associated with increased prevalence of orthorexia

traits, however, higher levels of nutrition knowledge are associated with decreased prevalence of orthorexia traits. Additional studies should further examine these associations in prospective studies of nutrition/dietetics students as they progress in their programs and gain additional knowledge of nutrition.

Introduction

Orthorexia Nervosa (ON) is a term used to describe a type of disordered eating where individuals follow extreme self-prescribed diets in pursuit of health that induce negative effects such as malnutrition or impairment of social or academic functioning (Dunn & Bratman, 2016). The term originally described by Dr. Steven Bratman describes patients that report obsessive thoughts about food, ritualize and restrict eating patterns, and strictly adhere to dietary rules (Dunn & Bratman, 2016). Often, individuals with ON eat for the purpose of improving health, but this healthy eating is accompanied by obsessive thinking, compulsive behavior, self-punishment, increasingly rigid restriction, and other characteristics of eating disorders (EDs) (e.g. physiological abnormalities, emotional impairments, social withdrawal, etc.) that negatively impact the individual (Bratman, 2017).

Though the term ON has gained much attention in the literature and media, ON is not currently listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013). Several sets of diagnostic criteria have been proposed (Barthels et al., 2015; Dunn & Bratman, 2016; Moroze et al., 2015; Setnick, 2005), though none have been universally accepted. A recent narrative review on this topic by Cena et al. (2019) recommended two key features be present in diagnostic criteria proposed for ON, namely an obsessive tendency to control dietary practices, and subsequent impairment that follows such rigid dietary control. The impairments could be physical, such as malnutrition, or psychological, such as distress or a decrease in an individual's ability to function normally. The authors also iterated the importance of continued analysis of additional factors that may influence the development of ON, such

as body image and weight concerns (Cena et al., 2019).

ON may be considered a type of disordered eating, which is a phrase used to describe a wide range of abnormal or irregular eating behaviors that could potentially meet the criteria for diagnosis of an ED (Anderson, 2018). The risk for developing disordered eating is higher for individuals with thin-ideal internalization, body dissatisfaction, history of dieting and overeating, and history of unhealthy weight control behaviors (Stice et al., 2017). The median age of onset for the most common types of EDs including anorexia and bulimia is 21 years (The National Institute of Mental Health, 2013), meaning that college and university students in particular are at risk (Agopyan et al., 2018). Prevalence rates of EDs among female college and university students range from 11-17% (Eisenberg et al., 2011; Hoerr et al., 2002), and approximately 4% in males (Hoerr et al., 2002). Several studies have investigated the prevalence of orthorexic behaviors among college and university students (Bo et al., 2014; Clifford & Blyth, 2019; Dell'Osso et al., 2016; Dunn et al., 2017; Gkiouras et al., 2018; Grammatikopoulou et al., 2018; Karakuş, 2017; Korinth et al., 2010; M. L. Parra-Fernández, Onieva-Zafra, Fernández-Martínez, et al., 2019), with rates of these behaviors ranging from 1-90% (Dunn et al., 2017). It is important to note, however, that this variability may be due to issues related to psychometric properties of the instruments being used (Meule et al., 2020; Missbach et al., 2017; Valente et al., 2019). The many factors that contribute to eating behaviors (e.g. biological, economic, psychosocial, etc.) are likely to greatly influence this age group, as it has been shown that this population experiences high levels of stress and have a greater tendency to eat in response to external cues and emotions (Hootman et al., 2018).

Introductory nutrition courses are designed to provide students with a basic understanding of nutrition and its role in overall health. Students who enroll in these introductory courses do so for a variety of reasons. Some may be genuinely interested in the subject matter, while others may be taking the course because it fulfills an institutional requirement. These courses also introduce students to the study of nutrition and the field of Dietetics. Interestingly, some studies have shown that students in nutrition science and dietetic majors, as well as nutrition and dietetic professionals, are at a higher risk for disordered eating (Agopyan et al., 2018; Gkiouras et al., 2018; Kinzl et al., 2006; Rocks et al., 2017; Souza & Rodrigues, 2014; Tremelling et al., 2017). Many factors have been proposed as to why this could happen including stress, pressure to maintain the “ideal” body weight, and feeling the need to serve as role models for other individuals (Larson, 1989; Mahn & Lordly, 2015).

While greater nutrition knowledge has been associated with healthier dietary choices (Barzegari et al., 2011; Kolodinsky et al., 2007) and lower risk of orthorexic behavior (Gleaves et al., 2013; Korinth et al., 2010; Reinstein et al., 1992), at least one study among dietetic students found greater nutrition knowledge to be associated with increased orthorexic tendencies (Agopyan et al., 2018). This is important to consider because nutrition knowledge likely influences diet-related attitudes, behaviors, and beliefs which was confirmed by Brytek-Matera et al. (2019) who found higher levels of knowledge of healthy eating among individuals who practiced strict dietary control, namely vegans.

To date, much of the research on ON has been conducted within university student populations, but has been focused mainly on identifying point prevalence of ON

within the sample (Dell’Osso et al., 2016; M. L. Parra-Fernández, Onieva-Zafra, Fernández-Martínez, et al., 2019; M.-L. Parra-Fernández et al., 2018; Reynolds, 2018), correlations between ON and individual personality and physical characteristics (Agopyan et al., 2018; Brytek-Matera et al., 2017; Farchakh et al., 2019; Gramaglia et al., 2019; Plichta et al., 2019), or psychometric tool validation and translation of these tools into different languages (Chard et al., 2018; He et al., 2019; M. L. Parra-Fernández, Onieva-Zafra, Fernández-Muñoz, et al., 2019; Valente et al., 2019). While some studies have investigated the relationship between nutrition knowledge and ON risk (Brytek-Matera et al., 2019; Depa et al., 2017; Korinth et al., 2010), to our knowledge none have examined how level of interest in nutrition may moderate this association. Therefore, the purpose of this study was to investigate relationships between interest in nutrition, knowledge of nutrition, and ON risk among students enrolled in an introductory nutrition course.

Methods

Study population and procedure

All students enrolled in the undergraduate introductory nutrition course during spring semester 2018 at Utah State University were invited to participate (n=579). Students were given a nutrition knowledge questionnaire at the beginning of the semester to measure their knowledge level upon entering the class. During weeks 8-9 of the semester, all students enrolled in the course received a link to the 51-item Qualtrics survey via an announcement sent electronically by the instructor. Informed consent was obtained prior to starting the survey. Participants were required to be older than 18 years

of age. A small amount of extra credit (1% of total points possible) was offered to students who completed the survey. Other extra credit options were provided for students who were not interested in participating in this research. The study procedures were reviewed and approved by the Utah State University Institutional Review Board (#9011).

Survey measures

The Eating Habits Questionnaire (EHQ) (Gleaves et al., 2013) is a 21-item tool which assesses the cognitions, behaviors, and feelings related to an extreme focus on healthy eating. It was created with the intention of correctly identifying cases in which individuals exhibit problematic preoccupations with healthy eating consistent with signs and symptoms of ON. The EHQ has three subscales; behaviors of healthy eating (e.g. I only eat what my diet allows; n=8 questions), problems associated with healthy eating (e.g. I am distracted by thoughts of eating healthily; n=9 questions), and feeling positively about healthy eating (e.g. I feel in control when I eat healthily; n=4 questions). Internal consistency measured by Cronbach's alpha for the 21-item questionnaire was good ($\alpha=.90$, $.82$, and $.86$ for the problems, behavior, and feelings subscales, respectively). Test-retest reliability correlations for the subscales were $r=.81$, $r=.81$, and $r=.72$, respectively (Gleaves et al., 2013). The EHQ problems subscale was found to be highly correlated with Eating Attitudes Test (EAT-26), a widely used validated tool that measures ED pathology ($r=.79$) (Garner et al., 1982; Gleaves et al., 2013), and moderately correlated with obsessive-compulsive complaints as measured by the Maudsley Obsessional Compulsive Inventory (MOCI) ($r=.32$) (Gleaves et al., 2013; Hodgson & Rachman, 1977). The EHQ uses a 4-point scale where a score of 1 was

assigned to not at all true, a score of 2 was assigned to somewhat not true, 3 was assigned to somewhat true, and 4 was assigned to very true. Studies using the EHQ show preliminary evidence that the EHQ is a reliable tool to identify individuals practicing behaviors associated with ON (Gleaves et al., 2013; Oberle et al., 2017, 2018; Oberle & Lipschuetz, 2018).

Seven additional questions were added to the EHQ portion of the survey based on other traits of orthorexia mentioned in the literature and proposed diagnostic criteria that were not addressed with the EHQ (Bratman, 2017; Brytek-Matera, 2012; Dunn & Bratman, 2016; National Eating Disorder Association, 2017; Oberle et al., 2018; Rudolph, 2018), specifically negative medical consequences from following the self-prescribed diet, compensatory behaviors, and negative affect from straying from dietary rules (Table 3-1). The questions were scored in the same manner the EHQ was scored using a 4-point Likert-type scale (not at all true to very true). Internal consistency of these additional questions was measured using Cronbach's alpha. The Cronbach's alpha for the 7 additional questions was $\alpha=.838$, suggesting that the items have relatively high internal consistency. The addition of these questions increased level of internal consistency of the EHQ from $\alpha=0.881$ to $\alpha=.899$.

Additional survey questions also included questions on age (18-21; 22-24; 25-27; 28 and older), sex (male or female), whether or not they had been previously treated for an ED (yes or no), and self-reported height and weight, in addition to the participants' level of interest in the area of nutrition (very disinterested, disinterested, interested, and very interested).

A nutrition knowledge questionnaire was also given to participants. This

questionnaire measured learning objectives targeted by the course, and was given at the beginning of the course to measure the level of nutrition knowledge students had coming in to the class (Table 3-2). Questions assessing knowledge were assigned a score of 0 (not correct) or 1 (correct).

Table 3-1 Supplemental Questions Added to the Modified EHQ

1. I usually feel guilty when I eat “unhealthy” food.
 2. I often wish that I could stop worrying so much about the food I eat.
 3. Making one “wrong” food choice usually ruins my day.
 4. I have suffered negative medical consequences from following a specific eating plan.
 5. I worry more than I should about being or becoming fat.
 6. I usually exercise more after I feel I have been eating inappropriately.
 7. I usually restrict my food intake when I feel I haven’t been eating appropriately.
-

Table 3-2 Percent (%) Correct of Each Item on the Knowledge Assessment (n=221).

| Knowledge Questions | % correct |
|---|-----------|
| 1. Carbohydrates are an important part of a healthy, balanced diet. Approximately half of your daily calories should come from carbohydrates. | 87.3 |
| 2. Eating equivalent amounts of all types of dietary fats (trans, saturated, polyunsaturated, monounsaturated) will have the same effect on your blood cholesterol. | 83.7 |
| 3. For optimal health, you should completely avoid eating refined white flour and table sugar. | 67.4 |
| 4. Oily fish (mackerel, tuna, salmon) have healthier fats than red meat. | 91.0 |

| | |
|---|------|
| 5. High fructose corn syrup is made up of approximately equal parts of glucose and fructose and is very similar to the chemical make-up of sucrose. | 67.9 |
| 6. Wheat is an ingredient that most people should avoid. | 96.8 |
| 7. Organic foods are more nutrient dense than non-organic foods. | 61.5 |
| 8. You absorb calcium in milk more efficiently than you absorb calcium in spinach. | 42.1 |
| 9. Supplementing with high levels of B vitamins will increase your energy. | 48.4 |
| 10. Dietary supplements are tested by the FDA and are therefore safe to consume. | 81.0 |
| 11. Dairy can be part of a healthy, balance diet. | 99.1 |
| 12. An equal amount of fat and sugar have the same number of calories. | 86.9 |

Statistical analyses

Statistical analysis was performed using the Statistical Package for the Social Sciences (Version 25, SPSS Inc., Chicago, IL, USA). The distribution of knowledge scores and modified EHQ score approximated a normal distribution. Descriptive statistics (means, standard deviation, and frequencies) were calculated for all continuous variables. BMI was computed from self-reported weight and height (kg/m^2). Modified EHQ questions were scored as previously described. Both knowledge scores and modified EHQ questions were summed to create total knowledge and total modified EHQ scores. One-way analysis of variance (ANOVA) with Tukey's Honestly Significant Difference (HSD) test was used to examine differences between all pairwise demographic variables (age, race, sex, prior treatment for ED, and year in school) and level of interest in nutrition with BMI, nutrition knowledge score, and modified EHQ score. Associations between categorical demographic variables and level of interest in nutrition were compared using Chi-square tests. Finally, simple and multivariable regressions were used

to assess relationships and predictive capability of nutrition knowledge score and level of interest on summed modified EHQ scores. All analyses were considered significant at a level of .05.

Results

Participant demographics

Of the 579 students enrolled in the nutrition course and invited to participate, the study sample included 221 male and female students (n=16 participants did not finish the survey, consequently their data was not included in final analysis). Demographic information of participants can be found in Table 3-3.

The majority of participants across all sections of the course were female (71%), Caucasian (95%), and under 25 years of age (90%). The sample consisted of 54% freshman (n=120), 26% sophomore (n=58), 13% junior (n=29), and 6% (n=14) senior students. Average BMI among participants was 24 (SD= 4.75). The average nutrition knowledge score was 8.7 (SD = 1.4). The mean of the 29 summed orthorexia traits as measured by the modified EHQ was 63.4 (SD=12.4; range 41-102). Several participants (n=6) self-identified as having been treated for an ED.

Table 3-3 Demographic Information of Participants

| | n (%) |
|-----------------------------------|---------------|
| Race | |
| % White | 210 (95) |
| Sex | |
| Female | 157 (71) |
| Age | |
| 18-21 | 164 (74) |
| 22-24 | 35 (16) |
| 25 and older | 22 (10) |
| Class | |
| Freshman | 120 (54) |
| Sophomore | 58 (26) |
| Junior/Senior | 43 (20) |
| Interest Level | |
| Disinterested | 13 (6) |
| Interested | 155 (70) |
| Very Interested | 53 (24) |
| | M (SD) |
| BMI (kg/m ²) | 24.04 (4.8) |
| Study Measures | |
| Modified EHQ score ^(a) | 63.4 (12.4) |
| Knowledge score ^(b) | 8.7 (1.4) |

^(a)EHQ=Eating Habits Questionnaire (range: 41 – 102);

^(b)(range: 0-12; obtained at the beginning of the semester)

Associations between demographic variables and variables of interest

Univariate associations between the demographic variables and the variables of interest (level of interest in nutrition, knowledge score, and modified EHQ score) were assessed using ANOVA and Chi-square tests. There were no associations between demographic variables and level of interest in nutrition (Pearson Chi-squared $p > .05$ in

all cases). Further, no differences were identified between demographic variables or nutrition knowledge score ($p > 0.05$ for all comparisons). There was no association between level of interest measured at weeks 8-9 of the semester and nutrition knowledge measured at the beginning of the semester ($p = .84$). No associations were found between BMI and demographic variables, nutrition knowledge scores, and modified EHQ score ($p > .05$ for all comparisons). Those who reported prior ED treatment had higher modified EHQ scores by an average of 12.75 points ($F(1,219) = 6.32, p = .01$).

Role of interest and knowledge in nutrition on ON risk

Students with higher levels of interest in nutrition had higher modified EHQ scores than did students with lower levels of interest in nutrition, and level of interest in nutrition predicted 18.5% of the variance in the observed modified EHQ score ($F(1,219) = 49.6, p < .0001, r = .43, R^2 = .185$). Conversely, students with higher knowledge scores had lower modified EHQ scores and nutrition knowledge score predicted 3.5% of the variance observed in the modified EHQ score ($F(1,219) = 7.99, p = .005, r = -.19, R^2 = .035$).

In a multivariable regression model examining the independent and moderating effects of interest and knowledge on modified EHQ score together, greater degrees of nutrition knowledge and interest each independently predicted modified EHQ scores ($F(2,218) = 31.1, p < .0001, r = .47, R^2 = .22$) but the effect of one did not moderate the other ($p \geq .94$ for the interaction term of nutrition knowledge score and degrees of interest). This model showed that interest in nutrition and nutrition knowledge predicted 22% of the variance in total modified EHQ scores. The addition of demographic covariates to the model explained an additional 5.4% of the variance in total modified EHQ score

($F(8,212)= 10.1, p<.0001, r =.53, R^2=.276$). Results of the regression analysis can be found in Table 3-4.

| Table 3-4. Multivariable Regression Analysis Summary for Knowledge and Interest Levels Predicting Summed Modified EHQ Scores (n=221) | | | |
|---|------------------------------------|------|-----------|
| Variables | Beta-coefficient (SE) ¹ | t | Sig. |
| Interest level | 10.7 (1.42) | 7.5 | <.0001*** |
| Knowledge score | -1.7 (.51) | -3.3 | .001** |

Model was controlled for BMI, age, race, sex, prior treatment for ED, and year in school.

¹SE=Standard Error.

Discussion

In this study of college students enrolled in a nutrition course which fulfilled a general science institutional requirement, students indicating greater interest in nutrition reported higher prevalence of orthorexia traits than did those with lower levels of interest, and this was not moderated by their level of knowledge in nutrition. Contrarily, students with high nutrition knowledge had lower prevalence of orthorexia traits as compared with students with lower levels of nutrition knowledge, and this was not moderated by their degree of interest in nutrition. Interestingly, our results showed there was no interaction between level of nutrition interest and nutrition knowledge, and these effects were independent of each other. This could have been due to the incongruence between when the measures were administered.

Our results indicated that students who were more knowledgeable about nutrition had a lower prevalence of orthorexic behaviors ($p=.001$). These results are supported by

other studies that have shown a relationship between higher education levels and lower risk of ON (Aksoydan & Camci, 2009; Arusoğlu et al., 2008; Donini et al., 2004; Korinth et al., 2010; Reinstein et al., 1992). More specifically, studies have shown that as nutrition knowledge increases, risk for orthorexia tends to decrease (Gleaves et al., 2013; Korinth et al., 2010; Rocks et al., 2017). Indeed it has been shown that greater knowledge in the area of nutrition can impact attitudes and behaviors regarding eating (Crites & Aikman, 2005; Korinth et al., 2010). Korinth et al. (2010) found that not only do nutrition students who were further along in their education choose healthier options, but also did so in a less obsessive manner. This suggests that increased nutrition knowledge has the potential to influence healthy food choices as well as appropriate eating behaviors. The findings of this study and others support the notion of encouraging sound nutrition education as it may be an approach to reducing unhealthy eating behaviors.

Our results indicated individuals with higher levels of interest in nutrition have a higher propensity toward ON behaviors ($p < .0001$). An individual with orthorexia would be expected to have high levels of interest in nutrition, as the disorder typically begins with an interest in improving one's health, naturally requiring an interest in the subject matter (Bratman, 2017). What has been unanswered until this point was the relationship between levels of interest in nutrition and varying degrees of knowledge. Contrary to what we hypothesized, the results of this study did not show moderating effects on overall risk between interest and knowledge of nutrition. This could be a result of our limited sample size or selective sample of students who were enrolled in a general education nutrition course and discordant timing of the assessments of knowledge and interest. The knowledge assessment was obtained at the beginning of the semester where

level of interest in nutrition was obtained during weeks 8-9 in the semester. Further studies should continue to investigate this relationship.

Though our sample size was small, this study showed a statistically significant relationship between summed modified EHQ scores and previous treatment for an ED ($p=.013$). These findings are supported by others who have also indicated that individuals who have had ED's previously are at a higher risk for developing orthorexia (Korinth et al., 2010). It has also been suggested that orthorexia may be a coping strategy for individuals with prior ED's (Barthels et al., 2017). Characteristics of ON are said to be highly prevalent among individuals with anorexia nervosa (AN) and bulimia nervosa (BN) and have been shown to increase after treatment (Segura-Garcia et al., 2015). Reasons for this may include striving to maintain some degree of control, without engaging in behaviors they have been treated for. Because ON is seen as more socially acceptable, practicing orthorexic behaviors may be a way for an individual to obtain the control they desire without experiencing the possible negative social consequences AN or BN have.

This study has a number of limitations worth noting. First, the cross-sectional design of this study did not allow us to measure changes in knowledge and interest levels over time. A longitudinal approach comparing these changes over time, or comparing future cohorts of students enrolled in this course against a control group would be beneficial in drawing conclusions about the relationships between interest and knowledge in nutrition and risk for orthorexia. Additionally, the survey was given approximately mid-semester which may not have been an accurate representation of initial knowledge and interest in the subject matter. Due to the variability of reasons students enroll in this

course, these results may not be generalizable to larger cohorts of nutrition students, or to a general student population. Offering extra credit for participating in our study could have possibly contributed to selection bias. It has been suggested that self-reported height and weight can lead to inaccuracies within the data due to under-reporting by participants (Skeie et al., 2015). Finally, our study population was predominantly female Caucasians, limiting the generalizability of our results to different genders of varying racial/ethnic and socioeconomic status groups.

The results of this study suggest that there was a higher prevalence of orthorexic behavior in individuals who were interested in the subject of nutrition. However, this risk was slightly lower in individuals who had higher levels of knowledge. From the results of our study, it appears promising that providing nutrition education to increase knowledge levels may decrease risky eating behaviors over time. Future studies should examine these associations among individuals of various gender and ethnic backgrounds who are studying nutrition as they progress in their programs and gain additional knowledge of nutrition. In addition to measuring the presence of orthorexic behavior, future studies should consider investigating the etiology of these behaviors to aid in the development of effective treatment strategies and preventative measures.

