

# Orthorexia Nervosa: When Healthy Eating Becomes Unhealthy

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## Research Article

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# Abstract

## *Purpose*

Orthorexia Nervosa (ON) is a recently proposed eating disorder that has gained growing acknowledgment. However, there exists a significant gap in the literature regarding ON. Additionally, the lack of formal criteria for the diagnosis of ON has led to a debate regarding whether it is a standalone diagnosis or part of another condition, including other eating disorders. This debate is further fueled by shared characteristics and consequences between ON and other disorders, namely Anorexia Nervosa (AN) and Bulimia Nervosa (BN). Moreover, ON has been recognized as highly prevalent in individuals' post-treatment for AN and BN. Thus, this study aimed to determine whether eating disorder history predicts greater severity of ON symptomology. Additionally, we aimed to determine whether sex, racial, and age group differences exist in severity of ON symptomology.

## *Method*

The Eating Habits Questionnaire (EHQ) was administered to 535 individuals along with questions regarding previous eating disorder history and demographic variables.

## *Results*

Analysis confirmed that individuals previously diagnosed with an eating disorder and those who previously received eating disorder treatment demonstrated higher ON symptomology severity. Minimal-to-no group differences among sex, race, and age in EHQ scores, except for Caucasian/White individuals scoring higher than Asian/Asian American individuals, were revealed.

## *Conclusion*

ON is highly prevalent among individuals previously diagnosed with an eating disorder and those who previously received eating disorder related treatment. Little to no age, sex, and racial differences were demonstrated in ON symptomology.

Level III: Evidence obtained from well-designed cohort or case-control analytic studies

# Introduction

The American Psychiatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders 5th Edition [1] described feeding and eating disorders as:

Persistent disturbance of eating or eating-related behavior that results in the altered consumption or absorption of food and that significantly impairs physical health or psychosocial functioning. (p. 329)

Among this class of disorders are Anorexia Nervosa (AN), Bulimia Nervosa (BN), and Binge Eating disorders, only one diagnosis within this class of disorders can

be given during a single episode. This approach was based on the significantly different clinical course, outcome, and treatment needs of each disorder despite similar psychological and behavior characteristics [1].

Orthorexia Nervosa (ON), a recently proposed eating disorder, is characterized by a fixation with eating healthy [9]. Although on the surface society views healthy eating as a positive behavior, the functional impairment associated with obsessional preoccupation suggests that these behaviors can be problematic. While ON was not included as a distinct disorder in the DSM-5, some studies have suggested specific diagnostic criteria for ON. For example, Moroze et al. [16] proposed the following diagnostic criteria: the presence of obsessional preoccupation with eating healthy foods with a focus on quality and composition of foods (Criteria A) accompanied by two additional symptoms.

Potential accompanying symptoms include unbalanced nutrition due to a preoccupation with food purity, preoccupation and worries about consuming impure or unhealthy foods with the effect of food quality and composition on health, avoidance of foods perceived as unhealthy, excessive time spent reading about, acquiring, and preparing foods, feelings of guilt and worry subsequent to consuming unhealthy foods, intolerance to different food beliefs, or spending excessive money relative to one's income on food based on perceived quality [16]. Moreover, the food obsessions interfere with physical health due to nutritional imbalances or lead to clinically significant distress or impairment in social, academic, or vocational functioning.

All studies with suggested criteria for ON have consistently indicated three primary diagnostic criteria: obsessive or pathological preoccupation with healthy eating, emotional consequences of non-compliance to self-imposed nutritional rules, and psychosocial impairments in areas of life as well as malnutrition and weight loss [6]. Moreover, suggested criteria emphasized avoidance of foods considered unhealthy and positive effects of adherence to healthy eating rules. ON is thought to result in social isolation, malnutrition resulting in severe medical conditions, substantial dietary restrictions, and affective instability [3]. Moreover, foods that contain significant amounts of fat, sugar, salt, or other unhealthy components are avoided, and food preparation becomes a vital part of the obsessive thoughts and compulsive behaviors.