Conclusion

The results of this study suggest that there was a higher prevalence of orthorexic behavior in individuals who were interested in the subject of nutrition. However, this risk was slightly lower in individuals who had higher levels of knowledge. From the results of

our study, it appears promising that providing nutrition education to increase knowledge levels may decrease risky eating behaviors over time. Future studies should examine these associations among individuals of various gender and ethnic backgrounds who are studying nutrition as they progress in their programs and gain additional knowledge of nutrition. In addition to measuring the presence of orthorexic behavior, future studies should consider investigating the etiology of these behaviors to aid in the development of effective treatment strategies and preventative measures.

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CHAPTER 4

VALIDATING THE ENGLISH DUSSELDORF ORTHOREXIE SCALE FOR USE IN
ADOLESCENTS AGED 14-17**Abstract**

Objective: To determine the content and face validity of the English-Düsseldorf Orthorexia Scale (E-DOS) in adolescents aged 14-17. The E-DOS has been validated for use in adults to identify individuals at-risk for symptoms and behaviors consistent with the condition of orthorexia nervosa (ON).

Methods: Researchers conducted seven focus groups with male and female high school students (n=40; 11 males, 29 females). Participants first completed the E-DOS scale and then were asked to participate in a group discussion regarding their understanding of the meaning of the questions in the E-DOS. Focus groups were audio recorded, transcribed, and coded to identify recurring themes in the focus group discussion using inductive and deductive content analysis. Codes for each of the 10 questions in the E-DOS scale were analyzed first to determine group understanding of key words identified for each question, and second to identify gender differences among responses.

Results: Codes identified from the transcripts of the focus groups agreed with the identified key word in 8 of the 10 E-DOS survey questions. The key words in the other 2 questions were either not understood by focus group population or would need to be altered due to incorrect understanding by focus group participants. Focus group responses between genders differed on several items, with female responses being categorized often

as diet mentality, and male responses as eating for performance-based reasons. Of the participants who completed the E-DOS, 7.9% were categorized as being at either moderate or high risk for ON.

Conclusions: The E-DOS scale demonstrated good face and content validity in an adolescent population; however, two items need to be revised to improve clarity and readability of the tool when used in adolescent populations. Future research should continue to conduct both qualitative and quantitative studies on these behaviors in adolescent populations.

Introduction

The term “clean eating” has become increasingly popular through social and popular media as our society has progressively become more preoccupied with healthy eating and an overall pursuit of health. The issue that arises is that this term is subject to individual interpretation, and is largely un-scientifically founded (Ambwani, Shippe, Gao, & Austin, 2019; Staudacher & Harer, 2018). Interestingly, despite this term being associated with negative outcomes related to creating extreme dietary views and an “all or nothing” approach (McCartney, 2016; Staudacher & Harer, 2018), several studies have found that participants still associate this term in a largely positive context (Allen, Dickinson, & Prichard, 2018; Ambwani et al., 2019). It has been suggested that the “clean eating” diet trend may make an individual more pathologically susceptible to becoming fixated on healthful eating (Ambwani et al., 2019). This pathological fixation has been described in the literature as Orthorexia Nervosa (ON), and is characterized by an obsession with healthy or “clean” foods, to the point that it becomes psychologically limiting and/or physically dangerous (Dunn & Bratman, 2016; Koven & Abry, 2015; Nevin & Vartanian, 2017).

Though individuals with ON can experience severe life disturbances, ON is not officially identified in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) as a diagnosable eating disorder (Dunn & Bratman, 2016; Koven & Abry, 2015). This has been said to be due to the lack of extensive empirical evidence regarding the disorder and the need for valid, reliable screening tools to detect the significant symptoms of ON (Brytek-Matera, Donini, Krupa, Poggiogalle, & Hay, 2015; Simpson & Mazzeo, 2017). Further, there is ongoing discussion regarding whether ON should be considered a

distinct condition or a subset of another established eating disorder (ED) (such as anorexia nervosa or obsessive compulsive disorder) (Dunn & Bratman, 2016; Gramaglia, Brytek-Matera, Rogoza, & Zeppegno, 2017; Koven & Abry, 2015).

The Dusseldorf Orthorexia Scale (DOS) (Barthels, Meyer, & Pietrowsky, 2015) is a screening tool for ON developed in Germany that has been validated and deemed reliable in identifying adults at high risk for ON. However, the English version of this tool has only been validated in a single college student population (mean age=19.64 years). Additionally, the study focused on examining construct, concurrent, and discriminant validity, and did not determine face or content validity of the tool. Many disordered eating risk factors emerge in adolescents ages 13-16 years old (Missbach, Dunn, & König, 2017; Rohde, Stice, & Marti, 2015), indicating it may be important to target screening and prevention strategies in these years.

Face validity is a necessary component of establishing the overall validity of a psychometric tool (Connell et al., 2018). It serves as a subjective measurement of how well a construct within an instrument is being represented. It is used to evaluate the “feasibility, readability, consistency of style and formatting, and clarity of the language used” (Taherdoost, 2016). This type of validity relies on expert judgement, and can be improved by input from the population in which the tool will be used within. Focus groups (FGs) are one way that qualitative data can be gathered from the individuals who will ultimately use the instrument in question (Connell et al., 2018) and have also been deemed as an acceptable method to adapt survey instruments to new populations (Fuller, Edwards, Vorakitphokatorn, & Sermsri, 1993). The qualitative data from FGs ultimately contribute to the development of quantitative studies by informing the content of the

questionnaire, including how items are worded and developed (O'Brien, 1993).

FGs are also often used to determine the content validity of a psychometric tool (Castel et al., 2008; Connell et al., 2018; Vogt, King, & King, 2004), as they can contribute to a greater understanding of the research question with participants serving as the experts within a specific target population (DeVellis, 2016; Omrani, Wakefield-Scurr, Smith, & Brown, 2019). FGs allow for the contribution of participants' own experience of the questions being asked (O'Brien, 1993). They allow for the investigator to gather information about participants' values and thought patterns, as well as how they communicate about the topic being studied. Due to the nature of being in a group setting, participants have the opportunity to respond to other group members experiences with similar or different experiences which allows more information to be gathered than that which would be given in an individual interview or survey measure (O'Brien, 1993).

Though the majority of current ON literature is quantitative in nature, mainly comprised of psychometric tool validation studies, adaptations of these tools to new languages, cross-sectional point prevalence studies, and evaluation of possible risk factors for ON, several previous studies have investigated ON using qualitative methods (Cinquegrani & Brown, 2018; Greville-Harris, Smithson, & Karl, 2019; Musolino, Warin, Wade, & Gilchrist, 2015). Musolino and colleagues investigated ON in the context of the behaviors acting as a cover for restrictive diets which allowed individuals to narrow their food choices based on the premise of morality (Musolino et al., 2015). An individual interviewed within the study even offered the term "healthy anorexia", describing a way in which someone may rationalize their disordered eating behaviors (Musolino et al., 2015). Cinquegrani and Brown evaluated the obsession with "clean

eating” among social media forums and found that several narratives emerged: first, individuals began controlling their dietary behaviors as an attempt to achieve better health, second, individuals felt the need to maintain control which led to feelings of fear and anxiety, and third, individuals becoming aware of the detrimental side effects of restriction (distress, feelings of guilt, impairment of social and academic functioning) and transitioning more into a “recovery” phase (Cinquegrani & Brown, 2018). Finally, in a recent evaluation of online blogs among individuals who self-identified as having ON by Greville-Harris and colleagues (Greville-Harris et al., 2019), several themes emerged similar to that of Cinquegrani and Brown’s work (Cinquegrani & Brown, 2018), with initial motivation for restriction stemming from the desire to lead a healthier lifestyle. They also identified social media as a potential aggravating influence, and finally bloggers’ obsessions with achieving perfection and control leading to a vicious cycle of disordered eating. These studies have added knowledge regarding factors that may be contributing to ON.

Several recent literature reviews of ON (Håman, Barker-Ruchti, Patriksson, & Lindgren, 2015; Valente, Syurina, & Donini, 2019) have indicated the need for more empirical qualitative analyses of the proposed disorder to not only gain a better understanding from individuals’ experiences to better shape diagnostic criteria, but also to examine aspects of how the disorder develops and how it is experienced by individuals’. Therefore, the purpose of this study was two-fold; first to determine the face and content validity of the E-DOS in a population of 14-17 year old adolescents, and second to examine differences in responses between genders. Further, a sub-aim was to quantitatively determine the prevalence of these behaviors in this population.

Methods

Measures

The DOS is a 10-item self-reported questionnaire that quantifies eating behaviors associated with ON. A four-point Likert-scale is used that ranges from “this does not apply to me” (1 point) to “this applies to me” (4 points). The maximum score is 40 points, with higher scores indicating a greater propensity toward ON (Barthels et al., 2015). This measure includes a cutoff, where a score ≥ 30 indicates the presence of orthorexic behavior. A score between 25 and 29 indicates an individual is at risk for ON. Psychometric properties of the English translated DOS are favorable, with high internal consistency (Cronbach’s $\alpha=0.88$, 95% CI [0.589, 0.899]) and good construct validity ($r=0.762$, $p<.001$).

Participants

Male and female students enrolled in 9th grade health classes during Spring trimester aged 14-17 from two local high schools were eligible for participation in the study. Schools included in the study were a convenience sample representative of the overall population in Cache Valley, Utah according to similar socioeconomic and demographic characteristics reported by the National Center for Education Statistics (“ACS School District Profile 2013-17,” 2017). Approval was granted from each schools’ principal, as well as each health teacher involved in the study-of which all agreed to participate. Health classes were chosen as the unit for recruiting due to this course being required for all high school students and therefore being a more representative sample of adolescents in this age group. Active consent was required for

all students that participated in the study, and all participants were required to sign confidentiality agreements prior to the FG to ensure confidentiality of responses within a group setting. Following return of the consent forms, participants were randomly assigned to FGs that took place over the course of two weeks. The FGs were conducted within each high school and were separated by gender to allow for unbiased responses from individuals (Karpowitz, Mendelberg, & Shaker, 2012). The study was approved by the Utah State University Institutional Review Board (Protocol #9790).

Study Design and Procedure

This study mainly used a qualitative design, however, E-DOS survey responses being quantitative in nature were analyzed separately. FGs were conducted to assess individual interpretation of terms within questions and overall understanding of concepts included on the E-DOS measure, and also to gather additional qualitative data from participants regarding how adolescents think and talk about food (Ouimet, Bunnage, Carini, Kuh, & Kennedy, 2004).

FGs were led by four undergraduate female moderators who underwent training sessions (six hours of training total) by the first author. Note-takers were present at each session to record key observations during the discussion, including documentation of nonverbal behavior such as facial expressions or group dynamics which could impact the flow of the discussion. The first author was present during the duration of each FG to ensure consistency among moderators. FGs lasted 30-45 minutes and size ranged from 4-8 participants in each group. FGs were digitally recorded and later transcribed by trained undergraduate researchers.

To ensure confidentiality, FGs were held in high school classrooms, and participants were assigned pseudonyms at the beginning of the FG that they were instructed to use instead of their own or their peers' names. Lunch was provided to each participant. Prior to the FGs starting, the E-DOS was administered to participants. The moderators of each FG did not review any answers to the E-DOS prior to beginning the FGs. Once all participants had completed the E-DOS, the surveys were gathered and the moderator introduced themselves. The moderator led the FG based on prompts that were determined prior to the interviews. Following the conclusion of the FGs, a one-hour debriefing session among researchers was held to discuss common themes observed, as well as to compare and contrast among each group.

Focus group questions

Questions asked within the FGs were created based on the 'cognitive interviewing' method, a qualitative approach designed to examine content validity and investigate whether survey items adequately achieve their intended purpose within the survey as a whole (Willis & Artino, 2013). This method relies on two main procedures, '*think-aloud interviewing*' and '*verbal probing*'. We relied mainly on the '*verbal probing*' approach to elicit more detailed information from respondents, imploring the use of 'comprehension and interpretation', 'specific', and 'general' cognitive probes (Willis, 2005). The questions asked within the FG focused mainly on having students define critical terminology within the E-DOS to be able to evaluate their overall understanding of vocabulary used, as well as the relevance of these questions to people their age. Questions asked during the FG can be found in Table 4-1.

Table 4-1 Focus group questions with corresponding codes

| Original E-DOS Survey Questions | Focus Group Questions | Top 3 Corresponding Codes (Combined Genders) |
|--|--|--|
| Q1 Eating healthy food is more important to me than indulgence/enjoying the food. | What does the word indulgence mean when you think about food? | <ul style="list-style-type: none"> • Excessive eating • Mindless eating • Binge-like behavior |
| | What does the word enjoying mean when you think about food? | <ul style="list-style-type: none"> • Intuitive eating • Favorite foods • Satisfied |
| Q2 I have certain nutrition rules that I adhere to. | What comes to mind when you think of the phrase ‘nutrition rules’? | <ul style="list-style-type: none"> • Food rules • Following a diet • Nutritional awareness |
| Q3 I can only enjoy eating foods considered healthy. | What does healthy eating mean to you? | <ul style="list-style-type: none"> • Balanced diet • Moderation • Fruits and vegetables |
| Q4 I try to avoid getting invited over to friends for dinner if I know that they do not pay attention to healthy nutrition. | What does it mean to pay attention to healthy nutrition? | <ul style="list-style-type: none"> • Nutritional awareness • Nutrition labels • Personal restrictions |
| Q5 I like that I pay more attention to healthy nutrition than other people. | Do you think people your age care about eating better than someone else? | <ul style="list-style-type: none"> • Body image • Weight consciousness • Peer pressure |
| Q6 If I eat something I consider unhealthy, I feel really bad. | What foods would you consider to be unhealthy? | <ul style="list-style-type: none"> • High sugar foods • High fat foods • High calorie foods |

Q7 I have the feeling of being excluded by my friends and colleagues due to my strict nutrition rules.

How could you be excluded for following strict nutrition rules?

- Social/familial exclusion
- Excluded for following a specific diet
- Differing food preferences

What does the word colleague mean?

- Coworker
- Friend
- Acquaintance

Q8 My thoughts constantly revolve around healthy nutrition and I organize my day around it.

Define what constantly revolving thoughts would be like.

- Persistent thoughts
- Subconscious thoughts
- Stress

Q9 I find it difficult to go against my personal dietary rules.

What do you think personal dietary rules are?

- Personal restrictions
- Individualized guidelines
- Food rules

Q10 I feel upset after eating unhealthy foods.

What kinds of emotions would you feel after eating unhealthy foods?

- Negative physical effects
 - Regret
 - Guilt
-

Qualitative data analyses

Qualitative analysis of the FGs was conducted using both deductive and inductive content analysis. Deductive content analysis is used to test a previously established theory in a new situation (Elo & Kyngäs, 2008), here to determine face validity of the E-DOS in an adolescent population (Chard, Hilzendegen, Barthels, & Stroebele-Benschop, 2018). Inductive content analysis is used as an exploratory method to determine patterns within the transcripts when little is known about the research question, and was used in this study to determine differences in themes generated between male and female responses (Brough, 2018; Elo & Kyngäs, 2008; Hsieh & Shannon, 2005). All FG recordings were transcribed and analyzed in groups of three consisting of the moderator and two note-takers who conducted that specific FG. Group discussion led to merging of redundant codes and renaming of parent codes that lacked detail. Child codes were then created to allow for more specificity within the defined categories (Figure 4-1). Each transcript with its corresponding codes was reviewed again independently by the main author who was present for group analysis to ensure consistency of coding. A cloud-based qualitative software, Dedoose, was used to store transcribed data and organize codes researchers created to identify common patterns and themes (Salmona, Lieber, & Kaczynski, 2019).

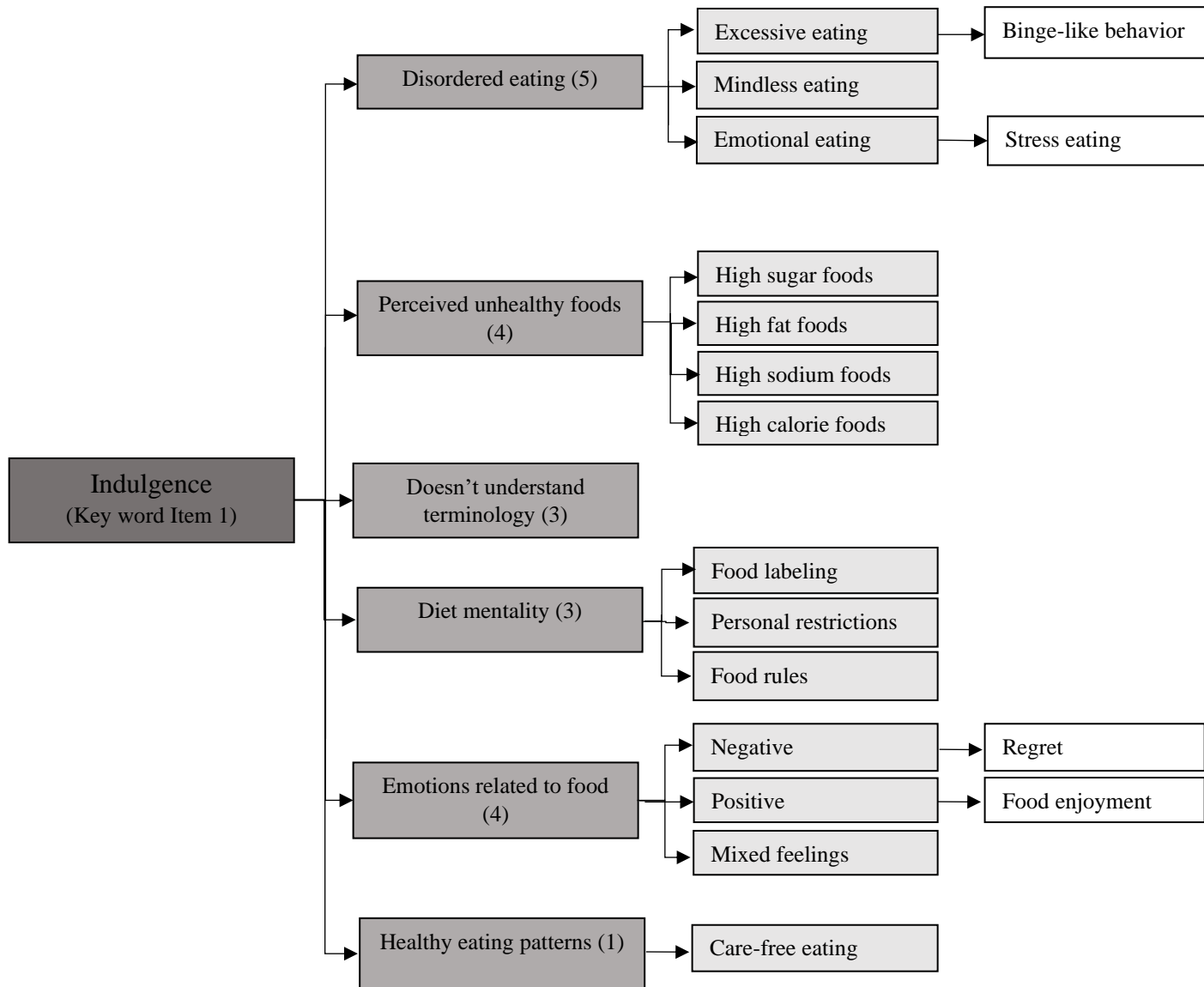


Figure 4-1. Visual representation of coding process

Once codes were identified, they were continually reviewed in an iterative manner and compared to data in its entirety to ensure the meaning of the data was not lost (Srivastava & Hopwood, 2009). Following methodology proposed by Willis and Artino (Willis & Artino, 2013) for analyzing cognitive interview results, codes were first evaluated per item on the E-DOS to determine if the terminology used was appropriately and adequately understood by participants. Second, the codes were evaluated between male and female FGs to develop more broad themes in order to evaluate how adolescents of different genders in this age group think and talk about food in its relation to health. The study adhered to the Consolidated Criteria for Reporting Qualitative Research (COREQ) tool, a 32-item checklist that has been identified as an appropriate tool to evaluate qualitative study characteristics including study design, data collection, analysis, participant selection, and theoretical framework (Appendix A) (Tong, Sainsbury, & Craig, 2007). Data saturation was assessed in relation to the research questions and was determined by the main researchers to be met when responses from participants were consistent within each transcript (Saunders et al., 2018).

Quantitative data analysis

E-DOS responses were analyzed using SPSS software version 25. Descriptive characteristics of the participants included frequency, percent, mean, and standard deviation. Independent t-tests were used to evaluate differences in means between gender and high school attended.

Results

Sample characteristics

In total, 40 students participated in seven FGs (split four and three between high schools) in March 2019. The majority of the participants were female (n=29). Of the 40 students, 95% completed the E-DOS (n=2 had missing responses that were not included in final statistical analysis).

Face validity of E-DOS

Item 1

The words “indulgence” and “enjoying” in question 1 were interpreted by researchers to have a positive connotation. Notably, both genders of FG participants’ comments revealed a predominantly negative connotation regarding “indulgence” and a positive connotation in regards to the word “enjoying”. The word indulgence was most often associated with the codes “excessive eating”, “binge-like behavior” and “mindless eating” which all fell under the “disordered eating” parent code. Further, the participants associated the word indulgence with foods they perceived to be unhealthy, such as foods with high sugar and fat content. A few participants (n=3) also expressed that they did not understand what the word indulgence meant.

“So you are mindless eating... so like you are eating large amounts of food like without noticing how your body is reacting to it.” (Female, group 3)

“Eating too much at one time I feel is like eating a lot in one sitting period... and kind of like bad food too. Like not really healthy food.” (Male, group 1)

“Like giving into things you know you shouldn’t do. Indulging it like... it brings to mind like eating too much of... something bad... Like... something that has too much sugar.” (Female, group 4)

Item 3

The majority of participants responded to the question “what does healthy eating mean to you” with codes that fell under the “healthy eating patterns” code, with “balanced diet”, “moderation”, “fruits and vegetables”, and “low sugar” child codes appearing most frequently. Seven participants also mentioned feeling better physically when consuming foods they deemed to be healthy.

“I think of just... eating healthy things more often... You don’t have to necessarily cut down on the unhealthy things, you just have to make sure your balancing it out with the healthy things.” (Female, group 3)

“I think it’s not like totally depriving yourself of all the good foods, but you know just finding a balance and eating the right amounts of all the nutrients that you need and you know occasionally rewarding yourself.” (Female, group 3)

Item 6

Participants most often associated foods they considered to be unhealthy with high sugar, fat, and calorie foods.

Item 7

When asked “how could you be excluded for following strict nutrition rules?” the majority of participants’ responses indicated they understood the context of the question, and often shared examples of scenarios in which an individual might experience exclusion:

“Maybe like if your friends or family are like going to get ice cream or like going to a birthday party and there is like cake and you can’t really have any of that and so you feel like you can’t have a good time cause you can’t have the bad parts of the food.” (Female, group 5)

“Yeah in general like if someone like, if there is an event going on and people invite you and they have all these greasy foods you probably don’t wanna go if you’re worried about fat. (Male, group 2)

The word “colleague” was misunderstood or said to be confusing by several (n=4) participants. This term was most often associated with the “coworker” code.

Item 8

The primary term “revolving thoughts” in item 8 was largely understood by the

majority of participants. When asked to define what “constantly revolving thoughts” would look like, most often responses were categorized under the “persistent thoughts” code.

“Somebody could be on a diet and the revolving thought in their head would be like “Oh, don’t eat that certain food” and they’ll just be constantly planning what they’re gonna eat.” (Female, group 1)

“Something like that it’s like constantly going through your mind, you are always thinking about it because you are worried about it and that kind of stuff.” (Female, group 3)

“Thoughts that occur to you daily, weekly, like just all the time like you just keep thinking it’s kind of what your mind goes to when you’re not thinking about anything else.” (Male, group 2)

Content analysis of male versus female responses

Item 2

Interestingly, a dichotomy appeared between responses among males and females for the question “what comes to mind when you think of the phrase ‘nutrition rules’?”. Males more often associated the term ‘nutrition rules’ with being aware of nutrients within certain foods, and mentioned U.S. governmental guidelines (e.g., MyPlate and the Food Pyramid) more often than females, who associated this term more frequently with codes categorized as “diet mentality”. Females mentioned following specific food rules and self-prescribed diets, labeling foods as “good” or “bad”, and setting personal restrictions.

“Nutrition rules it’s kind of like the food pyramid and the MyPlate like it sets a guideline for the general audience...” (Male, group 1)

“Yeah like you have certain things you can eat and then the things you should... avoid” (Female, group 2)

“Like, um... keeping very close tabs of what you eat and don’t eat.” (Female, group 2)

Item 4

Both genders associated the question “what does it mean to pay attention to healthy nutrition” most often with the code “nutritional awareness”, which was most often accompanied by responses related to looking at and being familiar with nutrition facts labels on food items, and being aware of the nutrients within foods.

“That’s like uhhh reading food labels and you kind of check in on like how much sodium, how much sugar, how much other things are in it so you know what you’re putting into your body.” (Female, group 1)

Females, however, contributed all responses coded as “diet mentality”, such as “personal restrictions”, “food rules”, “calorie counting”, and “food tracking”.

Item 5

When participants were asked if individuals their age care about eating better than someone else, 40% responded “yes”, while 15% responded “no”, and the remaining responses were neutral. Different themes emerged between male and females. Male participants mentioned nutrition rules being influenced more by medical reasons and eating for performance (such as engagement in high school sports). Female participants discussed factors that influenced food choices, namely body image related concerns, weight consciousness and peer pressure, as well as responses coded as disordered eating (such as stress, emotional, and mindless eating).

“...there are some kids who they have like some type of disease or something and if they eat unhealthy like it does something to their body... and they eat healthy so they can get more muscle, they can do more things.” (Male, group 1)

“Like I think some people like they want to fit in because they see like other people are skinny and stuff and so maybe they would eat healthy so they can like try and lose weight or something.” Female, group 4)

“I feel like girls like they have to look a certain way to fit in or to be popular so like we feel like we need to not eat certain things...” (Female, group 3)

Item 9

When students were asked their opinion on what “personal dietary rules are”,

differences in responses became apparent between males and females. Eating for performance-based nutrition goals was the most common response among males, followed by eating based on personal individualized guidelines (i.e., “how you eat personally compared to somebody else” (Male, group 2)), and finally eating based on individual metabolism.

“A runner would eat differently than someone who lifts a lot of weights... or a swimmer” (Male, group 2)

Females, however, responded most often with statements that were categorized under the “diet mentality” parent code, mentioning setting personal restrictions (i.e., “Like when you set certain rules for yourself that like what you can or can’t eat... or how much of something.” (Female, group 4)), having food rules, labeling foods as “good” or “bad”, following a certain diet, and counting calories.

“... Setting like strict plans like you have like a cheat day like every 2 weeks or something.” (Female, group 2)

“Things you want to change specifically in your diet so like if you wanted to cut out more calories or whatever.” (Female, group 5)

Item 10

When participants were asked what kind of emotions they might feel if they consumed “unhealthy” foods, among both genders the majority responded with statements detailing experiences of negative physical effects of the food, such as “...sometimes I’m fine but sometimes like, my stomach hurts a little bit after I’m like “oh, I shouldn’t have eaten that.”” (Female, group 4). Not only did respondents discuss negative physical effects, but overall this question elicited primarily negative emotions mentioned. “Regret” was mentioned most often by participants, followed by guilt (i.e., “I just feel guilty and kind of maybe...a little bit sad.” (Male, group 2), disappointment, and feeling sad or bad for consuming “unhealthy” foods. A male participant even stated

feeling “disgusting” after eating what they deemed as unhealthy foods. Overall, negative emotions were mentioned 31 times by participants across all groups.

Particularly interesting were several females (n=2) responses that detailed using compensatory behaviors, such as “Like I just think like I probably should go exercise... to like burn the calories.”, and “You ate something unhealthy so now you’re like “Ah, now I gotta go workout... feel better about myself”. (Females, group 2)

It is worth noting, however, that although the majority of responses regarding consuming “unhealthy” food was negative both from a physical and emotional aspect, that several participants did discuss positive emotions, such as satisfaction and enjoyment.

“It could also be satisfaction. It doesn’t always have to be feeling bad about what you eat.” (Female, group 1)

“It all depends on... what foods you view as unhealthy but it’s one of those things, me personally if I eat unhealthy foods it all depends on if I am enjoying the food... if I enjoy the food then I’ll feel happier.” (Male, group 1)

Quantitative analysis

A total of 38 E-DOS surveys were completed (n=2 participants did not complete the survey in its entirety). Participants’ mean score on the E-DOS was 18.5 (SD=4.88, range 11-33). Based on previously established cut-points for the DOS, 7.9% of students were considered to be at moderate (n=2) or high (n=1) risk of practicing behaviors associated with ON. No statistically significant differences were found between gender or high school and E-DOS scores ($p>.05$ for both).

Discussion

This qualitative study aimed to determine face and content validity of the previously validated E-DOS in an adolescent population, to assess gender differences among participant responses, as well as to determine the prevalence of these behaviors in a small sample as measured by the E-DOS. Overall, based on participant responses, we determined modifications to the E-DOS are necessary when using the tool among people aged 14-17 as several individuals did not understand terms used within the survey.

Much of the current literature surrounding survey development methodology is derived from studies with adult populations (Omrani et al., 2019). Several researchers have highlighted important differences that exist between adult and adolescent populations that impact methodology of survey development for each group, such as decision making skills, cognitive abilities, and a greater tendency of adolescents to make impulsive choices regardless of the outcome (Borgers, de Leeuw, & Hox, 2000; Borgers, Sikkel, & Hox, 2004; Hox & Borgers, 2001; Leeuw, Borgers, & Smits, 2004). Further, since adolescents are continually developing decisional and critical thinking skills (Omrani et al., 2019), it has been suggested that a greater emphasis should be placed on survey items for adolescents being written clearly and in a way that is easily understandable to this age group to avoid ambiguity (DeVellis, 2016; Leeuw et al., 2004). Wording on a psychometric instrument can have an impact on readability (Lenzner, 2014), and should therefore be taken into consideration when adapting surveys to a younger population.

The key words “indulgence” and “enjoying” in item one (“Eating healthy food is more important to me than indulgence/enjoying the food”) on the survey were interpreted

differently by adolescents than researchers. Responses from participants regarding the word “indulgence” were mainly undesirable in context, with many responses being coded under “disordered eating”. This contributed evidence that this term was misinterpreted by adolescents, given that the way the question is written on the E-DOS insinuates a positive connotation to both “indulgence” and “enjoying” since they are used in conjunction with one another. Based on the responses gathered, terms used in item one on the E-DOS may be more ambiguous to this population than in previously sampled adult populations. A similar point came to light regarding item seven (“I have the feeling of being excluded by my friends and colleagues due to my strict nutrition rules”) regarding the word “colleague”. Among the students in the FGs, several stated that this term was confusing. Researchers should be aware of unfamiliar and ambiguous terms within surveys, and it is recommended that these be removed to avoid eliciting various responses due to misunderstanding (Bradburn, Sudman, & Wansink, 2004). A potential solution proposed by Willis and Artino (Willis & Artino, 2013) to improve the lack of concurrence across participants on the terminology within items that were misunderstood may be to define the terms on the E-DOS more explicitly to prevent confusion when the tool is used within this population.

Drawing from the discussions within the FGs, content validity of the E-DOS in an adolescent population is supported. Participant responses indicated that the items and constructs within the survey were relevant to this age group. Though many questions elicited homogeneous responses between genders, several questions produced profound heterogeneity between genders, indicating that differences exist between genders in terms of the opinions and ways in which food and nutrition are discussed among this age group.

This is not surprising, given that much of the research investigating factors that influence food choices in adolescents have found that males and females have different experiences in regards to health and nutrition (Alkazemi, 2019; Arganini, Saba, Comitato, Virgili, & Turrini, 2012; Askovic & Kirchengast, 2012; Lai Yeung, 2010).

There are numerous intrinsic (e.g. individual food preferences, hunger cues, physical response to food eaten, etc.) and extrinsic (e.g. peer-pressure, food guilt, social norms, etc.) factors that influence eating and health behaviors in adolescents (Caine-Bish & Scheule, 2009; Campbell, Franks, & Joseph, 2019; Deliens, Clarys, De Bourdeaudhuij, & Deforche, 2014; Scaglioni et al., 2018). Similar to literature published on this topic (Campbell et al., 2019; Scaglioni et al., 2018; Viner et al., 2012), our results also showed that there were many factors that influence how, what, and why the participants chose to eat. It has been suggested that in general, females are often more conscious about food choices and dietary behaviors than males (Arganini et al., 2012; Ek, 2015; Lai Yeung, 2010). We found this to be true within our FG, with responses from females on several items of the E-DOS (i.e. “what comes to mind when you think of the phrase ‘nutrition rules’?”, “what does it mean to pay attention to healthy nutrition”, “do you think people your age care about eating better than someone else?”, and “what do you think personal dietary rules are?”) indicating they are often motivated by extrinsic factors, such as self-prescribed food rules and personal restrictions, peer-pressure, dieting, body-image related concerns, and weight-consciousness. They also mentioned more often foods being labeled as either “good” or “bad”. Several previous qualitative studies among adolescents investigating gender differences on eating attitudes and behaviors also found that female students discussed more weight-related concerns than males (Askovic & Kirchengast,

2012; Lai Yeung, 2010). The responses among female participants are concerning due to the fact that several factors mentioned, namely dieting and restriction, and social pressure (Striegel-Moore & Bulik, 2007; The McKnight Investigators, 2003), have been found to be risk factors for disordered eating and eating disorders (EDs) in female adolescents (Keel & Forney, 2013; Rohde et al., 2015; Steiner-Adair et al., 2002), as well as recent data indicating that EDs are twice as prevalent among female adolescents (3.8%) than males (1.5%) (Merikangas et al., 2010). Further, the “dieting mentality”, which is described as cycles or patterns of restrictive eating, excluding specific foods or nutrients, or guilt stemming from food choices (Cole & Horacek, 2009), has been associated with an increased risk for developing EDs later on (Koff & Rierdan, 1991).

Responses among males on several items of the E-DOS were largely related to eating for performance-based reasons (most often mentioning high school sports) and physical activity, where participants elicited responses coded as “food is fuel”. Mitrofanova and colleagues (Mitrofanova, Pummell, Martinelli, & Petróczi, 2020) found a similar theme emerge in their mixed-methods evaluation of the content validity of a psychometric tool designed to identify individuals with ON. Although this study was done among adults, they found participants discussed food as a way to fuel the body and achieve better physical performance. Similar to our participants, individuals involved in this study believed that healthy eating would have a direct influence on physical health and performance, and this was discussed as a reason why an individual may choose to follow personal dietary rules (item 9), or why they may care more about eating better than someone else (item 5).

Our research team also found it interesting that among both genders, “unhealthy

foods” (item 10) were most often associated with negative physical (e.g. feeling sick) and emotional (e.g. guilt, regret) responses. Parental influence has been suggested as an important factor in the context of adolescent food choices and behaviors (Campbell et al., 2019; Scaglioni et al., 2018). Loth et al. (Loth, MacLehose, Fulkerson, Crow, & Neumark-Sztainer, 2014) found that disordered eating behaviors and extreme weight-control behaviors were more common among adolescents’ whose parents exhibited higher levels of pressure-to-eat or food restriction. Additionally, Birch and colleagues found that when parents restricted their children’s food choices, it resulted in higher levels of dietary inhibition and negative self-evaluation of food (L. L. Birch et al., 2001; Leann L. Birch, Fisher, & Davison, 2003). Interestingly, these findings led Birch to hypothesize that parents who create a highly restrictive environment can result in children losing their ability to respond to internal hunger cues, and have a greater likelihood of internalizing feelings of shame or guilt if foods not deemed acceptable by parents were consumed (Leann L. Birch et al., 2003; Loth et al., 2014). This could explain the reason females within our FGs labeled foods as “good” or “bad”, as well as why negative emotions were predominantly mentioned by both genders. This iterates the importance of healthy home and family environments, as this is established as a well-known factor that influences eating behaviors in this age group (Campbell et al., 2019; Felker & Stivers, 1994; Gonçalves, Moreira, & Trindade, n.d.; Senguttuvan, Whiteman, & Jensen, 2014). Although parental influence was not a main theme that emerged among participants, it is worth noting that it was mentioned several times during different FGs as a factor that influenced their food choices.

Though our sample was small, a considerable proportion (7.9%) of adolescents

who completed the E-DOS qualified as being at moderate or high risk for practicing behaviors associated with ON. The rate identified within the adolescents who participated in the FGs is similar to the study in which the E-DOS was validated, where the prevalence among 384 undergraduate students was found to be 8% (Chard et al., 2018). Further, the rate of ON behaviors being practiced within our sample is comparable to the estimated point prevalence rate (5.7%) of all types of EDs in adolescents found in a recent systematic review (Galmiche, Déchelotte, Lambert, & Tivolacci, 2019).

These findings are important, as we know that there is evidence that supports eating behaviors that are established early on in adolescence are likely to continue on to adulthood (Movassagh, Baxter-Jones, Kontulainen, Whiting, & Vatanparast, 2017; Scaglioni et al., 2018). In a large 10-year longitudinal study, it was found that the prevalence of dieting and disordered eating tended to either start and remain elevated, or increase from adolescence to young adulthood (Neumark-Sztainer, Wall, Larson, Eisenberg, & Loth, 2011). More worrisome was that in general, those who dieted or practiced disordered eating behaviors during adolescent years had a significantly higher risk for continuing these behaviors even ten years later. The findings of our study offer first-hand experiences and opinions of adolescents within the critical age range for establishing healthy eating patterns and behaviors. The responses from participants within our FGs confirm that some adolescents may be viewing food in an unhealthy way, which based on previous data (Neumark-Sztainer et al., 2011) may suggest harmful behaviors could develop and continue on into young adulthood.

Although this study has several strengths, such as including focus groups for both males and females, there are limitations to note. FGs conducted within adolescents are

subject to the effects of social desirability which has the potential to bias results (Daley, 2013). Since participants were recruited within health classes, it is likely that they knew each other which could contribute to responses being influenced by peers. Self-reported survey data is also known to be subject to bias. Our sample was predominantly female adolescents, male perspectives and experiences may have been underreported. Our FGs were largely homogenous in terms of race, meaning our results may not be generalizable to other races or ethnicities due to varying cultural food practices. However, the goal of this study was not necessarily to be representative of a broader population, but rather to evaluate the appropriateness of this tool for this age group and gather information about adolescents' experiences with food.

Conclusion

This study aimed to determine the appropriateness of the E-DOS, a tool previously validated in an adult population, for a younger adolescent population. Moreover, we aimed to gather qualitative responses from adolescents regarding their views and opinions on food and nutrition. Our results show that adolescents were in agreement with researchers' interpretation of terminology on all but two survey questions, indicating good face and content validity of the E-DOS. Several items on the E-DOS elicited ambiguous responses from participants, indicating certain terms within the scale should be adapted or removed to be more suitable for this population. Differences in responses appeared between genders, with females offering responses frequently categorized in "body image" and "diet mentality" related codes, while males repeatedly made comments that fit into the codes "performance-based nutrition rules",

and “food is fuel”, indicating there may be a discrepancy between how food is viewed between male and female adolescents. Our results suggest that with minor modifications this tool is appropriate for use in this population. This will lead to obtaining a better understanding of eating behaviors in adolescents which will help in the subsequent diagnosis and treatment of disordered eating.

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CHAPTER 5

EFFECTIVENESS OF A VIDEO-BASED INTUITIVE EATING PROGRAM DELIVERED
WITHIN CLASSROOMS TO REDUCE DISORDERED EATING BEHAVIORS: A PILOT
STUDY**Abstract**

Purpose: Adolescence is critical time period during which eating behaviors and attitudes surrounding food are formed. Orthorexia Nervosa (ON) is a proposed eating disorder characterized by an obsession with eating healthful foods to the point that it causes psychological disturbances. Little is known about ON in adolescents. The objective of this pilot study was to determine the efficacy and feasibility of a video-based Intuitive Eating (IE) program designed to increase IE and decrease behaviors associated with ON in adolescents.

Method: A pilot quasi-experimental trial included ninth grade adolescents (N = 236) primarily between 13-14 years of age (79.4%) from four local high schools measured at baseline and post-program. Linear mixed effects models were used to determine differences between conditions (single session, multiple sessions, or standard nutrition curriculum) in ON behaviors, eating disorder (ED) symptomology, and levels of IE. ANOVA was used to explore associations between primary outcome variables.

Results: Baseline ON scores were positively correlated with EAT-26 scores ($r_s = .40$, $p < .0001$). No interaction or main effects for condition were found indicating that changes in outcome measures did not differ by condition; however, main effects for time and gender were seen for all primary outcome measures at posttest ($p \leq .01$). Boys scored

significantly lower than girls for ON behaviors and ED symptoms at posttest ($p = .01$ and $p < .0001$, respectively), and higher for IE at baseline ($p = .04$) and posttest ($p = .05$).

Level of interest in nutrition was significantly associated with ON risk ($p < .0001$), with ON behaviors increasing with higher levels of interest.

Conclusions: Level of interest in nutrition may be an important factor to consider when evaluating ON risk. Results suggest exposure to nutrition education or IE may improve risk factors associated with ON and ED's among adolescents. Further research is needed to determine if IE may be an appropriate approach to preventing or decreasing behaviors associated with ON among adolescents.

Introduction

Orthorexia Nervosa (ON) is a complex disorder that initially begins with the intent to follow all of the “correct” principles of eating.^{1,2} However, this focus can eventually become pathological in nature, and migrate toward an obsession with consuming only foods deemed healthy enough by the individual. This obsession is typically regulated by self-imposed dietary rules. Commitment to consuming healthful foods does not typically translate to negative consequences for the vast majority of individuals; however, for individuals with ON healthy eating transforms into an extreme, psychologically limiting, and potentially physically dangerous disorder.³ The National Institute of Mental Health defines EDs as serious illnesses that cause severe disturbances to a person’s eating behaviors.⁴ Despite parallels between ON and other eating disorders (EDs), ON has not been officially identified in the DSM-5.^{1,2} A defining distinction between ON and other eating disorders (EDs) is the motivation driving the dietary restrictions, namely the overt focus on quality of the food versus the quantity of the food.