While ON may appear similar to other eating disorders, it differs in that the preoccupation revolves around the quality of food rather than the quantity [3]. Moreover, it is believed that ON does not stem from a preoccupation with physical appearance but rather through other mechanisms, including a motivation to improve one's nutritional lifestyle. Furthermore, ON is thought to develop out of efforts to alter negative eating habits or increase positive eating habits to prevent or treat illnesses [23]. While the goal appears to be enhancing quality of life, ON can result in various negative outcomes (e.g., malnourishment).

ON also differs from healthy eating habits. Suggested diagnostic criteria emphasized individuals with ON follow restrictive diets based on needs or medical conditions the individuals do not possess [22].

Additionally, they may insist on the health benefits of such diets despite contradicting evidence. The Loading [MathJax]/jax/output/CommonHTML/jax.js onstrate a dichotomous nature in which foods are perceived

as either “all good” or “all bad,” differing from suggested limitations of certain foods outlined in various healthy eating guidelines. Moreover, the preoccupations and behaviors may contribute to malnourishment [16]; this is the opposite effect expected from following suggested dietary guidelines. Moreover, the healthy eating guidelines set forth by individuals with ON are exaggerated, and emotional distress results from transgressions [8].

The lack of formal criteria for the diagnosis of ON has led to a debate regarding whether it is a standalone diagnosis or part of another condition, including obsessive-compulsive disorder, addictions, or other eating disorders [3]. This debate is further fueled by the shared characteristics and consequences between ON and other disorders. Nonetheless, those with ON are focused on being healthy and are often open about their non-sensible food beliefs. However, ON has been demonstrated as highly prevalent in individuals’ post-treatment for AN and BN [21].

Additionally, prevalence rates have been reported with great variance, likely because of the lacking psychometric properties of diagnostic measures, undefined formal diagnostic criteria, and cultural differences [9]. Prevalence rates have been reported at ranges between 6.9–88.7%; the most commonly used tools to assess ON are the Bratman Orthorexia Test (BOT) and the ORTO-15, yet both measures lack validity [14]. Moreover, most measures that have been created to assess ON have utilized international samples and were validated in languages other than English, further limiting their use on a U.S. sample. Additionally, studies of ON to date have focused mainly on university students, thus limiting their generalizability. Nonetheless, it has been reported that many professionals within the eating disorder field are aware of this condition and observe it within their practice [24].

Prevalence rates of eating disorders among minority women are generally unavailable due to the historical view that white women are more likely to meet criteria for eating disorders. However, recent research suggested prevalence rates of eating disorders are rising in both Western and non-Western countries and occur among all ethnic individuals at similar rates (National Eating Disorders Association; NEDA) [17]. The typical age of onset was suggested to be between 10 and 30, and there is a female to male ratio of 10:1 for AN and BN [23]. Importantly, eating disorders demonstrated high mortality rates: AN claims 5.1% per 1,000 persons per year and BN 1.74% per 1,000 persons per year.

Various psychosocial risk factors were associated with ON. In terms of demographic risk factors, there are mixed findings regarding age. Some studies identified ON to be more common among younger individuals. For example, in a sample of Italian athletes, Segura-Garcia et al. [20] found ON to be more common among younger adults ( $N=734$ ). Others, however, have suggested the risk of ON to increase with age. Varga et al. [25] found as age increased, ON did as well. Alternatively, higher quality studies did not find significant correlations between ON and age [7]. In terms of gender, findings were also mixed, with some studies suggesting higher rates in females [19] and others suggesting higher rates in males [12]. However, most studies of high quality suggested no relationship between gender and ON [7, 18].

Additionally, pre-existing or co-existing psychopathology were correlated with ON [15]. Particularly, current

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cantly correlated with developing ON [5, 21]. Furthermore,

*drive for thinness* [4] and *internalization of a thin-ideal* [10] were shown to correlate with ON. Moreover, eating habits, including avoiding certain foods, strict eating schedules, spending large amounts of time preparing food, restricting food intake, and consuming less saturated fats were indicated as risk factors for ON [13]. Within these findings, mechanisms suggested to contribute to ON included preoccupation with fear of weight gain or clean eating as a trigger to preoccupation with weight and shape which is seen in other eating disorders.

Past research has been somewhat inconsistent in identifying ON as a separate diagnostic category. The present study could further shed light on this diagnostic category and bring its existence and adverse effects into awareness for both individuals and mental health and medical providers. Moreover, identifying sex, racial, and age differences among individuals who meet criteria for ON is crucial in providing proper care to all individuals struggling with this disorder. Two research hypotheses and three research questions have been formulated.