While EDs can influence both genders at all different ages and backgrounds, the average age of onset for disordered eating habits occurs between ages 14-22, with risk factors that present earlier in adolescence having the ability to positively predict the development of EDs in the future.⁵ While ON is not currently considered a diagnosable ED, development of risk factors for this condition likely begin at an early age similar to other EDs, thus influencing the risk for developing an ED later in life. Recent data from the ‘Youth Risk Behavior Surveillance System’ showed that in 2017 approximately 47% of adolescents within grades 9-12 were actively trying to lose weight.⁶ Further, a 10-year longitudinal study found the prevalence of dieting among male and female adolescents

was approximately 25% and 50%, respectively. Rates of dieting remained fairly constant from adolescence to adulthood in both younger and older females, and younger males, but significantly increased (21.9% to 27.9%, $p < 0.001$) in the older cohort of males as they advanced from middle adolescence to middle young adulthood.⁷ This finding is especially concerning, considering that EDs are among some of the highest mortality rates within all mental disorders.⁸ Not only is dieting associated with a higher risk of developing an ED, it is also correlated with weight gain, depression, negative self-esteem, physiologic disturbances, and loss of ability to eat intuitively.^{9,10} Given the shared findings of dieting predicting ON and EDs, it is worthwhile to continue to identify effective and prevention strategies for this age group.

It has been proposed that helping individuals reconnect with their internal signals of hunger and satiety instead of relying on external cues or motivators (such as pressure from the media to achieve a certain body type or peer and parental influence) may be a better alternative to dieting, and may actually serve as a preventive strategy against risky eating behaviors.^{11,12} This anti-diet approach, known as “Intuitive Eating” (IE), focuses on helping individuals eat according to physical reasons driven by hunger and satiety cues, rather than emotional or environmental factors.^{10,11} There are three separate adaptive processes that represent IE: unconditional permission to eat (meaning an individual is free to eat in response to their hunger signals), eating for physical rather than emotional reasons (avoiding using food as a coping mechanism when unpleasant emotions are experienced), and reliance on physiological cues of hunger and satiety (understanding and recognizing what hunger and fullness feels like to an individual and relying on this to guide eating behaviors).¹¹

Interventions that implore an IE approach have had success in improving several psychological markers, including increased self-esteem,¹²⁻¹⁵ self-compassion,¹⁴ and life satisfaction,^{12,15,16} and decreased body dissatisfaction,^{12,17} internalization of the thin ideal,^{12,15} drive for thinness,¹⁸ perfectionism,¹⁹ depression,²⁰ and eating disorder symptomology.^{12,15,21} Studies have also shown IE to be negatively associated with the practice of dietary restraint and dieting.^{10,12} Further, IE has been shown to be inversely associated with a specific type of restrained eating known as “rigid control” (e.g., “all or nothing” mentality in regards to eating).¹⁶ Additionally, it has been shown that eating intuitively for physical rather than emotional reasons can decrease the likelihood for binge eating and food preoccupation.^{10,12,16}

The majority of studies published on IE have been cross-sectional designs, limiting understanding of how these behaviors influence risk factors over time. Recently, a longitudinal study spanning eight years provided further support for IE among a large cohort (n=1491). It was found that greater levels of IE at baseline and a subsequent increase in IE over time were both associated with a lower likelihood of having high depressive symptoms, low self-esteem, high body dissatisfaction, unhealthy and extreme weight control behaviors, and binge eating at follow-up, with the strongest protective effects being seen for binge eating.²² These results are novel in being the first to show the benefit that greater levels of IE have for a range of psychological and behavioral outcomes across time. The authors highlight the need to evaluate school-based nutrition education interventions that have integrated an IE approach to determine if IE could offer potential benefits in preventing harmful behaviors in comparison to the traditional nutrition education provided within schools.²²

Given the empirical evidence for IE, it is our hypothesis that the risky behaviors and attitudes IE has been shown to reduce coincide closely with the risky and potentially harmful behaviors present in individuals with ON. Much of the current convention surrounding health encourages restrictive dietary practices, with the underlying belief that strict cognitive monitoring is essential for maintaining a healthy appetite and avoiding eating in excess.²³ However, current evidence suggests that this rigid control, as seen in individuals with ON, leads to weight gain, loss of ability to eat according to internal cues, and higher incidence of disordered eating.²³

EDs in the United States are currently under-diagnosed and under-treated, with only one-third of individuals suffering from an ED receiving treatment.²⁴ Previous literature supports the efficacy and need for implementation of ED prevention and early intervention programs that aim to reduce ED specific risk factors. Dissemination of prevention and intervention materials can be improved by designing efficacious programs that are more feasible for implementation within universal populations. Public schools are a unique universal environment in which large, captive audiences of young individuals can be influenced in a positive way due to the number of risk factors they are exposed to.²⁵ Several systematic reviews and meta-analyses have indicated that universal prevention programs (those that target a general population of both genders with varying levels of risk) can have a modest effect in reducing risk factors associated with EDs.^{26,27}

The majority of ED prevention programs that exist are delivered in a multiple session format (i.e., two or more separate sessions or classes). Research findings have shown support for multisession programs that are interactive in nature, and are guided by a cognitive dissonance theoretical approach.^{27,28} Some suggest that programs providing

less than two sessions, or that are less than an hour in length, may be insufficient to induce lasting behavioral or attitudinal change.²⁹ Reasons for this may include the need for allowing time between sessions for participants to reflect on the material being taught, and thus act on and incorporate new skills.²⁷ Indeed, effect sizes tend to be larger among multisession programs versus single session programs.²⁷

Despite these findings, there has been a growing body of evidence providing support for single session ED prevention programs.³⁰⁻³³ There has been discussion regarding the need to reevaluate dissemination strategies that have been all but discarded, single session programs being one of those strategies.³⁴ As Wilksch points out, many of the previously studied single session programs were largely psychoeducational in nature versus focused on targeting specific ED risk factors, as well as delivered in a didactic manner versus interactively, both of which are associated with smaller effect sizes.^{27,34} Programs delivered in a single session format have the advantage of overcoming the potential barriers encountered with multisession programs, including lack of time, scheduling difficulties, and high cost.^{31,32} Investigating shorter or single session versions of longer established programs is one way to meet the demand for broader dissemination, as well as increase the organization's willingness to adopt the program for use within the curriculum.³⁴ Given the lack of literature regarding effective prevention or early intervention strategies for behaviors associated with ON, it is worth investigating if these behaviors can be positively modified with smaller doses of content designed to reduce the behaviors.

Current literature on ON has focused primarily on the creation of psychometric measures to identify individuals practicing ON behaviors, translation of these measures to

various languages, and using the instruments to determine prevalence of the disorder. A large limitation of the current body of research on ON is the use of convenience samples to evaluate ON behaviors (e.g., university students), and samples being predominantly female.³⁵ Published research is scarce regarding ON behaviors in adolescents, with only two studies having been conducted among this population.^{36,37} Thus, little is known about this disorder in younger individuals. Another limitation of the literature is a lack of studies that investigate familial or parental impact on individuals practicing risky behaviors associated with ON, adding to the lack of understanding on origins of this disorder.³⁵ Finally, no studies to date have investigated the efficacy of any type of prevention or intervention program on reducing behaviors associated with ON.

It is our hypothesis that individuals with ON are ignoring internal signals of hunger and satiety and instead eating based on their self-prescribed diet rules, therefore reducing their ability to eat intuitively and increasing the likelihood of suffering physical and psychological consequences. The purpose of this research study was to determine the effect of two versions of an IE program on risky behaviors associated with ON, as well as the correlation these behaviors have with an individual's ability to eat intuitively. The knowledge gained from this research has the potential to inform future prevention programs on possible mechanisms that decrease risky eating behaviors, specifically those associated with ON.

Methods

Procedure

Due to limitations within the schools, and with respect to individual teacher's

schedules, randomization was not feasible for this study. Therefore, we used a quasi-experimental study design. To avoid contamination of the two forms of the intervention, schools served as the selection unit where each school received only one form of the intervention, or served as the control. All health teachers (n=7) within high schools (n=4) in the Cache County School District (CCSD), Utah, were invited to participate via email (see Figure 5-1 for recruitment and participant flow). The schools included in the study are likely to have similar SES and demographic characteristics given that Cache County is fairly homogenous according to district demographic estimates reported by the National Center for Education Statistics.³⁸ School eligibility was determined based on whether any IE curriculum was typically taught during the trimester, all schools were determined to be eligible for participation. Follow-up meetings were scheduled in person with each teacher to orient them to the requirements of participating in the study. Teachers were given the option of which version of the IE program their teaching schedule would allow for given that the multisession IE program (three sessions total) required a greater time commitment. One school agreed to serve as the waitlist control, where students received the usual teacher-led nutrition curriculum. The IE program materials were given to teachers in the control group following the close of the study to implement within their future classes at their own discretion. Health courses were chosen to deliver the IE programs within because of the similarities between content within the course and program. Further, teachers were instructed to deliver the IE program within their nutrition unit to increase the applicability of the material provided. Health courses taught at the high schools are required for ninth grade freshman students, thus increasing the likelihood of having a representative sample. Blinding of participants was not

possible given the nature of the study. Approval for this study was obtained by the CCSD Research Review Committee, the Utah State University Institutional Review Board, and the individual school principals.

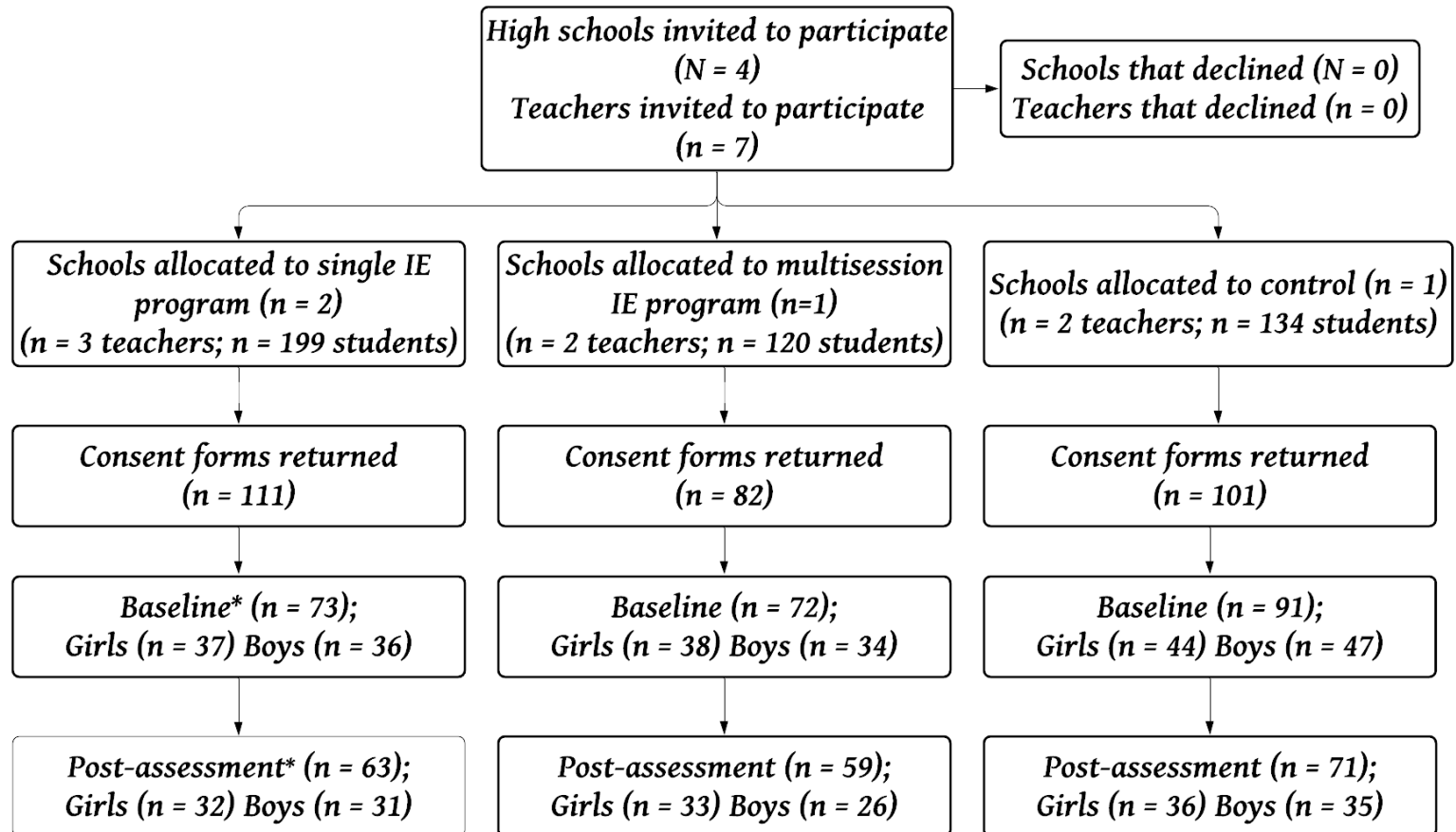


Fig. 5-1. Diagram of participant recruitment and flow.

*Counts reflect total after one single session schools data (n = 23) was removed and therefore was not included in LMM analysis.

Surveys with outcome measures were administered via online Qualtrics Survey software one class period prior to the IE program delivery in each intervention group, and in the class period following the end of the program. Control school teachers were instructed to administer the survey before starting the nutrition unit, and immediately following. Though the timing of program delivery within each classroom varied due to differences in when each teacher delivered their nutrition unit during the trimester, teachers within active intervention groups were instructed to conduct the program at the beginning of the nutrition unit to control for any bias that may arise from students receiving additional nutrition information.

Participants

Students

All male and female students enrolled in a required health course first trimester of Fall 2020 were eligible for inclusion. On the first day of the trimester, students received a parent information letter that they were instructed to take home to inform parents of the study. Per CCSD guidelines, informed consent documents requiring parent signature for data collection were sent home with students two weeks following the parent information letter. Active consent was required for collecting survey data only, as the IE curriculum had already been approved for use by teachers within CCSD classrooms. Only students with parental consent and those who provided written assent were included in data analysis.

Parents

All parents with children enrolled in a health class were given the option to provide their email address on their child's signed informed consent to participate in a one-time anonymous online survey. The parent survey included questions regarding the school their child attends, their gender, self-reported height and weight, interest level in nutrition, and two of the main outcome measures included on the student survey, the Intuitive Eating Scale (IES-2) and the English Dusseldorf Orthorexia Scale (E-DOS). Parent responses were matched to their child's response via an anonymous identifier created for each student participant.

Intervention

Expert review

Considering that this pilot study would be the first time the multisession program would be implemented, the program underwent an expert review prior to program delivery within the schools to identify any areas for improvement. Invitations to participate in the review included individuals who had an advanced degree in nutrition (MS or PhD), registered dietitians, eating disorder specialists, psychologists, academic researchers, school teachers/counselors, and/or those who specialized in program curriculum development. Of the 32 individuals invited to participate, 25% responded (n=8; 1 male, 7 females). Our sample included registered dietitians (RD) (n=3), academic researchers (n=2), a psychologist (n=1), a university administrator (n=1), and a wellness coordinator (n=1). Experts were asked to rate each of the three sessions (on a scale of 1-10, 1=low, 10=high) on the relevance to the content area, relevance to the population, and appropriateness level for the age group. None of the individual content areas within the program sessions were rated less than eight out of 10. They were also asked to provide

qualitative feedback on each individual component within the sessions, as well as overall feedback for each session. Revisions were made to the program based on the specific feedback from the experts prior to program implementation.

Framework

The single IE program was developed by a RD who specialized in working with clients with EDs and disordered eating, and the multisession program was constructed by a team of RDs (n=4), two of which had PhD qualifications in nutrition. Both programs were originally created to be delivered by RDs in person within the classroom setting. However, due to limitations and restrictions within schools at the time this program was implemented related to the COVID-19 pandemic, the content was recorded via video by the creator of the program. The videos included all original program material that would have been delivered in-person, and pre-timed breaks were built into the videos to allow for teacher-led guided discussions within each class. Teachers were provided detailed scripts with questions corresponding to each break within the video and were instructed to follow the script within the allotted time given for each discussion.

The single IE program had been frequently piloted and delivered within multiple high school health classes within the district by the creator of the program, and had been accepted by the school district as an acceptable curriculum for teachers to purchase and incorporate in their classrooms prior to the time the study took place. In addition to an expert review, the multisession program underwent pilot testing in January 2020 with the main author and creator of the single session program delivering each of the sessions to a group of senior dietetic students (n=12) and the instructors of the course (n=2) who had either Masters or PhD qualifications in nutrition. Recommendations to increase the

acceptability and flow of the sessions included: rearranging the order in which several content areas were presented, reorganizing the flow of the “Diet Rebel” activity, and refining discussions within the mindful eating activity. These recommendations were included in the final version of the multisession program referenced in this study.

Both the single and multisession IE program have the same aims: to help adolescents develop a healthier relationship with food, and decrease their propensity toward dieting by helping them learn how to eat in response to internal, rather than external cues. The programs are based on the 10 IE principles by Tribole and Resch³⁹; Reject the Diet Mentality, Honor your Hunger, Make Peace with Food, Challenge the Food Police, Respect your Fullness, Discover the Satisfaction Factor, Honor Your Feelings Without Using Food, Respect Your Body, Exercise-Feel the Difference, and Honor Your Health. Both programs were created based on characteristics established in the literature that are shown to produce larger effect sizes, and thus greater reduction in risk factors, including: having interactive versus solely didactic presentation (e.g., group discussions and in-class activities), use of dissonance induction strategies versus solely aiming to increase knowledge (e.g., discussing how to navigate social media, activities on the dangers of dieting, etc.), targeting well-established risk factors for EDs (e.g., dieting, emotional eating, body dissatisfaction, etc.), minimal psychoeducational content regarding EDs, content regarding body acceptance, use of validated psychometric measures, and the majority of content delivery being presented via professional interventionists versus solely by teachers or school counselors.²⁷

Though the two programs have the same aims, the multisession program has a greater number of interactive components and in-class activities to solidify the concepts

of the program. The question of whether behaviors associated with ON can be changed with small doses of content, or if larger doses are needed has remained unanswered until this point. From a feasibility standpoint, single session programs may be more realistic for incorporation on a universal school-wide level versus multisession programs. Several single session programs have been shown to have positive effects on eating behaviors,^{30,40} supporting the case that smaller doses, when delivered efficiently, may be a feasible alternative to multisession programs. Details regarding specific topics covered within each version of the program can be found in Table 5-1.

Table 5-1. Description of IE Programs

| | Activities | Worksheet |
|---|---|---|
| Single IE Program (55 min total x 1 session) | | |
| <ul style="list-style-type: none"> • Introduction to IE • The “Diet Mentality” • Focusing on additions with “Gentle Nutrition” • Understanding hunger/fullness • Finding the “click” with fullness • Emotional eating • Dichotomous food labeling • Body acceptance | <ul style="list-style-type: none"> • Class activity: Make 3 meals and 3 power snacks • Class discussion: Alternatives to emotional eating • Class activity: Some of the time versus most of the time foods • Class activity: Allow each student to state one thing they are grateful their body does for them functionally. | n/a |
| Multisession IE Program (165 min total x 3 sessions) | | |
| <i>Session 1</i> | | |
| <ul style="list-style-type: none"> • Introduction to IE • The “Diet Mentality” • The “Food Police” • Focusing on additions with “Gentle Nutrition” • Dichotomous food labeling | <ul style="list-style-type: none"> • Role Play Activity: Banishing the “Food Police” • Class activity: Make 3 meals • Class activity: Some of the time versus most of the time foods | n/a |
| <i>Session 2</i> | | |
| <ul style="list-style-type: none"> • Understanding hunger/fullness • Finding the “click” with fullness • Mindful eating • Smart snacking with power snacks | <ul style="list-style-type: none"> • Class activity: Mindful Eating Taste • Class activity: Make 3 power snacks | <ul style="list-style-type: none"> • Mindful eating worksheet • Power snacks worksheet |
| <i>Session 3</i> | | |
| <ul style="list-style-type: none"> • Emotional eating • Behavior chains • Body acceptance • Becoming multidimensional | <ul style="list-style-type: none"> • Class discussion: Alternatives to emotional eating • Class activity: Allow each student to state one thing they are grateful their body does for them functionally. • Class activity: Don’t keep all your eggs in one basket | <ul style="list-style-type: none"> • Emotional eating worksheet • Body acceptance worksheet |

Intervention Integrity

As a means of measuring program fidelity, each teacher received an audio recording device and was instructed to record each class period the program was delivered in. Teachers were also asked to provide the approximate percent completion of the program and discussion script following the conclusion of the program.

Outcome Measures

Primary outcome measures

Intuitive Eating. The Intuitive Eating Scale-2 (IES-2)¹⁵ is a 23 item questionnaire that measures an individual's ability to eat according to physical hunger and satiety cues rather than in reaction to emotions. The scale measures 4 dimensions: a) Eating for Physical Rather than Emotional Reasons, b) Unconditional Permission to Eat, c) Reliance on Hunger and Satiety Cues, and d) Body-Food Choice Congruence.¹⁵ This measure has shown to have good reliability ($\alpha = 0.88$) and validity ($r = 0.95$) among several cohorts, including two separate adolescent populations.^{15,41,42}

Orthorexia. The English Dusseldorf Orthorexia Scale (E-DOS) is a 10-item questionnaire that measures orthorexic eating behaviors. It uses a four-point Likert scale allowing individuals to rate their level of agreeance from "this applies to me" to "this does not apply to me". Higher DOS scores indicate greater tendency toward orthorexic behavior. This scale was developed by German researchers and shows high internal consistency ($\alpha = 0.84$) across several populations⁴³⁻⁴⁵, and high retest reliability ($r=0.67-0.79$, $p = 0.001$). Its English translated version that was validated in college age students

(M = 19.64 years) also has favorable psychometric properties with high internal consistency ($\alpha = .88$) and good construct validity ($r = 0.76$).⁴⁶

Eating Disorder Symptomology. The Eating Attitude's Test (EAT-26) is a 26-item questionnaire that is widely used to assess eating disorder risk in various populations including high school students.⁴⁷ Questions are presented in a Likert scale format, ranging from 'Never' to 'Always'. The measure includes three subscales; dieting, bulimia and food preoccupation, and oral control. It has been used in both clinical and non-clinical samples, and has been shown to be reliable and valid in being able to detect characteristics associated with anorexic and bulimic behaviors and attitudes. This tool has been shown to accurately distinguish between individuals with and without eating disorders with at least 90% accuracy.⁴⁸

Secondary outcome measures

Interest. Level of interest in nutrition was measured on an ordinal scale, from 'not at all interested' to 'very interested' and was measured at baseline and post-survey.

Program acceptability.

Students. Participants within the single and multisession programs were asked to provide information regarding their satisfaction of the program they were involved in. Students indicated their level of satisfaction with the programs on a 5-point Likert scale (*i.e.*, 1= Strongly disagree to 5= Strongly agree). Two open-ended questions were also included to solicit the students' feedback on specific things they liked about the program, and what, if anything, they would change about the program. Open-ended responses were coded into categories by the main author and totals within each category were calculated.

Teachers. Seven male (n=2) and female (n=5) teachers participated in the study.

Following the close of the program in each classroom, teachers who participated in an intervention group (n=5; 3 teachers implemented the single session program, 2 teachers implemented the multisession program) were sent a link to a Qualtrics survey inquiring about their opinions on the feasibility of incorporating the program into their classroom. This survey was anonymous, and teachers were provided a letter of information at the beginning of the survey. Both Likert scale and open-ended questions were included. Open-ended responses were compiled and analyzed by the main author.

Statistical analysis

Exploration of Variables. All statistical analyses were conducted using IBM Statistical package for Social Sciences version 26 (IBM SPSS). Differences in baseline interest levels were evaluated using chi-square test of independence between conditions and genders. ANOVA was used to evaluate differences between interest levels and continuous primary outcome measures. To evaluate change over time of the interest variable, difference scores were calculated from pre to post, where pre-survey levels were subtracted from post-survey levels ($D = Y - X$) and the differences between intervention groups were assessed using frequency tables and chi-square tests. Difference scores are often used in social and behavioral sciences to determine shifts in psychological constructs over time that are measured on ordinal scales.⁴⁹ Spearman rank-order correlations were used to assess relationships between parent and child BMI, DOS, and IES scores, as well as relationships between student baseline DOS, IES, and EAT scores.

Linear Mixed Modeling. In preliminary analyses, baseline differences between condition and gender were evaluated using ANOVA or chi-square tests with an α level of .05 for all outcome and demographic variables. Primary outcomes were evaluated using

linear mixed effects model (LMM) analyses to determine main and interaction effects of condition and time, as well as other potential interactions. LMM was chosen as the method of analysis for this data given its ability to take into consideration the nesting within the data (i.e., students nested within classrooms within teachers within each respective school). This allowed for analysis of individual differences in scores across time rather than averaged scores across conditions, and allowed us to use all available data instead of excluding participants with only one data point. The effect of changes within conditions over time was modeled by including an interaction term for condition (single session, multisession, control)*time (pre-program, post-program). Random effects were included to account for nesting at the participant, classroom, and teacher level. Baseline scores were included as fixed factors. All models were run using baseline interest and BMI as covariates. A Bonferroni adjustment was applied to account for multiple comparisons between intervention groups and gender. Effect sizes for group pairwise comparisons were calculated using Cohen's *d*, where the difference in adjusted means within intervention groups and between genders from pre to post were divided by the pooled standard deviations of each group at each measurement (small effect $d = 0.20-.49$; medium effect $d = 0.50-.79$; large effect ≥ 0.80).

Results

Descriptive data

Demographic characteristics of participants are summarized in Table 5-2.

Baseline scores from pre to post were highly correlated for three out of four schools on all outcome measures. Data from one of the schools participating in the single session

intervention was removed and not included in the final model, as pre and post scores on all outcomes measures showed no correlation and data was thus determined to be unreliable. Further, this school yielded the smallest sample size ($n=23$) which was determined to be a potential contributor to the unreliability of data.

Of the survey responses collected, eight responses were removed due to less than 5% of the survey being completed. Thus, the initial sample of students with parental consent who were present at the time baseline measures were administered included 236 students (61% of a potential pool of 386 students; 117 boys, 119 girls). Within each intervention condition, 73 students completed baseline measure for the single session, 72 within the multisession, and 91 within the control. Participants were predominantly Caucasian (83%), with the remainder identifying as Hispanic (7.7%), Asian (2.5%), American Indian (1.8%), Black/African American (1.1%), Native Hawaiian (1.1%), or Other (3.2%). Students were allowed to identify with as many cultural backgrounds as were applicable. Students were primarily 13-14 years of age (79.4%) and freshman (82.3%), followed by 15-16 years (19.4%), and 17-18 years (1.2%). Self-reported height and weight were used to calculate Body Mass Index (BMI) and percentile values (based on current Centers for Disease Control and Prevention guidelines⁵⁰) for male and female teenagers for 95% of participants ($n=12$ participants missing height and weight). Eighty-two percent of the original sample ($n=193$; 63 single session, 59 multisession, 71 control) completed the post-program survey. Thus, 222 participants ($n=111$ boys; $n=111$ girls) were included in the present analysis.

We observed no significant differences in demographic characteristics or baseline measures by condition ($p > .05$ for all). Average BMI was 21.5 for girls ($SD = 4.3$) and

20.6 for boys (SD = 4.1). Average BMI percentile for girls was 59.4%, (SD = 28.2) and 52% for boys (SD = 31.3). 5.8% of students (n=13) were below the 5th percentile for age and sex (underweight), while 22.3% were above the 85th percentile (14.7% overweight; 7.6% obese).

Table 5-2. Sample characteristics at baseline.

| | Single Session (n=73) | Multisession (n= 72) | Control (n=91) | Total Sample (N =236) |
|--|--------------------------|-------------------------|-------------------|--------------------------|
| Gender, n(%) ^a | | | | |
| Boys | 36 (49.3) | 34 (47.2) | 47 (49.6) | 117 (49.6) |
| Girls | 37 (50.7) | 38 (52.8) | 44 (48.4) | 119 (50.4) |
| Age in years, n(%) ^b | | | | |
| 13-14 | 55 (76.4) | 55 (76.4) | 75 (82.4) | 185 (78.7) |
| 15-16 | 17 (23.6) | 14 (19.4) | 16 (17.6) | 47 (20) |
| 17-18 | 0 (0) | 3 (4.2) | 0 (0) | 3 (1.3) |
| Grade, n(%) ^c | | | | |
| Freshman | 71 (98.6) | 67 (93.1) | 87 (95.6) | 225 (95.7) |
| Sophomore | 0 (0) | 2 (2.8) | 2 (2.2) | 5 (2.1) |
| Junior | 1 (1.4) | 2 (2.8) | 2 (2.2) | 5 (2.1) |
| Senior | 0 (0) | 1 (1.4) | 0 (0) | 1 (0.4) |
| BMI percentile, M(SD) ^d | 59.9 (30.3) | 51.1 (31.9) | 56.1 (28.0) | 55.7 (30) |
| BMI category ^e | | | | |
| Underweight (< 5 th percentile) | 4 (6) | 6 (8.7) | 3 (3.4) | 13 (5.8) |
| Healthy (≥ 5 th percentile and ≤ 85 th percentile) | 44 (65.7) | 50 (72.5) | 67 (76.1) | 161 (71.9) |
| Overweight (≥ 85 th percentile and ≤ 95 th percentile) | 10 (14.9) | 8 (11.6) | 15 (17.0) | 33 (14.7) |
| Obese (≥ 95 th percentile) | 9 (13.4) | 5 (7.2) | 3 (3.4) | 17 (7.6) |
| Interest in Nutrition, n(%) ^f | | | | |
| Not interested at all | 12 (16.7) | 8 (11.1) | 7 (7.7) | 27 (11.5) |
| Somewhat interested | 39 (54.2) | 38 (52.8) | 52 (57.1) | 129 (54.9) |
| Interested | 17 (23.6) | 24 (33.3) | 28 (30.8) | 69 (29.4) |
| Very interested | 4 (5.6) | 2 (2.8) | 4 (4.4) | 10 (4.3) |

^a $\chi^2(2) = .32, p=.85$ ^b $\chi^2(4) = 7.8, p=.10$ ^c $\chi^2(6) = 4.6, p=.60$ ^d $F(2, 224) = 1.47, p = .23; \eta p^2 = .01$ ^e $\chi^2(9) = 8.3, p=.22$ ^f $\chi^2(6) = 4.9, p=.56$

Primary outcomes

Adjusted means for outcome variables at each time point within conditions are shown in Table 5-3, and adjusted means for genders at each time point are shown in Table 5-4. The LMM results showed that the interaction term condition \times time was not statistically significant for any outcome measure (DOS, IES, EAT-26) ($p > .05$), indicating that changes in outcome measures did not differ by condition. Significant main effects for time, gender, interest, BMI, and interactions between time \times gender were observed across outcome measures and are discussed individually below.

DOS. We observed lower DOS scores indicating fewer ON related behaviors at the post-test assessment compared to the pre-assessment for all conditions indicating a main effect for time [$F(1,185) = 6.13, p = .01$]. Interest in nutrition was also associated with higher DOS scores [$F(1,214) = 35.28, p < .0001$]. A time \times gender interaction was also found [$F(1,186) = 8.39, p < .004$]; boys had lower DOS scores than girls at posttest ($p = .01, d = .23$).

IES. A main effect for time [$F(1,160) = 37.68, p < .0001$], gender [$F(1,213) = 4.66, p = .03$], and BMI [$F(1,216) = 7.54, p = .007$] were seen. Post-hoc analyses for gender revealed on average both girls and boys IES scores increased from pre to post, though boys experienced a slightly higher increase as shown by mean differences (MD = .15, $p < .0001, d = .20$). For the subscale ‘Eating for Physical Rather than Emotional Reasons’ (EPR), a main effect for time [$F(1,174) = 19.72, p < .0001$], and gender [$F(1,210) = 8.44, p = .004$] were seen, with boys scoring higher than girls at post-test by an average of 0.33 points ($p = .004, d = .21$). The ‘Unconditional Permission to Eat’ (UPE) subscale showed a main effect for time [$F(1,178) = 6.31, p = .013$], interest

[$F(1,217) = 13.72, p < .0001$], and gender [$F(1,211) = 3.85, p = .05$], with boys scoring higher than girls at post-test ($M = .19, p = .05, d = .18$). The ‘Reliance on Hunger and Satiety Cues’ (RHSC) subscale showed a main effect for time [$F(1,173) = 4.73, p = .03$] and BMI [$F(1,215) = 4.70, p = .03$]. Finally, the ‘Body-Food Choice Congruence’ (B-FCC) showed interest was the only significant predictor of change in scores [$F(1,219) = 16.64, p < .0001$].

EAT. A main effect for time [$F(1,168) = 8.89, p = .003$], and gender [$F(1,203) = 15.37, p < .0001$] were seen, with post-hoc analysis showing boys scored lower than girls at post-test by an average of 3.80 ($p < .0001, d = .36$). The ‘Dieting’ (D) subscale showed a main effect for time [$F(1,167) = 10.91, p = .001$], BMI [$F(1,183) = 7.93, p = .005$], and gender [$F(1,205) = 16.26, p < .0001$], with girls showing average improvement of 1.02 points from pre to post ($p = .002, d = .13$), though boys still scored lower at posttest by an average of 2.56 given a lower average baseline score ($p < .0001, d = .34$). The ‘Bulimia and Food Preoccupation’ (BFP) subscale showed a main effect for gender [$F(1,207) = 6.56, p = .01$], where boys were on average 0.48 points lower than girls at posttest ($p = .02, d = .23$). The ‘Oral Control’ (OC) subscale also showed a main effect for gender [$F(1,204) = 4.44, p = .04$], with boys scores on average being 0.86 lower than girls ($p = .001, d = .13$).

Table 5-3. Linear mixed model estimated marginal means for outcomes by condition

| | Single Session | | Multisession | | Control | | Time × Condition |
|-----------|----------------------|---------------------------|----------------------|--------------------------|----------------------|---------------------------|------------------|
| | Pre <i>M (SE)</i> | Post <i>M (SE)</i> | Pre <i>M (SE)</i> | Post <i>M (SE)</i> | Pre <i>M (SE)</i> | Post <i>M (SE)</i> | <i>p</i> value |
| DOS | 15.65 (.52) | 15.08 (.52) | 16.84 (.51) | 16.27 (.52) | 16.58 (.46) | 15.85 (.47) | .95 |
| IES | 3.46 (.05) | 3.62 (.07) ^{***} | 3.38 (.05) | 3.53 (.07) ^{**} | 3.41 (.04) | 3.56 (.06) ^{***} | .97 |
| IES-EPR | 3.64 (.13) | 3.80 (.14) [*] | 3.30 (.13) | 3.43 (.14) [*] | 3.50 (.12) | 3.72 (.13) ^{**} | .61 |
| IES-UPE | 3.41 (.07) | 3.47 (.09) | 3.46 (.08) | 3.60 (.09) [*] | 3.35 (.07) | 3.45 (.08) | .67 |
| IES-RHSC | 3.57 (.09) | 3.73 (.11) | 3.53 (.09) | 3.64 (.11) | 3.48 (.08) | 3.57 (.11) | .89 |
| IES-B-FCC | 3.26 (.09) | 3.29 (.09) | 3.51 (.09) | 3.57 (.09) | 3.50 (.08) | 3.44 (.09) | .56 |
| EAT | 7.86 (.97) | 5.98 (.90) ^{**} | 7.84 (.96) | 7.24 (.90) | 6.99 (.86) | 6.03 (.81) | .96 |
| EAT-D | 4.89 (.68) | 3.89 (.64) [*] | 4.68 (.68) | 4.23 (.64) | 4.35 (.60) | 3.53 (.58) [*] | .63 |
| EAT-BFP | 0.60 (.15) | 0.26 (.17) | 0.44 (.16) | 0.71 (.17) | 0.36 (.14) | 0.29 (.16) | .08 |
| EAT-OC | 2.34 (.40) | 1.88 (.37) | 2.83 (.38) | 2.58 (.36) | 2.28 (.34) | 2.18 (.32) | .65 |

Test of significant pairwise comparisons within conditions over time: * $p \leq .05$, ** $p \leq .01$, *** $p \leq .0001$. M, adjusted estimated marginal mean; SE, standard error. Model was controlled for Interest and BMI. DOS = English-Dusseldorf Orthorexia Scale; IES = Intuitive Eating Scale-2; IES EPR = Eating For Physical Rather Than Emotional Reasons Subscale; UPE = Unconditional Permission to Eat Subscale; RHSC = Reliance on Hunger and Satiety Cues Subscale; B-FCC = Body-Food Choice Congruence Subscale; EAT = Eating Attitudes Test; EAT-D = Dieting Subscale; EAT-BFP = Bulimia and Food Preoccupation Subscale; EAT-OC = Oral Control Subscale

Table 5-4. Linear mixed model estimated marginal means for outcomes by gender at pre and posttest

| | Pre | | Post | | Time × Gender <i>p</i> value |
|-----------|--------------------------------|---------------------------------|--------------------------------|---------------------------------|---------------------------------|
| | Boys <i>M</i> (<i>SE</i>) | Girls <i>M</i> (<i>SE</i>) | Boys <i>M</i> (<i>SE</i>) | Girls <i>M</i> (<i>SE</i>) | |
| DOS | 16.36 (.41) | 16.35 (.41) | 15.01 (.42) | 16.46 (.41)** | .004 |
| IES | 3.47 (.04) | 3.36 (.04)* | 3.65 (.05) | 3.50 (.05)* | .46 |
| IES-EPR | 3.61 (.09) | 3.35 (.09)** | 3.81 (.10) | 3.49 (.10)** | .37 |
| IES-UPE | 3.47 (.06) | 3.35 (.06) | 3.60 (.07) | 3.41 (.07)* | .38 |
| IES-RHSC | 3.58 (.07) | 3.65 (.09) | 3.65 (.09) | 3.64 (.09) | .39 |
| IES-B-FCC | 3.41 (.07) | 3.43 (.07) | 3.41 (.08) | 3.46 (.07) | .78 |
| EAT | 5.65 (.76) | 9.49 (.75)*** | 4.52 (.72) | 8.32 (.70)*** | .96 |
| EAT-D | 3.10 (.54) | 6.18 (.53)*** | 2.60 (.51) | 5.16 (.50)*** | .26 |
| EAT-BFP | 0.31 (.13) | 0.62 (.12) | 0.18 (.14) | 0.66 (.14)* | .41 |
| EAT-OC | 2.28 (.28) | 2.69 (.28) | 1.79 (.26) | 2.64 (.56)** | .18 |

Test of significant pairwise comparisons between genders at pre and post: * $p \leq .05$, ** $p \leq .01$, *** $p \leq .0001$. *M*, adjusted estimated marginal mean; *SE*, standard error. Model was controlled for Interest and BMI. DOS = English-Dusseldorf Orthorexia Scale; IES = Intuitive Eating Scale-2; IES EPR = Eating For Physical Rather Than Emotional Reasons Subscale; UPE = Unconditional Permission to Eat Subscale; RHSC = Reliance on Hunger and Satiety Cues Subscale; B-FCC = Body-Food Choice Congruence Subscale; EAT = Eating Attitudes Test; EAT-D = Dieting Subscale; EAT-BFP = Bulimia and Food Preoccupation Subscale; EAT-OC = Oral Control Subscale

Secondary outcomes

Interest levels. Level of interest in nutrition did not vary between conditions at baseline $\chi^2(6, N = 235) = 5.13, p=.53$), though differences were observed between genders at baseline, with a greater percentage of boys than girls indicating they were not interested at all in nutrition $\chi^2(3, N = 235) = 8.58, p = .04$). Differences in baseline DOS scores were found between each level of interest ($F(3,229) = 11.41, p < .0001$), with those who indicated they were ‘Very interested’ ($M = 21.2$) or ‘Interested’ ($M = 18$) scoring higher on the DOS than those who were ‘Somewhat interested’ ($M = 15.47$) or ‘Not interested at all’ ($M = 14.37$) ($p < .0001$ and $p = .001$, respectively). No difference was found between those who were ‘Very interested’ and ‘Interested’ ($p = .18$), or those who were ‘Somewhat interested’ or ‘Not interested at all’ ($p = .62$). Differences in means on the IES or EAT did not vary between levels of interest ($p > .05$ for both). The majority of students’ interest levels remained unchanged at posttest (70%), while 11% became more interested in nutrition, and 19% became less interested. Changes in level of interest across time did not vary by condition $\chi^2(6, N = 192) = 3.96, p=.68$) or gender $\chi^2(6, N = 235) = 5.13, p=.53$).

Correlations between DOS, IES, and EAT scores. Baseline primary outcome measures were correlated for two of the three measures; IES and EAT scores ($r_s = -.20, p = .002$) were inversely associated, and DOS and EAT scores were positively associated ($r_s = .40, p < .0001$). DOS and IES scores were not associated ($p = .07$).

Parent/child correlations. Of the 224 parents who provided their email, 27.2% ($n=61$) accessed the online survey. Several ($n = 7$) responses were removed due to either incomplete survey responses ($n = 3$), or no student baseline survey match ($n = 4$),

resulting in 54 (n = 4 males, n =49 females, n = 1 other) paired parent-child survey matches for analysis. The majority of parents (74.1%) indicated being either very interested (n=19) or interested (n = 21) in the subject of nutrition. 24.1% indicated they were somewhat interested, and 1.9% indicated no interest in nutrition. Self-reported height and weight provided by 98% of parents were used to calculate BMI (M = 26.3, SD = 5.7). Parent BMI was significantly positively correlated with child BMI ($r = .42$, $p = .002$). Average parent DOS score was 17.1 (SD=4.3), and average IES score was 3.4 (SD = .42). Parent interest levels were not associated with DOS scores ($p = .09$). No relationship was found between parent IES and DOS ($p = .22$). Further, no significant correlation was found between parent and child DOS scores ($p = .37$), IES scores ($p = .19$), or level of interest ($p = .34$).