Based on the findings from the literature, the following hypotheses were proposed:

### **Hypothesis 1**

History of an eating disorder will be a predictor of severity of ON symptomology.

### **Hypothesis 2**

History of eating disorder related treatment will be a predictor of severity of ON symptomology.

### **Research Question 1**

The preceding literature has indicated mixed findings regarding sex differences and ON symptomology. However, a majority of studies to date suggest no significant sex differences. Based on these findings taken together, in this study we aimed to determine whether sex differences exist in severity of ON symptomology.

### **Research Question 2**

Eating disorders have historically been recognized as disorders that only affect white women. However, recent research suggests individuals of racial minorities suffer from eating disorders at similar rates to white individuals. Based on these findings, in this study we aimed to determine whether racial differences exist in severity of ON symptomology.

### **Research Question 3**

The preceding literature has indicated mixed findings regarding age and ON symptomology. However, higher quality studies to date suggest no significant age differences. Based on these findings taken together, in this study we aimed to determine whether age group differences exist in severity of ON

# Methods

## Participants

Participants for this study included adults above the age of 18 residing in the United States. Participants were recruited through the internet, including social media and Listserv email distributions. All participants in this study were volunteers.

## Procedure

Participants responded to an online questionnaire using Qualtrics' online survey platform. Participants signed the informed consent and completed the survey electronically. Confidentiality was maintained by not asking participants to identify themselves on the questionnaire. Participants were able to respond to the survey in any setting in which they had access to a smartphone, tablet, or computer. Therefore, participants were not limited to location or setting to initiate a survey response. However, access to Wi-Fi, wireless mobile connection, or other internet connection sources was necessary for survey completion. The Florida Institute of Technology Institutional Review Board approved the data collection.

## Materials

# Survey

Demographic information, such as age, sex, and race, was obtained at the beginning of the survey. Additionally, participants answered questions regarding history of eating disorder diagnosis and treatment.

## Eating Habits Questionnaire (EHQ)

The EHQ is a brief screening measure developed by David H. Gleaves, Erin

C. Graham, and Suman Ambwani to identify symptoms of ON [11]. It consists of 21 self-report items with three subscales: Problems, Knowledge, and Feelings. It was initially developed by surveying undergraduate students in a Southeastern U.S. university. During its development, the EHQ was found to be valid, efficient, and consistent in the identification of ON. The EHQ was shown to be reliable, with good internal consistency, with subscale alphas .90, .82, and .86 for the Problems, Knowledge, and Feelings factors, respectively [11]. Additionally, test-retest reliability of the subscale scores was acceptable ( $r = .81, .81, \text{ and } .72$ , respectively). Moreover, in the preliminary study, the EHQ demonstrated convergent, discriminant, and criterion-related validity. Subsequent studies utilizing the EHQ reported adequate internal consistency and evidence for convergent and divergent validity [18, 26]. It should be noted, there are limited studies examining the validity and reliability of the EHQ; thus, more research with further reliability and validity data is needed.

The EHQ screening questionnaire includes questions assessing for knowledge of healthy eating, Loading [MathJax]/jax/output/CommonHTML/jax.js and feeling positively about healthy eating [26]. The Behaviors

subscale has five items related to healthy eating behaviors (e.g., “I follow a health-food diet rigidly”) and the Problems subscale has 12 items that assess for problems or impairments associated with healthy eating (e.g., “My healthy eating causes significant stress in my relationships”). The Feelings subscale includes four items that assess for positive feelings related to healthy eating (e.g., “I feel in control when I eat healthy”) [18]. The items are ranked on a 1–4 Likert scale, with answers including “false, not at all true,” “slightly true,” “mainly true,” and “very true.” Scale and total scores are calculated by averaging the items for a possible range of 1–4.

## Statistical Design

A Mann-Whitney analysis was used to determine whether history of an eating disorder predicted severity of ON symptomology. To determine whether history of eating disorder related treatment predicted severity of ON symptomology, a Mann-Whitney analysis was used. A Mann-Whitney analysis was used to determine whether sex differences exist in severity of ON symptomology. Lastly, separate one-way between groups ANOVA’s were used to determine whether ethnic and age group differences exist in severity of ON symptomology.