Program acceptability

Students. Of the 192 students who were in either the single session or multisession program, 81% (n=155; n=90 single session, n=65 multisession) provided feedback indicating their acceptance of the programs. Of the participants within the single session and multisession programs, 77% and 88%, respectively, indicated they either strongly agreed or somewhat agreed that the program taught them at least one new thing they thought would help them in the future. 76% and 78%, respectively, indicated the IE class was applicable to individuals their age. 66% and 75%, respectively, revealed they felt the IE class helped them think about food and nutrition in a more positive way. 56% and 54%, respectively, indicated the IE class changed their thoughts and/or opinions about diets and dieting. Finally, 53% and 54% stated the IE class had a positive effect on the way they thought about their bodies.

The most common open-ended responses of students' favorite parts of the single session program included the nutrition specific information provided (19%), new information on intuitive eating (11%), learning to eat without rules (9%), and reframing the concept of "good" and "bad" foods (8%). For the multisession, students mentioned most often that they liked the mindful eating activity (50%), the "diet voices" activity (7%), and learning how to listen to hunger and fullness cues (7%). Open-ended responses regarding aspects of the programs students would change revealed 68 (81%) in the single session and 40 (66%) in the multisession stating they would not change or alter the program. Themes that emerged for program dislikes in the single session included delivering the program via video versus in person (3%) and lack of activities (3%). Unfavorable aspects of the multisession program were delivering the program via video versus in person (20%) and the program being too long (3%).

Teachers. Of the teachers who participated in program implementation, 80% (n=4; n=2 single session and n=2 multisession) completed the survey. All teachers that participated in the survey rated the programs as "very relevant" for their students, and stated they would be willing to incorporate the program into their current nutrition curriculum. Overall program ratings by teachers were "good" (50%) or "very good" (50%) (on a 5-point scale from "poor" to "excellent"). Ratings regarding the ease of following the teacher script that was provided for class discussions during pre-determined pauses in the video were mixed, and were as follows: "very easy" (n=1), "somewhat easy" (n=1), "neutral" (n=1), and "somewhat difficult" (n=1). Regarding the open-ended question on the most-liked aspects of the programs, teachers mentioned they appreciated the script that was provided, the handouts, applicability of the information to the age

group, ease of understandability of the content, and that it was delivered by an expert. Responses as to aspects of the program that were unfavorable included the method of delivery (with preference to in-person delivery versus videos) and overall lack of time to incorporate the program.

Discussion

Main findings

This study investigated the efficacy and acceptability of two versions of a video-based IE pilot program designed to reduce behaviors associated with ON, and subsequently increase IE in adolescents. Our findings show that irrespective of the condition participants were in, improvements across time were seen for all primary outcome measures. Further, program acceptability among students and teachers was high.

An interesting finding within this study was the contrast between genders on not only baseline scores, but also changes across time. Baseline scores were consistently lower for boys on both ED measures (DOS and EAT), and higher for IE than girls. Boys in our sample showed significant improvement across time regardless of condition on the DOS (MD = -1.35), while girls showed no change ($p = .76$). This finding is encouraging for boys, indicating that even a small exposure to nutrition education may have a positive impact on ON risk factors. However, given the lack of change seen in girls, this could indicate that future prevention approaches for ON may need to be tailored more for a female population. Additionally, more work is needed to understand program attributes that contribute to a reduction in risky behaviors associated with ON among girls, and if these attributes are different than those that invoke change for boys. A recent literature review by McComb and Mills³⁵ concluded gender appears to be unrelated to ON,

however, the vast majority of studies included in the review were comprised of adult populations. Based on our findings, it appears gender differences were present among an adolescent population in behaviors related to ON, as well as how each gender changes over time in response to IE information or traditional nutrition curriculum. These gender differences should continue to be evaluated in future prevention programs in order to determine the best approach, and, whether gender may impact the efficacy of the program. Encouragingly, although girls scored higher on average than boys on the DOS, average scores among both genders were still well below the cut-off range for the DOS indicating neither risk for ON (score between 25-29), or presence of ON behavior (score ≥ 30) in our sample.

Our results regarding DOS scores decreasing over time following exposure to nutrition education or IE are promising. However, given that improvements in scores were seen across conditions regardless of the program participants received, the question as to whether our specific programs have the ability to lessen ON behaviors, or, if IE in general may be a potential approach to decreasing ON behaviors cannot directly be answered. Nevertheless, this finding may suggest that exposure to nutrition education in some capacity may be a viable component of future intervention or prevention programs. Higher levels of nutrition knowledge have not only been tied to better body esteem and less frequent use of dieting and weight loss practices,⁵¹ but more specifically to lower risk of practicing ON behaviors.⁵²⁻⁵⁵ Defining what areas of nutrition education specifically are associated with a potential decrease in ON behaviors may be an interesting area for future research.

Baseline IES scores among girls in this study ($M = 3.36$) are comparable to those

of the female participants in Healy and colleagues⁴¹ evaluation of an IE program among adolescents ($M = 3.33$), though boys in the current study scored higher on average ($M = 3.47$) than boys in their sample ($M = 3.05$). The literature regarding the impact of gender on IE is scarce, however, our findings are consistent with several studies⁵⁶⁻⁵⁸ who also found IE scores were higher in boys than girls, though it is important to consider that these studies were conducted in adult populations. Similar to Camilleri et al.'s⁵⁹ findings, our sample showed boys scored higher than girls at posttest on the 'Unconditional Permission to Eat' and 'Eating for Physical Rather than Emotional Reasons' subscales of the IES. Regarding differences on the 'Unconditional Permission to Eat' subscale, several studies^{10,15,56} have found that men are more likely to trust their bodies to tell them how much to eat when compared to females, which may explain why boys in our sample scored higher overall on the IES at baseline and follow-up than girls, as well why they had higher scores on this particular subscale. The differences in 'Eating for Physical Rather than Emotional Reasons' scores can partially be explained by findings in the literature that adult females engage in emotional eating more frequently than adult males,⁶⁰ and one study showing adolescent girls were more likely to cope with their emotions using food than boys.⁴² Conversely, at least one study has shown no gender differences in emotional eating in adolescents specifically.⁶¹ Further, prevalence of emotional eating is said to be fairly low in adolescents.⁶² More work is needed to understand if a true gender difference exists regarding physical versus emotional motivations for eating in adolescents.

The differences seen in IE between boys and girls in our study are worth examining further given the elevated rates of pathological eating in adolescents,

specifically females.^{22,63,64} Adolescence is a critical developmental period where beliefs, attitudes, and behaviors surrounding eating are formed. Current literature supports the notion that there is potential for these patterns to continue on into young adulthood.^{10,65} Greater levels of IE have consistently been associated with protective effects on both behavioral and psychological health, with these effects continuing on into adulthood.²² Andrew and colleagues' ⁶⁵ investigation of potential predictors of IE in female adolescents highlighted several findings that may inform development of future ED prevention programs. Interestingly, they found the strongest predictor of IE in their sample was body appreciation, followed by lower levels of social appearance comparison and self-objectification. This finding was supported by Dockendorff et al.,⁴² who found IES scores were inversely associated with body dissatisfaction. The link between IE and body appreciation is interesting given that body dissatisfaction is a well-known risk factor in the development of EDs.^{66,67} This provides continued support for intervention programs that objectively aim to reduce the beliefs surrounding, and the pursuit of, the culturally accepted and encouraged "thin-ideal". Reductions in the thin-ideal subsequently lead to reductions in body dissatisfaction, as well as other established ED risk factors (e.g., dietary restriction, negative affect, and ED symptomology).⁶⁶

The effect that level of interest in the subject of nutrition had on ON risk was an interesting finding in the present study. Although this is not currently recognized as a risk factor for established EDs, it has previously been assumed to be associated with ON given that ON stems from a pathological interest in healthy eating, though no published literature to date has formally measured level of interest. Previous unpublished work by King and Wengreen that did include a formal measure of level of interest in a sample of

undergraduate students found that greater levels of interest in nutrition were positively associated with greater levels of ON, though greater levels of nutrition knowledge seemed to decrease risk for ON.⁶⁸ The current study reiterated these findings, with greater levels of interest in nutrition being associated with higher DOS scores. Following the assumption that those studying within the field of nutrition are presumed to be interested in the subject, ON has also been previously studied in nutrition students. Fortunately, studies show greater levels of nutrition education seem to predict lower levels of ON.^{44,55} Based on previous work and the current study's findings, those who are interested in the subject of nutrition may be more likely to engage in ON behavior, though greater levels of nutrition education seem to have a protective effect by preventing the desire to become healthier from becoming an obsession. Thus, this may provide preliminary support for including level of interest in nutrition when screening for ON behaviors in order to identify those who may be at higher risk. Another potential interpretation may also be that current screening tools are unable to differentiate between individuals who are simply more interested in practicing healthful behaviors, and those who suffer from ON because they experience psychological impairments as a result of an obsession with achieving health.

To our knowledge, correlations between the primary outcome measures in this study have not been tested previously, therefore direct comparisons between others' work is difficult. However, the direction of the relationship observed within the current sample supports our hypothesis that orthorexic behavior would be positively associated with higher levels of ED symptomology. While it appears there is a relationship between the DOS and EAT, there is evidence that ON is a distinct disorder, and theoretically the tools

should be measuring different constructs.^{69,70} Since the question of whether ON is a separate condition or a subset of an existing ED continues to be widely debated, analyses to determine convergent validity between these measures may be helpful in determining what specific constructs of ON are associated with ED behaviors as measured by the EAT.

Contrary to our hypothesis and others' findings,⁷¹ ON was not inversely associated with IE. One would predict that an individual practicing orthorexic behaviors would not be eating intuitively, as an IE approach discourages following self-imposed dietary restrictions and neglecting internal hunger and satiety cues as a result of the self-imposed restrictions. As defined by Tribole and Resch,³⁹ individuals who give themselves unconditional permission to eat listen to physiological symptoms of hunger, and avoid characterizing food in dichotomous categories of "good" or "bad". Within the literature, individuals who allow themselves permission to eat unconditionally tend to engage less often in binge eating or overindulgence, as there are no dietary rules in place to determine when or how much food they are allowed to eat. Granting unconditional permission to eat is also associated with greater levels of psychological flexibility and mindfulness,⁷² and lower levels of body concern and BMI.^{73,74} A qualitative study by Barraclough and colleagues⁷⁵ indicated adopting the "unconditional permission to eat" aspect of IE to be the most difficult, however, participants in our study regardless of condition or gender saw improvements within this subscale. This qualitative work was done in adult females, which may be a preliminary indication that adolescents are more receptive to adopting a more flexible approach to eating based on the results in our study. Longitudinal studies would be appropriate to explore the relationship between IE and ON

further, and investigate whether lower levels of IE might serve as a risk factor for orthorexic behaviors.

As others' who have conducted universal school-based studies have mentioned, there is a potential for floor or ceiling effects to blunt program effects given that the samples included are generally healthy compared to clinical populations.⁷⁶ In line with previous universal school-based ED intervention programs, effect sizes seen with our outcomes measures were small.^{27,67} Interestingly, some of the effect sizes seen in the current study were comparable to that of a similar study design by Atkinson and Diedrichs³¹ who also used a video-based ED intervention program approach.

Program acceptability/feasibility

The majority of feedback from teachers that participated in the program was positive, with all teachers stating they would incorporate the program into their curriculum. Although the teacher-component in this study was minimal and content was largely delivered by a RD, allowing teachers to facilitate external curriculums with their classrooms has the potential to help increase the dissemination of evidence-based information to universal school-based settings. Further, there is greater flexibility when teachers are able to implement the curriculum at their convenience, versus scheduling professional interventionists to facilitate the curriculum within the classroom. However, issues regarding proper implementation of programs by teachers within school-settings have been brought to light in the literature, including the potential for omission of specific topics designed to be covered within the curriculum, or including topics that are not specified in the curriculum.⁷⁷ Moreover, current recommendations for ED program implementation show effect sizes tend to be larger within programs that employ

professional interventionists versus teacher-based delivery.²⁷ Given that this program was originally designed to be solely delivered by RDs devoid of any teacher facilitation, future dissemination of this program and any future RCT's that evaluate the effectiveness of this program should be delivered accordingly in order to better understand the true efficacy of the program. Regarding program feasibility, teachers who received the multisession program discussed the challenges of allowing time within their established curriculum to incorporate the program. This is a barrier to future implementation of prevention programs, as lengthy programs may be less likely to be implemented.⁷⁸ Although no "optimal" dose for ED prevention programs has been established,⁷⁹ research suggests that multisession programs tend to produce greater effect sizes,⁸⁰ though very little research exists investigating efficacy of single session programs. This perception of lack of time may be mitigated by providing additional training on how to incorporate the prevention programs into the nutrition curriculum already being provided by teachers.

Strengths and Limitations

The design of this study addresses several important gaps in current literature. It is the first to evaluate the effectiveness of an IE program on reducing behaviors associated with ON, examine potential relationships between IE and ON behaviors, and elaborate on the role interest in nutrition has on ON risk. However, there are several limitations worth noting. First, this program was designed to be delivered in-person with trained facilitators delivering the content and conducting the discussions with students. However, in-person delivery of the program within the classrooms was not feasible due to the COVID-19 pandemic. Further, this limited our ability to interact with and train teachers on how to properly conduct the discussions as school district restrictions prohibited researchers

from entering school settings. Second, given the difference in time requirements for each program, randomization was not feasible. Ideally a follow-up would have been included as well, however, teachers were resistant to allot more time for a third administration of the survey. Third, though we completed an expert review and piloted the multisession program and overall acceptability and feasibility was favorable, ratings were based on in-person delivery of the program given that the school restrictions were placed after the pilot and expert review were completed which led to the creation of the pre-recorded video method of delivery. Ideally, we would have piloted the pre-recorded videos as well. Fourth, several teachers did not audio-record the sessions as instructed, and program adherence was only assessed by teacher self-report. Additionally, the time at which the program was delivered within the nutrition unit varied between schools and teachers. Though teachers were instructed to deliver the program at the beginning of the nutrition unit to avoid information bias, several teachers administered the programs in the middle or at the end of the unit after the traditional nutrition curriculum had been delivered. Finally, self-reported measures are always subject to potential biases in responses.

Conclusion

To our knowledge, this is the first study to evaluate the relationship between IE and ON in adolescents. Further, it is the first to investigate the effectiveness and feasibility of a video-based program designed to reduce risky eating behaviors associated with ON in adolescents. Preliminary evidence suggests level of interest in the subject of nutrition may influence ON risk; more research is needed to explore if this could serve as a valuable identifiable risk factor. The single session and multisession programs were

accepted by students and teachers, though students expressed an in-person presentation would have been preferred, and teachers expressed time constraints were a barrier to implementation. It would be worthwhile to conduct a randomized implementation of this program when in-person program delivery is possible. Improvements were seen over time across all conditions in the primary outcomes regardless of the program received; on average boys exhibited fewer ED symptoms and higher levels of IE than girls at baseline. Further, boys saw larger decreases in ON behaviors and ED symptoms at posttest, and higher levels of IE at posttest than girls. Girls did not experience changes in ON behavior over time. Contrary to others' findings, ON was not inversely associated with IE in our sample; future studies are warranted to investigate this relationship further and determine if IE is an appropriate approach to change ON behaviors. It is our hope that a greater ability to identify ON at earlier ages will help increase understanding of this condition and its potential to hinder growth and development in adolescent individuals.

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CHAPTER 6

SUMMARY AND CONCLUSION

Summary

ON is a condition characterized by an overt focus on consuming healthful foods to the point that an individual's psychological, and potentially physical, well-being is negatively affected. Our understanding of ON has advanced considerably despite the relatively short amount of time this proposed disorder has been studied in comparison to other established EDs. However, current conceptualizations of ON continue to evolve as new findings are actively being published. Several large barriers exist in relation to studying this disorder. Given its relative newness, the disorder is not currently recognized in the DSM-5. Moreover, although several groups have proposed diagnostic criteria,¹⁻³ none have formally been agreed upon to date. This has presented difficulties in determining the prevalence of behaviors associated with ON, as psychometric instruments that have been proposed to measure ON differ in their conceptualizations of the disorder, and validity and reliability vary widely depending on the tool used and the population it is used in. Further, as Valente and colleagues⁴ point out, the definition of ON has remained largely unchanged since its conception 20 years ago, and this original definition has been used repeatedly in the literature without much consideration of what conceptualization of ON may look like today with the advent of new trends, technology, and social media. The current research aimed to address and clarify some of the gaps that have been identified in the literature to enhance the overall understanding of ON.

The first study presented in this paper was a cross-sectional analysis investigating associations between nutrition knowledge, level of interest in nutrition, and ON risk among college students. Results of this study suggest those who have higher levels of interest in the subject of nutrition may be at a higher risk for practicing behaviors associated with ON, while those who have higher levels of nutrition knowledge may be at a lower risk for practicing ON behaviors. It has been assumed up to this point that those at a higher risk for ON are naturally more interested in the subject of nutrition given the focus of the disorder. This was the first study to include an objective measure of interest in the subject of nutrition. Our results indicate that it may be an interesting area for future investigation to determine if it may be a viable predictor or moderator of ON risk. Additional research is needed to verify if these associations are also present in diverse populations.

Given the scarcity of research on ON in younger individuals, the aim of the second study was to determine the content and face validity of a psychometric instrument used to measure ON (the English Dusseldorf Orthorexia Scale) (E-DOS) in an adolescent population. Previously, this tool had only been validated and used in adult populations. Qualitative data was collected via focus groups with male and female high school students. Results from the focus groups indicate this tool was largely understood by adolescents, and is appropriate for use with some minor adjustments to several terms used. A secondary aim of this study was to explore gender differences that may exist in adolescents' thoughts, opinions, and beliefs surrounding food and eating. Interesting gender differences appeared, where female responses were most often categorized in body image or dieting behavior codes, and male responses were based more on nutrition

for performance based reasons (e.g., sports). Additionally, although our sample was small, we obtained quantitative data from focus group participants by having them complete the DOS survey. A fairly surprising proportion of participants (7.9%) were considered to be at moderate or high risk for orthorexia. Studying these behaviors in adolescents is deserving of more attention as this is a population that is known to be at risk for EDs, and there is potential for early intervention to prevent continued practice of risky eating behaviors.

The final study aimed to investigate the efficacy and acceptability of an Intuitive Eating (IE) based program designed to reduce behaviors associated with ON in an adolescent population. Although changes in outcome measures in our study were not dependent on condition, encouragingly each condition showed improvements over time on each outcome measure. Our interpretation of these results was that nutrition education, whether IE based or standard nutrition curriculum provided within high schools, may have positive effects on increasing IE, and subsequently decreasing ON, and ED symptomology. Since very little is known about successful approaches to decreasing ON behaviors, it would be beneficial for future research to determine what specific components of the program might be contributing to changes in scores. Once successful program attributes have been identified, ensuring follow-up evaluations of the programs are conducted will be helpful in determining the clinical significance and lasting impact of the program. We are optimistic that IE approaches have the potential to be an effective approach to decreasing ON behaviors. To our knowledge only one other study⁵ has investigated the association between IE and ON and results were contrary to our findings where ON behaviors were inversely associated with IE, while our sample showed no

association. Among our sample significant gender differences were found, where boys consistently saw greater improvements over time than girls on outcome measures. Of particular interest were the improvements in ON scores for boys, but no improvements seen in girls. Investigating potential factors that invoke change for girls related to ON behaviors is worthwhile.

An intriguing finding among both the first and third studies was the effect that the level of interest in nutrition had on ON risk. In two separate populations (i.e., a college-aged sample and an adolescent sample), ON scores were higher among those who indicated they were more interested in nutrition. Future investigation of this relationship may help clarify whether interest level is an independent risk factor for ON, or, if interest level has a potential mediating or moderating effect on risk.

To date, no prior studies have objectively explored the association between level of interest in nutrition and its effect on risky eating behaviors. However, interest as a psychological construct has been studied, primarily in regard to its ability to increase academic achievement or to aid in choosing a vocation. Interest is described as a psychological state where attention, effort, and affect are increased, both situationally and over time.⁶ Further, interest can serve as a powerful motivating force to engage and reengage with activities, ideas, or content.⁷ Recently, an objective measure of interest for adolescents (Academic Interest Scale for Adolescents) was validated that included four distinct dimensions: emotion, value, knowledge, and engagement.⁸ Given that the measure of interest included in the studies within this dissertation was a single Likert-scale question, we were only able to determine associations between lower and higher levels of interest and risk. Given the results we observed in two separate populations

between interest and risk for ON, it may be worthwhile to explore associations between these dimensions of interest to determine if any particular dimension is contributing to the risky behaviors. Though more supporting evidence is needed to confirm the relationship, level of interest may serve as a valuable addition to screening tools that aim to identify those with ON.

Conclusions

The field of ON is rapidly changing with new findings consistently being produced. The studies discussed in this dissertation filled several gaps that have previously been identified in the literature, including clarifying the relationship between nutrition knowledge and ON risk, contributing to the limited amount of qualitative research on ON, and exploring potential solutions to decrease ON behaviors. Further, several new discoveries emerged, such as the potential relationship between ON risk and interest in nutrition, the relationship between IE and ON, and how adolescent populations may be affected by ON. Our results indicate that exposure to nutrition education may decrease behaviors associated with ON. Future randomized controlled trials, potentially conducted among populations exhibiting higher levels of ON behaviors, would be appropriate to determine if IE based programs are an effective way to lower risk.

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APPENDICES

Appendix A. Healthy Eating in College Students Survey Tools

Healthy Eating In College Students-H01

Q52 Please fully review this Letter of Information document before deciding whether to proceed with this survey.

- Yes, I am over the age of 18 and agree to participate in this study. (1)
- No, I am not over the age of 18 or I do not agree to participate in this study. (2)

Please answer all questions based on your own eating habits and the extent to which you agree with the statement being made. There will be additional true/false questions, please answer these to the best of your ability.

Start of Block: Demographic Block

Q1 What is your age?

- 18-21 (2)
 - 22-24 (3)
 - 25-27 (4)
 - 28+ (5)
-

Q2 What gender do you identify with?

- Male (1)
 - Female (2)
-

Q3 Are you Spanish, Hispanic, or Latino or none of these (select all that apply).

- Spanish (1)
 - Hispanic (2)
 - Latino (3)
 - None of these (4)
-

Q4 Choose one or more races that you consider yourself to be:

- White (1)
 - Black or African American (2)
 - American Indian or Alaska Native (3)
 - Asian (4)
 - Native Hawaiian or Pacific Islander (5)
 - Other (specify) (6) _____
-

Q5 What year are you in school?

- Freshman (1)
 - Sophomore (2)
 - Junior (3)
 - Senior (4)
-

Q6 What is your height?

- Feet (2) _____
 - Inches (3) _____
-

Q7 What is your weight?

- Weight in pounds (1) _____
-

Q8 How interested are you in nutrition?

- Very Interested (1)
- Interested (2)
- Not Interested (3)
- Very Disinterested (4)

End of Block: Demographic Block

Start of Block: EHQ

Q9 My eating habits are superior to others.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q10 I follow a diet with many rules.

- Agree (1)
- Somewhat Agree (2)
- Somewhat Disagree (3)
- Disagree (4)

Q11 My diet is better than other people's diets.

- Agree (1)
- Somewhat Agree (2)
- Somewhat Disagree (3)
- Disagree (4)

Q12 I prepare food in the most healthful way.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q13 I follow a health-food diet rigidly.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q14 The way my food is prepared is important in my diet.

- Agree (1)
- Somewhat Agree (2)
- Somewhat Disagree (3)
- Disagree (4)

Q15 I am more informed than others about healthy eating.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q16 I only eat what my diet allows.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q17 My healthy eating causes significant stress in my relationships.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q18 I spend more than 3 hours a day thinking about healthy food.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q19 I have difficulty finding restaurants that serve the foods I eat.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q20 Few foods are healthy for me to eat.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q21 I turn down social offers that involve eating unhealthy food.

- Agree (1)
- Somewhat Agree (2)
- Somewhat Disagree (3)
- Disagree (4)

Q22 My diet affects the type of employment I would take.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q23 I go out less since I began eating healthily.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q24 I am distracted by thoughts of eating healthily.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q25 In the past year, friends or family members have told me that I'm overly concerned with eating healthily.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q26 I feel in control when I eat healthily.

- Agree (1)
- Somewhat Agree (2)
- Somewhat Disagree (3)
- Disagree (4)

Q27 I feel great when I eat healthily.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q28 I have made efforts to eat more healthily over time.

- Agree (1)
- Somewhat Agree (2)
- Somewhat Disagree (3)
- Disagree (4)

Q29 Eating the way I do gives me a sense of satisfaction.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q30 I usually feel guilty when I eat "unhealthy" food.

- Agree (1)
- Somewhat Agree (2)
- Somewhat Disagree (3)
- Disagree (4)

Q31 I often wish that I could stop worrying so much about the food I eat.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q32 Making one "wrong" food choice usually ruins my day.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q33 I have suffered negative medical consequences from following a specific eating plan.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q34 I worry more than I should about being or becoming fat.

- Agree (1)
- Somewhat Agree (2)
- Somewhat Disagree (3)
- Disagree (4)

Q35 I usually exercise more after I feel I have been eating inappropriately.

- Agree (1)
- Somewhat Agree (2)
- Somewhat Disagree (3)
- Disagree (4)

Q36 I usually restrict my food intake when I feel I haven't been eating appropriately.

- Agree (1)
 - Somewhat Agree (2)
 - Somewhat Disagree (3)
 - Disagree (4)
-

Q38 Have you ever been treated for an eating disorder?

- Yes (1)
- No (2)

End of Block: EHQ

Start of Block: Identify if the following statements are true or false.

Q39 Carbohydrates are an important part of a healthy, balanced diet. Approximately half of your daily calories should come from carbohydrates.

- True (1)
 - False (2)
-

Q40 Eating equivalent amounts of all types of dietary fats (trans, saturated, polyunsaturated, monounsaturated) will have the same effect on your blood cholesterol.

- True (1)
 - False (2)
-

Q41 For optimal health, you should completely avoid eating refined white flour and table sugar.

- True (1)
 - False (2)
-

Q42 Oily fish (mackerel, tuna, salmon) have healthier fats than red meat.

- True (1)
 - False (2)
-

Q44 High fructose corn syrup is made up of approximately equal parts of glucose and fructose and is very similar to the chemical make-up of sucrose.

- True (1)
 - False (2)
-

Q45 Wheat is an ingredient that most people should avoid.

- True (1)
 - False (2)
-

Q47 Organic foods are more nutrient dense than non-organic foods.

- True (1)
 - False (2)
-

Q48 You absorb calcium in milk more efficiently than you absorb calcium in spinach.

- True (1)
 - False (2)
-

Q49 Supplementing with high levels of B vitamins will increase your energy.

- True (1)
 - False (2)
-

Q50 Dietary supplements are tested by the FDA and are therefore safe to consume.

- True (1)
 - False (2)
-

Q43 Dairy can be part of a healthy, balanced diet.

- True (1)
 - False (2)
-

Q51 An equal amount of fat and sugar have the same number of calories.

- True (1)
- False (2)

End of Block: Identify if the following statements are true or false.

Appendix B. District Approval Letter for Focus Group Study



PERMISSION TO CONDUCT RESEARCH

November 5, 2018

To Whom It May Concern:

The purpose of this letter is to inform you that I give *Elizabeth King* permission to conduct the research titled *Validation of DOS Survey Instrument*. This also serves as assurance that this researcher complies with requirements of the Family Educational Rights and Privacy Act (FERPA) and the Protection of Pupil Rights Amendment (PPRA) and will ensure that these requirements are followed in the conduct of this research. I understand the procedures, level of risk, consent procedures, and benefits of the proposed research.

Sincerely,

Robyn Hedgecock
Student Data Manager
Cache County School District

Appendix C. Focus Group Survey Questions

Orthorexia Nervosa Awareness Survey

Please circle the answer that is *most correct* for your personal eating and food habits.

| | This Does Not Apply to Me | This Sometimes Applies To Me | This Mostly Applies to Me | This Always Applies to Me |
|---|---------------------------------|---------------------------------------|---------------------------------|---------------------------------|
| 1. Eating healthy food is more important to me than indulgence/enjoying the food. | 1 | 2 | 3 | 4 |
| 2. I have certain nutrition rules that I adhere to. | 1 | 2 | 3 | 4 |
| 3. I can only enjoy eating foods considered healthy. | 1 | 2 | 3 | 4 |
| 4. I try to avoid getting invited over to friend's or family's houses for dinner if I know that they do not pay attention to healthy nutrition. | 1 | 2 | 3 | 4 |
| 5. I like that I pay more attention to healthy nutrition than other people. | 1 | 2 | 3 | 4 |
| 6. If I eat something I consider unhealthy, I feel really bad. | 1 | 2 | 3 | 4 |
| 7. I have the feeling that I am being excluded by my friends and peers due to my strict "nutrition" or "food" rules. | 1 | 2 | 3 | 4 |
| 8. My thoughts constantly revolve around healthy nutrition and I organize my day around it. | 1 | 2 | 3 | 4 |
| 9. I find it difficult to go against my personal dietary rules. | 1 | 2 | 3 | 4 |
| 10. I feel upset after eating unhealthy foods. | 1 | 2 | 3 | 4 |

Focus Group Clarifying Questions:

- What does the word indulgence mean when you think about food? Enjoying?
- What comes to mind when you think of the phrase ‘nutrition rules’?
- What does healthy eating mean to you?
- What does it mean to pay attention to healthy nutrition?
- Do you think people your age care about eating better than someone else?
- What foods would you consider to be unhealthy?
- How could you be excluded for following strict nutrition rules? What does the word colleague mean?
- Define what constantly revolving thoughts would be like.
- What do you think personal dietary rules are?
- What kinds of emotions would you feel after eating unhealthy foods?

Additional Qualitative Questions:

- Do you think people your age feel guilty for eating something that is thought to be unhealthy? How often do you think they feel this way?
- What do people your age say about good and bad foods? Are there foods you have heard you should never eat?
- Have you ever heard of someone your age being overwhelmed with thoughts about healthy eating?
- How do people your age choose the foods they eat?
- Do you feel like adults worry more than teens about healthy eating? How do you know this?

Appendix D. District Approval Letter For IE Program Implementation



SCHOOL PERMISSION TO CONDUCT RESEARCH

November 22, 2019

To Whom It May Concern:

The purpose of this letter is to inform you that *Elizabeth King* has permission to conduct the research titled "*The Effectiveness of An Intuitive Eating Program on Preventing Risk Factors for Orthorexia*". Please coordinate with the administration at each of our high schools for scheduling. This letter also serves as assurance that this school complies with requirements of the Family Educational Rights and Privacy Act (FERPA) and the Protection of Pupil Rights Amendment (PPRA) and will ensure that these requirements are followed in the conduct of this research.

Sincerely,

Robyn Hedgecock
Student Data Manager
Cache County School District

Appendix E. Survey for Expert Review of IE Program

Session 1 - Introduction to Intuitive Eating

Please review the EveryBodyRocks: Intuitive Eating script and slides that were attached to the email you received that invited you to participate in this study. Using the rubrics below, please provide feedback on the components of the curriculum, and the curriculum as a whole. We so appreciate you sharing your time and expertise!

Please rate the components of **Session 1 - Introduction to Intuitive Eating** on a scale from 1-10 (1 being low and 10 being high) in terms of 1) relevance to the content area (promoting healthy eating attitudes and behaviors), 2) relevance to the target population (male and female high school students), and 3) presented at a level appropriate for the age group.

| | Relevance to Content Area | Relevance to Population | Appropriate Level for Age Group | Comments |
|--|---------------------------|-------------------------|---------------------------------|---|
| | 1-10 (1=low, 10=high) | 1-10 (1=low, 10=high) | 1-10 (1=low, 10=high) | Please provide an comments or suggested changes here: |
| Definition of Intuitive Eating | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| "What comes to mind when I say "Nutrition"?" | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Diet mentality (taking away, good vs bad, root of the problem, take on the road, weight versus wellness) | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Food Police (and examples) | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Nutrition Know-It-All (and examples) | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Diet Rebel (and examples) | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Scenario #1 and #2 | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Additions (eating times, variety, new food labels) | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

| | Relevance to Content Area | Relevance to Population | Appropriate Level for Age Group | Comments |
|-------------------------|---------------------------|-------------------------|---------------------------------|---|
| | 1-10 (1=low, 10=high) | 1-10 (1=low, 10=high) | 1-10 (1=low, 10=high) | Please provide an comments or suggested changes here: |
| Nurturer (and examples) | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

Please provide any comments or suggestions about **Session 1 - Introduction to Intuitive Eating as a whole**.

Session 2 - How To Fuel Your Awesome Body

Please rate the components of **Session 2 - How To Fuel Your Awesome Body** on a scale from 1-10 (1 being low and 10 being high) in terms of 1) relevance to the content area (promoting healthy eating attitudes and behaviors), 2) relevance to the target population (male and female high school students), and 3) presented at a level appropriate for the age group.

| | Relevance to Content Area | Relevance to Population | Appropriate Level for Age Group | Comments |
|---------------------------|---------------------------|-------------------------|---------------------------------|---|
| | 1-10 (1=low, 10=high) | 1-10 (1=low, 10=high) | 1-10 (1=low, 10=high) | Please provide an comments or suggested changes here: |
| Hunger and Fullness Scale | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

| | Relevance to Content Area | Relevance to Population | Appropriate Level for Age Group | Comments |
|--|---------------------------|-------------------------|---------------------------------|---|
| | 1-10 (1=low, 10=high) | 1-10 (1=low, 10=high) | 1-10 (1=low, 10=high) | Please provide an comments or suggested changes here: |
| Pendulum | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Power Snacks | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Finding the "Click" | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Mindful Eating (watching food enter your mouth, cleansing your palate, find your bit size, loaves and fishes, food hopping, put silverware down, taste deeply) | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Learning from History | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

Please provide any comments or suggestions about **Session 2 - How To Fuel Your Awesome Body as a whole**.

Session 3 - Building Confidence

Please rate the components of **Session 3 - Building Confidence** on a scale from 1-10 (1 being low and 10 being high) in terms of 1) relevance to the content area (promoting healthy eating attitudes and behaviors), 2) relevance to the target population (male and female high school students), and 3) presented at a level appropriate for the age group.

| | Relevance to Content Area | Relevance to Population | Appropriate Level for Age Group | Comments |
|----------------------------------|---------------------------|-------------------------|---------------------------------|---|
| | 1-10 (1=low, 10=high) | 1-10 (1=low, 10=high) | 1-10 (1=low, 10=high) | Please provide an comments or suggested changes here: |
| Emotional Eating | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Top Reasons for Emotional Eating | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Behavior Chaining | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Accepting Your Body | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Negative Filtering | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| One Good Thing | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Gratitude for Your Body | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| What Can Your Body Do? | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Eggs in One Basket | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| I Am | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

Please provide any comments or suggestions about **Session 3 - Building Confidence as a whole.**

Overall Evaluation

Please provide any additional comments you have on the overall curriculum here.

Types of Professionals

What gender do you most closely identify?

- Male
- Female
- Prefer not to answer

Please select the option you most closely identify with:

- Registered Dietitian
- Educational Researcher
- Psychologist
- Eating Disorder Therapist
- High School/Middle School Teacher
- Other

'Other' Questions

How many years have you been practicing in this profession?

- 0-1 years
- 2-5 years
- 6-10 years
- 11 or more years
- Not currently practicing but have practiced in the past

Orthorexia Nervosa (ON) is a disorder characterized by an unhealthy obsession with eating healthy or "clean" foods. Someone becomes consumed with what and how much to eat, and how to deal with "slip-ups."

Had you heard of this term before it was defined for you today?

- Yes
- No

Based on the definition above, do you feel this disorder is relevant to adolescent (ages 10-19) populations?

- Yes
- No

Eating Disorder Therapist

Are you also a Registered Dietitian?

- Yes
- No

How many years have you been practicing in this profession?

- 0-1 years
- 2-5 years
- 6-10 years
- 11 or more years
- Not currently practicing but have practiced in the past

Orthorexia Nervosa (ON) is a disorder characterized by an unhealthy obsession with eating healthy or "clean" foods. Someone becomes consumed with what and how much

to eat, and how to deal with “slip-ups.”

Had you heard of this term before it was defined for you today?

- Yes
 No

Have you ever treated an individual with orthorexia?

- Yes
 No

What methods do you currently use to treat these individuals?

Compared to other eating disorders (anorexia nervosa, bulimia nervosa, binge eating disorder, ARFID, etc.), do you feel orthorexia is more or less severe?

- Not nearly as severe
 Somewhat as severe
 Equally as severe
 More severe
 Much more severe

Considering the definition of orthorexia that was previously provided to you, to what extent do you feel the following factors contribute to the development of ON? (1=no contribution, 5=vital contribution):

| | 1 | 2 | 3 | 4 | 5 |
|----------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Exercise | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | 1 | 2 | 3 | 4 | 5 |
|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Weight Loss Goals | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Social Media Use | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| History of an Eating Disorder | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Currently Dieting | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Body Image Concerns | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Obsessive Compulsive Behaviors | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Based on the previous definition, do you feel this disorder is relevant to adolescent (ages 10-19) populations?

- Yes
 No

High School/Middle School Teacher

How many years have you been practicing in this profession?

- 0-1 years
 2-5 years
 6-10 years
 11 or more years
 Not currently practicing but have practiced in the past

Orthorexia Nervosa (ON) is a disorder characterized by an unhealthy obsession with eating healthy or "clean" foods. Someone becomes consumed with what and how much to eat, and how to deal with "slip-ups."

Had you heard of this term before it was defined for you today?

- Yes
 No

Based on the definition above, do you feel this disorder is relevant to adolescent (ages 10-19) populations?

- Yes
- No

Psychologist

How many years have you been practicing in this profession?

- 0-1 years
- 2-5 years
- 6-10 years
- 11 or more years
- Not currently practicing but have practiced in the past

Orthorexia Nervosa (ON) is a disorder characterized by an unhealthy obsession with eating healthy or "clean" foods. Someone becomes consumed with what and how much to eat, and how to deal with "slip-ups."

Had you heard of this term before it was defined for you today?

- Yes
- No

Have you ever treated an individual with orthorexia?

- Yes
- No

What methods do you currently use to treat these individuals?

Do you feel this disorder is deserving of its own diagnostic criteria within the Diagnostic and Statistical Manual of Mental Disorders (DSM-V)?

- Yes
 No

Why?

Are there any existing diagnosis(es) that you think ON fits most closely with? Select all that apply.

- Anorexia Nervosa (AN)
 Bulimia Nervosa (BN)
 Avoidant Restrictive Food Intake Disorder (ARFID)
 General Anxiety Disorder (GAD)
 Obsessive Compulsive Disorder (OCD)
 None
 Other

Considering the definition of orthorexia that was previously provided to you, to what extent do you feel the following factors contribute to the development of ON? (1=no contribution, 5=vital contribution):

| | 1 | 2 | 3 | 4 | 5 |
|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Exercise | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Weight Loss Goals | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Social Media Use | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| History of an Eating Disorder | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Currently Dieting | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Body Image Concerns | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Obsessive Compulsive Behaviors | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Based on the previous definition, do you feel this disorder is relevant to adolescent (ages 10-19) populations?

- Yes
 No

Educational Researcher Questions

How many years have you been practicing in this profession?

- 0-1 years
 2-5 years
 6-10 years
 11 or more years
 Not currently practicing but have practiced in the past

Orthorexia Nervosa (ON) is a disorder characterized by an unhealthy obsession with eating healthy or "clean" foods. Someone becomes consumed with what and how much to eat, and how to deal with "slip-ups."

Had you heard of this term before it was defined for you today?

- Yes

No

Based on the previous definition, do you feel this disorder is relevant to adolescent (ages 10-19) populations?

Yes

No

RD Questions

How many years have you been practicing in this profession?

0-1 years

2-5 years

6-10 years

11 or more years

Not currently practicing but have practiced in the past

Orthorexia Nervosa (ON) is a disorder characterized by an unhealthy obsession with eating healthy or "clean" foods. Someone becomes consumed with what and how much to eat, and how to deal with "slip-ups."

Had you heard of this term before it was defined for you today?

Yes

No

Have you ever treated an individual with orthorexia?

Yes

No

What methods do you currently use to treat these individuals?

On a scale of 1-5 (1=does not capture at all, 5=captures all aspects), to what extent do you feel these proposed diagnostic criteria capture all aspects of orthorexia?

Table. Proposed Diagnostic Criteria for Orthorexia Nervosa¹⁰

Criterion A

Obsessive focus on healthy eating, as defined by a dietary theory or set of beliefs whose specific details may vary; marked by exaggerated emotional distress in relationship to food choices perceived as unhealthy; weight loss may ensue as a result of dietary choices, but this is not the primary goal. As evidenced by the following:

- Compulsive behavior and/or mental preoccupation regarding affirmative and restrictive dietary practices believed by the individual to promote optimum health;
- Violation of self-imposed dietary rules causes exaggerated fear of disease, sense of personal impurity and/or negative physical sensations, accompanied by anxiety and shame;
- Dietary restrictions escalate over time, and may come to include elimination of entire food groups and involve progressively more frequent and/or severe "cleanses" (partial fasts) regarded as purifying or detoxifying. This escalation commonly leads to weight loss, but the desire to lose weight is absent, hidden, or subordinated to ideation about healthy eating.

Criterion B

The compulsive behavior and mental preoccupation becomes clinically impairing by any of the following:

- Malnutrition, severe weight loss, or other medical complications from restricted diet;
- Intrapersonal distress or impairment of social, academic, or vocational functioning secondary to beliefs or behaviors about healthy diet;
- Positive body image, self-worth, identity and/or satisfaction excessively dependent on compliance with self-defined healthy eating behavior.

Additional features that may confirm a diagnosis of ON include obsessive focus on food choice, planning, purchase, preparation, and consumption; food regarded as source of health rather than pleasure; distress or disgust when in proximity to prohibited foods; exaggerated faith that inclusion or elimination of particular kinds of food can prevent or cure disease or affect daily well-being; periodic shifts in dietary beliefs while other processes persist unchanged; moral judgment of others based on dietary choices; body image distortion around sense of physical impurity rather than weight; persistent belief that dietary practices are health-promoting despite evidence of malnutrition.

1 2 3 4 5

Does not capture at all Captures all aspects of ON

Compared to other eating disorders (anorexia nervosa, bulimia nervosa, binge eating disorder, ARFID, etc.), do you feel orthorexia is more or less severe?