## Results

663 participants completed the survey. After checking for completeness, 128 participants were removed from data analysis due to incomplete survey responses, leaving a total of 535 responses ( $N = 535$ ). 503 (94%) identified as female and 32 (6%) identified as male. Age groups were as follow: 39.8% 18–24 years, 38.1% 25–34 years, 11.2% 35–44 years, 7.1% 45–54 years, 2.6% 55–64 years, 0.9% 65–74 years, 0.2% 75–84 years, and 0.2% 85 years or older. Based on self-reported race, 468 (87.5%) were Caucasian/White, 22 (4.1%) were Biracial/Multiracial, 15 (2.8%) were Asian/Asian-American, 14 (2.6%) were Black/African American, 2 (0.4%) were American Indian/Alaska Native, and 14 (2.6%) identified as “other.” There were 461 (86.2%) not Hispanic/Latino and 74 (13.8%) Hispanic/Latino participants. Concerning eating disorder history, 64 (12%) participants reported previously being diagnosed with an eating disorder, and 39 (7.3%) reported previously receiving eating disorder specific treatment. The average EHQ score was 38.03 ( $SD = 9.4$ ).

Based on the literature, it was hypothesized that history of an eating disorder would be a predictor of severity of ON symptomology. A Mann-Whitney test indicated that EHQ scores for those with a history of an eating disorder diagnosis ( $M_{rank} = 364.66$ ) were significantly higher than those with no history of an eating disorder diagnosis ( $M_{rank} = 254.87$ ),  $U = 8886.00$ ,  $z = -5.335$ ,  $p < .001$ . The hypothesis was supported.

It was hypothesized that history of eating disorder related treatment would be a predictor of severity of ON symptomology. A Mann-Whitney test indicated that EHQ scores for those with a history of eating disorder related treatment ( $M_{rank} = 131.22$ ) were significantly higher than those with no history of eating

disorder related treatment ( $M_{rank} = 97.03$ ),  $U = 2175.50$ ,  $z = -3.227$ ,  $p = .001$ . The hypothesis was supported.

In this study, we aimed to determine whether sex differences exist in severity of ON symptomology. A Mann-Whitney test indicated that EHQ scores were not significantly different for males ( $M_{rank} = 264.97$ ) and females ( $M_{rank} = 268.19$ ),  $U = 7951.00$ ,  $z = -.114$ ,  $p = .909$ . Recent literature indicating no significant sex differences in eating disorder behavior was supported.

In this study, we aimed to determine whether racial differences exist in severity of ON symptomology. A one-way ANOVA was conducted, and the assumption of homogeneity of variances was not met (Levene's statistic = 2.383,  $p = .037$ ). As such, the Welch's F test was used. ANOVA results showed that there is an overall significant mean difference among the six group means of racial groups, *Welch's F* (5,9.46) = 3.99,  $p = .032$ , with an eta-squared of .015, suggesting that 1.5% of the variance on EHQ scores is explained by their racial group.

Post hoc comparisons, using the Games-Howell post hoc procedure, were conducted to determine which pairs of the six racial groups means differed significantly. These results indicated that Caucasian/White individuals ( $M = 38.25$ ,  $SD = 9.61$ ) had a significantly higher average score on the measure of ON than Asian/Asian American individuals ( $M = 33.00$ ,  $SD = 4.04$ ). Recent literature indicating no significant racial differences in eating disorder behavior was not supported. However, these differences were only found among two of the eight racial groups.

In this study, we aimed to determine whether age group differences exist in severity of ON symptomology. A one-way ANOVA was conducted, and the assumption of homogeneity of variances was met (Levene's statistic = .327,  $p = .897$ ). ANOVA results showed no overall significant mean difference among the eight group means of age groups,  $F(7,527) = .346$ ,  $p = .932$ , with an eta-squared of .007, suggesting that .7% of the variance on EHQ scores is explained by age. Recent literature indicating no significant age differences in eating disorder behavior was supported.