- Not nearly as severe
- Somewhat as severe
- Equally as severe
- More severe
- Much more severe

Considering the definition of orthorexia that was previously provided to you, to what extent do you feel the following factors contribute to the development of ON? (1=no contribution, 5=vital contribution):

| | 1 | 2 | 3 | 4 | 5 |
|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Exercise | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Weight Loss Goals | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Social Media Use | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| History of an Eating Disorder | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Currently Dieting | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Body Image Concerns | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Obsessive Compulsive Behaviors | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Based on the previous definition, do you feel this disorder is relevant to adolescent (ages 10-19) populations?

- Yes
- No

Appendix F. Intuitive Eating Curriculum

EVERYBODYROCKS™

Brooke Parker R.D.

INTUITIVE EATING

Finding moderation
with food and
loving yourself
along the way

Intuitive Eating:
Evelyn Tribole &
Elyse Resch

WHAT COMES TO MIND?

- Nutrition
 - Diets
 - Food Labels
 - Plates & Pyramids
 - Good & Bad Foods
 - Strength & Performance
 - Confusing & Hard





DIETS IDENTIFY "GOOD" AND "BAD"



DIETS DON'T GET TO THE ROOT OF THE PROBLEM.



**DIETS ARE
DIFFICULT TO
TAKE ON
THE ROAD.**



DIETS FOCUS ON WEIGHT NOT WELLNESS.

- Many dieters regain **more** weight than was lost on their diets.
- Dieting is a strong predictor of future weight gain.



Wellness, Not Weight

VOICES THAT TALK ABOUT FOOD & HEALTH





FOOD POLICE

Definition

- Inner Judge & Jury
- Decides if you are “good” or “bad”
- Causes
 - Guilt
 - Worry
 - Judgement

FOOD POLICE EXAMPLES

You eat way too much.

You have no control.

You **CAN'T** eat after 6pm.

The food will just turn into **FAT**.

You always crave sweets. What's **WRONG** with you?

Carbs will make you **FAT**. You are so **FAT**.

You already had a cookie last night; you **CAN'T** have another one today.

You didn't exercise today, better not eat dinner.

You should feel **GUILTY** for eating that.



NUTRITION KNOW-IT-ALL

- Seeks out the latest food trends.
- Uses health messages to keep you in a “dieting” mindset.
- When tagged up with the Food Police foods are now “good” or “bad”, there is no in-between.

NUTRITION KNOW-IT-ALL EXAMPLES

Instagram messages say the best way to **lose weight** is to cut out carbs.

People who are in control and "**good**" always eat **healthy**.

You shouldn't add any cheese on that. There's too much **fat** in it.

All **processed** foods are bad.

You should not eat foods with **added sweeteners**.

That piece of cake is so high in **calories**, stick with the celery sticks instead!



DIET REBEL

- Loud voice that does not like to be told what to do.
- Wants to fight back and do the opposite.
- Often has to "throw a fit" to get its way

DIET REBEL EXAMPLES

I am not going to eat salads for every meal.

I'll show you, you think I should lose 5 pounds - I'll put on 10.

Let's see how many cookies I can stuff in before someone sees.

I can't wait for my family to leave the house so I can eat everything I want.

I hate the gym and will not go in there again.

SCENARIO #1

"Your friend had an extra Crumbl cookie and offers it to you"



SCENARIO #2

"Your friend is having a birthday dinner at Pizza Pie Cafe, but last time you went you got way too full."



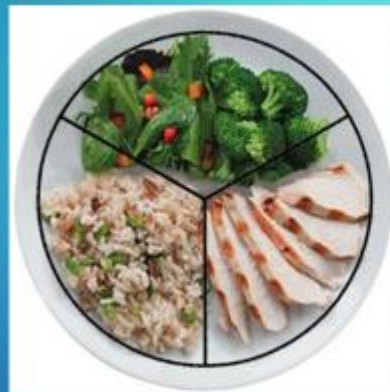
ADDITIONS





VARIETY

- Meals: 3 food groups
(Grain + Protein + Produce)
- Snacks: 2 food groups
Carb (grain or fruit) + protein



Grain = Fuel for body and brain

Protein = Keeps us full longer and helps our energy from carbohydrates last longer

Produce = Awesome vitamins/minerals and MORE BITES (esp. vegetables)

NEW FOOD LABELS



— "Good" Foods vs. "Bad" Foods —

— "Healthy" vs. "Junk" —

Most-of-the-Time Foods

Some-of-the-Time Foods



NANA NURTURER

- Kind and Gentle Voice
- Tries to find a compromise instead of "black and white" thinking.
- Does not cause guilt.
- Looks for ways to learn from experiences instead of being judged by them.

NURTURER EXAMPLES

All foods have a place in a balanced diet.

I feel good when eating nutritious foods **most-of-the-time** and have a blast eating "fun" foods **some-of-the-time**.

My body needs to be fed often to maintain an active metabolism.

My body can do a lot of amazing things.

I can feel satisfied with one or two cookies if I take the time to taste them. I don't really need or want the whole bag.

Everyone over eats sometimes. What can I learn from this experience to make it better next time?

SCENARIO #1

“Your friend had an extra Crumbl cookie and offers it to you”



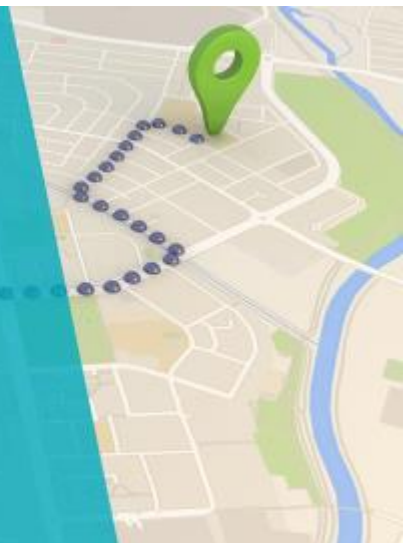
SCENARIO #2

“Your friend is having a birthday dinner at Pizza Pie Cafe, but last time you went you got way too full.”

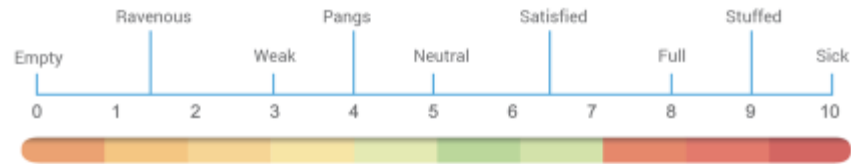


WHERE WE'VE BEEN

- Diet Mentality Often Falls
- Adding Consistent Eating Times, Variety, and New Words to Label Food are very helpful
- The Food Police and Nutrition Know-It-All are a destructive team
- Practice ways to offer compromise and compassion with Nurturer voice



UNDERSTANDING HUNGER AND FULLNESS



PENDULUM SWING



Optimal Swing: from a (3 - 4) to a (6 - 7) for a high metabolism

How Often: every 3 to 4 hours

Note:

Extreme hunger will promote a swing to extreme fullness

FINDING THE “CLICK”

1. The food doesn't taste as good
2. Take mini-breaks when eating



MINDFUL EATING

Find Satisfaction and **CLOSURE** with food moments



Watch the food entering your mouth.

Clearing the Palate





Find your
favorite
bite size.



Loaves and
Fishes

Food
Hopping



Put
silverware
down.



Taste
deeply.

FINDING THE “CLICK”

1. The food doesn't taste as good
2. Take mini-breaks when eating
3. Learn from history -
If you get to an 8 when eating,
keep in mind you will need
less of that food the next time
you eat it.





POWER SNACKS - PROTEIN



**Lasting
Energy!**



POWER SNACKS - CARBS



**Now
Energy!**



EMOTIONAL EATING

Questions to ask yourself:

- ❖ Am I Hungry?
- ❖ How do I feel?
- ❖ What do I need?



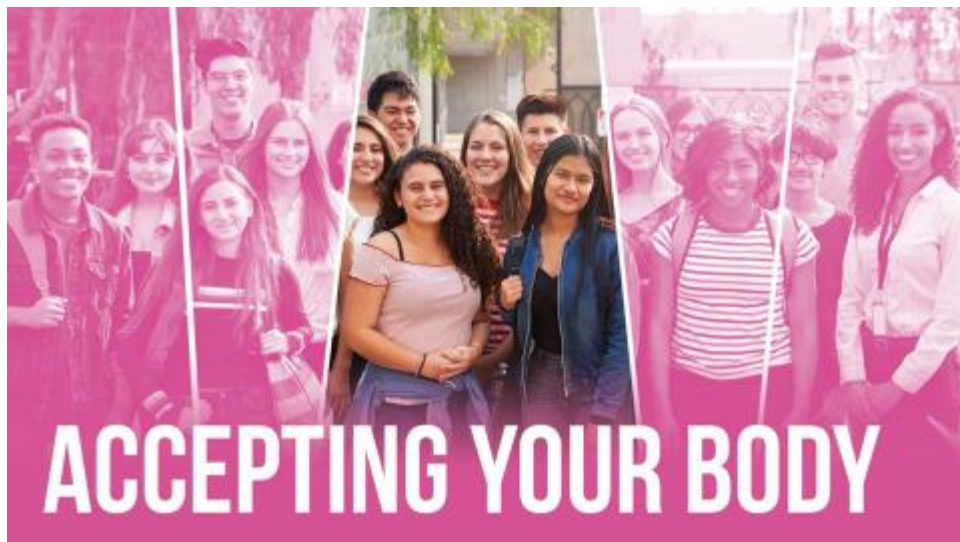
TOP REASONS FOR EMOTIONAL EATING

1. Boredom
 - Music
 - Movement
 - Reading
 - Coloring, art, crafts
 - Hobbies
 - Outdoors/animals,
 - Pampering - bubble baths, paint nails
 - Research random things
 - Serve someone
2. Stress
3. Lonely

BEHAVIOR CHAIN

Most habits have a consistent chain reaction.





LEAVE WITH ONE GOOD THING





A One-Dimensional Identity can make you
Fragile & Weak



BECOME MULTI-DIMENSIONAL!



Appendix G. Permission to Reproduce EAT-26

From: Eat-26 Auto Responder
Sent: Tuesday, February 25, 2020 8:36 PM
To: Elizabeth King
Subject: [EXT] Permission to reproduce eat26

Hello,

Thank you for your request for permission to reproduce and 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.

Please consider this e-mail as granting you permission to reproduce the test for the purpose suggested in your request if 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.

Again, thank you for requesting permission to reproduce and 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 Copyright Holder

President & CEO

River Centre Clinic

5465 Main Street

Sylvania, OH 43560

dmgarner@gmail.com

CURRICULUM VITAE

Elizabeth King, RD

486 W 1780 N #101 • Logan, UT 84341

PHONE (801) 663-0803 • E-MAIL Elizabeth.king@usu.edu

www.linkedin.com/in/elizabeth-king-rd

EDUCATION

- Doctor of Philosophy, Nutrition Sciences** May 2021
Utah State University, Logan, UT
- Cumulative GPA 3.90/4.0
 - *Dissertation Research:* Disordered eating in adolescents
- Bachelor of Science, Dietetics; (ACEND accredited)** May 2017
Utah State University, Logan, UT
- *Certifications:* ServSafe Certification
 - Certified Dietitian, State of Utah, 2018
 - Cumulative GPA: 3.94/4.0 *Magna Cum Laude*
- Associate of Science, General Studies** May 2014
Snow College, Ephraim, UT
- *Cumulative GPA:* 3.8/4.0

TEACHING EXPERIENCE

- Adjunct Professor-** Salt Lake Community College, Salt Lake City, UT December 2018- Present
Courses Taught: Foundations of Nutrition (undergraduate level)
- Teach 2-3 introductory nutrition courses to approximately 90 undergraduate students per semester.
 - Encourage students to achieve their goals through open communication, positive feedback, and support.
 - Provide individualized in-depth feedback for each student to deepen their understanding of various concepts in nutrition.
 - Communicate with students frequently to support their full engagement in the course, ensure they had the support needed to succeed.
 - Create and develop new course material, curriculum, and assignments to encourage deeper understanding of concepts presented.
- Graduate Teaching Assistant-** Utah State University, Logan, UT August 2020 – Present
Courses Taught: Advanced Sports Nutrition (graduate level-15 students)
Foundations of Nutrition (undergraduate level-160 students)
- Effectively implement changes from previous instructor's course evaluations to ensure continued quality improvement of the courses.
 - Facilitate online discussions incorporating evidence-based information to guide and direct students in critical thinking.

- Implement a flipped classroom pedagogical approach to encourage individual learning and an interactive learning environment.
- Employ novel engagement techniques inside and outside of the classroom to continually capture student's attention and keep them interested in the subject matter.
- Modify existing curriculum to incorporate current events and research findings.

PROFESSIONAL WORK EXPERIENCE

Dietetic Preceptor-Utah State University, Logan, UT August 2017-2020

- Oversaw supervised practice experiences through teaching and mentoring 24 dietetic interns each year in developing professional practice competencies.
- Completed formal and informal evaluations of interns' progress within rotations helping them to identify strengths and areas of personal development.
- Created an environment that encouraged critical thinking to allow students to develop and strengthen research and problem solving skills.
- Established rapport and initiated interpersonal relationships with interns to encourage open communication and transparency.
- Planned and prepared daily learning experiences for students to fulfill Knowledge and Competency based requirements for accreditation as aspiring registered dietitians.

DIETETIC EXPERIENCE

Consultant Dietitian-Assisted Living, Salt Lake City, UT August 2017-2020

- Coordinated nutritional care of residents by completing nutrition assessments in order to monitor overall nutrition status.
- Provided nutritional counseling and education for residents and families to allow for patient-centered care and be respectful of resident preferences, needs, and values.
- Ensured facilities followed state and federal nutrition care regulations in order for all residents to be adequately nourished.
- Assisted in menu planning to ensure that residents' individual nutrition needs and dietary restrictions were met.
- Regularly coordinated care with residents' physicians, CNA's, nurses, and facility administrators to ensure a multi-disciplinary team approach.

Clinical Intern (660 hours) - various locations August 2015-2017

Logan Regional Hospital, Sunshine Terrace Assisted Living, McKay Dee Hospital, LDS Hospital, Primary Children's Hospital, Cottonwood Endocrine and Diabetes Center, Fresenius Medical Care

- Conducted nutrition assessments and provided appropriate diet education for patients and residents with a wide variety of medical conditions with nutrition implications.

- Utilized proper medical nutrition therapy and performed follow-up evaluations on Cardiac, Intensive Care, Oncology, Surgical, Renal, Endocrine, and Transplant patients.
- Developed, evaluated, and adjusted patient and client meal plans to optimize nutrition outcomes and goals.
- Interacted and worked with a variety of multidisciplinary medical teams to provide optimal care for patients.
- Conducted group and individual diabetic counseling and education classes in both in-patient and out-patient settings.

Community Intern (370 hours) – various locations

August 2015-2017

Williamsburg Retirement Community, Natural Grocers, Utah State University Soup CSA, Cache High School, Utah State University Athlete Fueling station, Extension Healthy Families Program, WIC, Dolores Dore Eccles Center for Early Care and Education

- Contributed to designing and implementing a wellness program for seniors living in a retirement community.
- Planned and taught a cooking demonstration for community members.
- Planned and facilitated activities for the Healthy Family Fun program.
- Created educational handouts for distribution in various community centers.

Management Intern (170 hours) – various locations

August 2015-2017

Logan Regional Hospital, Edith Bowen Laboratory School, Bridger Elementary, Pioneer Valley Lodge Retirement Community, Sunshine Terrace Foundation, Logan Senior Citizen Center

- Facilitated procurement, production, distribution, and service of nutritional services.
- Established collaborative relationships with health care and school personnel to deliver effective nutritional services.
- Processed free and reduced family applications and claimed reimbursement for the National School Lunch Program.
- Inspected food preparation and food service for conformance with prescribed diets and standards of sanitation, palatability, appearance, and nutritional quality.

RESEARCH/JOURNAL ARTICLES

- King, E., Wengreen, H., Savoie-Roskos, M. (2020). *School-Based Eating Disorder Prevention Programs: A Systematic Review*. July 2020
 Manuscript submitted for publication to School Mental Health.
- King, E., Wengreen, H. (2020). *Associations Between Level of Interest In Nutrition, Knowledge of Nutrition, And Prevalence of Orthorexia Traits*. Manuscript submitted for publication to Nutrition and Health. July 2020

Researcher

November 2017

Department of Kinesiology and Health Science, Utah State University

Research Topic: Energy Cost of Walking with Versus Without Hand Weights

- Participated in data collection during the research process
- Conducted literature review and contributed to writing manuscript.

Researcher

March 2016

Department of Nutrition and Dietetics, Utah State University

Research Topic: Skin carotenoid levels associated with a comprehensive health survey: The USU Wellness Expo

- Acted as research team leader for study, provided direction, instruction, and guidance for dietetic students involved in the research project.
- Aided in writing and submitting the abstract for review.

RESEARCH POSTERS

King, E., Wengreen, H., Bailey, C., Beck, C., Crapse, P., Edwards, M., Hudson, R., June 2020

Kunzler, A., Matthias, H., Peters, C., Petterborg, W., Smith, A., Tinsley, H., Voorhees, M., Litchford, A. (2020, June 1-4). Validating the Düsseldorf Orthorexia Scale for Use in Adolescents Aged 14-17 [Conference presentation]. American Society for Nutrition Annual Conference, Seattle, WA, United States. <https://tinyurl.com/y6ggp39t>

King, E., Wengreen, H. (2018, October 20-23). Orthorexia Nervosa: October 2018

Associations Between Nutrition Knowledge and Interest [Conference Presentation]. Food and Nutrition Conference & Expo, Washington DC, United States. <https://tinyurl.com/y296lfwj>

King, E., Aguilar, S. (2017, March 30-31). Skin Carotenoid Levels

as a Measure of March 2017 Health [Conference presentation]. Utah Academy of Nutrition and Dietetics Annual Conference, Ogden, UT, United States.

SERVICE EXPERIENCE**Networking Director-Utah Academy of Nutrition and Dietetics**

May 2020 – Present

Board Member

- Establishing a communication network between UAND leadership, new Academy members, and UAND's New Member Committee liaison.
- Plan, organize, and execute quarterly networking events for UAND members to encourage communication and among Utah dietitians.

Reviewer for International Journals

- Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity August 2019-Present
- Appetite

AmeriCorps-Corporation for National and Community Service

August 2016-2020

- Acted as a mentor for dietetics students where I taught sustainable practices centered on serving disadvantaged youth in the community.

Community Engaged Scholars

August 2016-2017

- Engaged in service related to Nutrition and Dietetics within the community.
- Completed a capstone service project totaling 100 hours.

INVITED PRESENTATIONS

King, E. Clean Eating: Is There a Problem? Salt Lake Community College Annual Health and Fitness Conference, Salt Lake City, UT, United States.

GUEST LECTURES

- King, E. (2019). Clean Eating: Is There A Problem? *NDFS 5230*. Lecture conducted from Utah State University, Logan, UT. 2019
- King, E. (2018). What Should I Eat? Fact vs. Fiction. *Campus Recreation*. Lecture conducted from Utah State University, Logan, UT. 2018
- King, E. (2018). Healthy Eating 101. *Campus Recreation*. Lecture conducted from Utah State University, Logan, UT. 2018
- King, E. (2017). The Ketogenic Diet: What You Should Know. *NDFS 4020*. Lecture conducted from Utah State University, Logan, UT. 2017
- King, E. (2017). Healthy Eating for High School Athletes. *Logan High Soccer Team*. Lecture conducted from Logan High School, Logan, UT. 2017

CONFERENCES

- Attendee**, American Society for Nutrition (ASN), Seattle, WA. June 2020
- Attendee**, Food and Nutrition Conference and Expo (FNCE), Washington DC, US. April 2018
- Attendee**, Utah Academy of Nutrition and Dietetics Annual Conference, Ogden, UT. March 2017

AWARDS/HONORS/SCHOLARSHIPS

| | |
|--|------------|
| AGRI Don & Ming Wang Graduate Fellowship Scholarship | March 2020 |
| USUSA Graduate Enhancement Award | 2019-2021 |
| AmeriCorps Education Award | 2017-2019 |
| Seely-Hinckley Scholarship | March 2017 |
| Service-Learning Scholar Award | April 2017 |
| Presidential Scholarship-Utah State University | 2014-2016 |
| Dean's List | 2012-2016 |
| Presidents Honor Roll | 2012-2016 |
| Presidential Scholarship-Snow College | 2012-2014 |

CERTIFICATIONS

| | |
|---|------|
| Altering Behavior Patterns Course , Salt Lake Community College, Salt Lake City, UT. | 2020 |
| Online Teaching Credential Course , Salt Lake Community College, Salt Lake City, UT. | 2019 |
| Canvas User Credential Course , Salt Lake Community College, Salt Lake City, UT. | 2019 |

AFFILIATIONS

| | |
|--|------------------|
| Member , Sports, Cardiovascular, and Wellness Nutrition | 2018-Present |
| Member , American Society of Nutrition | 2018-Present |
| Member , Dietetics in Health Care Communities DPG | 2018-Present |
| Member , Academy of Nutrition and Dietetics | 2016-Present |
| Member , Utah Academy of Nutrition and Dietetics | 2016-Present |
| Member , AmeriCorps | August 2015-2020 |