## Discussion

The purpose of this study was to add to the limited body of research of ON. A major objective of this study was to determine whether eating disorder history predicted greater severity of ON symptomology. We predicted that individuals who were previously diagnosed with an eating disorder would demonstrate higher scores on the EHQ. Moreover, we predicted individuals who previously received eating disorder related treatment would demonstrate higher scores on the EHQ. Statistically significant results were found, indicating that higher EHQ scores are related to eating disorder history. These findings are commensurate with previous studies suggesting that ON is highly prevalent in individuals post-treatment for AN and BN [21]. This finding represents an important step in establishing the validity of ON as a potential eating disorder diagnosis.



The lack of formal criteria for the diagnosis of ON has led to a debate regarding whether it is a standalone diagnosis or part of another condition, including other eating disorders [3]. The identified high comorbidity between ON and other eating disorders within this study suggests that ON may be motivated by a desire to lose weight [13]. As such, ON may be seen as the “more acceptable” eating style to manage both acceptance by familial support, as well as internal struggles on the individual in the maintenance stage of care. However, we must also consider the potential for ON to develop into other eating disorders or for ON to be a part of these disorders; ON may also serve as a precursor or warning sign of even more pathological eating behaviors. Future research is needed to assess this relationship.

In this study, we also explored the relationships of ON and sex, race, and age, adding to a slightly inconsistent literature, where ON symptoms have previously been found to be positively, negatively, and unrelated to each of these constructs. We found no significant differences in EHQ scores between men and women. This is consistent with most studies of high quality suggesting no relationship between gender and ON [7, 18]. This finding is important as historically eating disorders have been considered diagnoses that primarily impact women. Thus, our findings highlight the importance of assessing and providing resources to men who appear to be at equal risk for developing ON. Moreover, the lack of overall sex differences in severity of ON scores support ON as distinct from AN and BN, which demonstrate a female to male ratio of 10:1 [1]. It should be noted that only 6% of our sample identified as male; thus, these results should be interpreted with caution.

In this study, when examining ON and race, we found a significant difference in EHQ scores, with Caucasian/White individuals scoring higher than Asian/Asian American participants. These findings suggest that Asian/Asian American individuals are at a decreased risk for ON when compared to Caucasian/White individuals. However, cultural differences in responding to survey items associated with ON may have influenced Asian individuals’ scores, consequently inaccurately representing their symptomology. Interestingly, no other racial differences in EHQ scores were observed. Historically, eating disorders were recognized as disorders that mainly affected Western women. However, our findings are commensurate with recent research suggesting prevalence rates of eating disorders are rising in both Western and non-Western countries and occur among most ethnic individuals at similar rates [17].

While our findings suggested Asian/Asian American individuals may be at a decreased risk for ON, our findings also highlight the importance of recognizing the occurrence of eating disorders among all racial groups. In doing so, we will be able to provide better access to care, accurate diagnosing, and resources to individuals within racial groups that have been historically misdiagnosed and underrecognized regarding their pathology.

We also found no significant differences in EHQ scores across the lifespan. These findings are consistent with studies suggesting no significant correlations between ON and age [7]. Alternatively, previously mixed findings indicated ON to be more common among younger adults [20], and others suggested the risk of ON to increase with age [25]. Our findings highlight the need to assess for ON at each age group throughout the lifespan. Together our findings reject the historical view of eating disorders as the “white

woman” syndromes and elucidate the importance of providing appropriate care to individuals of all sexes, ages, and races.

## Strengths And Limits

This study adds to the limited body of research of ON. There is a significant gap in the literature regarding ON and very little research outlining risk factors for ON. As such, this study serves as a steppingstone to establishing the validity of ON as a potential eating disorder diagnosis. Additionally, this study highlights the importance of assessing and providing resources to individuals who previously were not believed to be at equal risk for developing ON and other eating disorders, thus advocating for better access to care, accurate diagnosing, and resources to individuals within groups that have been historically misdiagnosed and underrecognized regarding their pathology.

There are important limitations to consider within this study. First, we gathered data from a non-clinical, convenience sample, with most participants being women. Thus, our sample may not account for existing variations among groups. Second, all of our measures were self-reported. Although data were anonymous, some participants may have responded inaccurately to survey questions. Moreover, our sample was recruited via social media, listservs, and email distributions, which might limit its generalizability to older, less educated populations, and populations that lack computer literacy or internet access.

Additionally, the measurement of ON was based on the EHQ, a relatively

new screener. While studies utilizing the EHQ reported adequate internal consistency and evidence for convergent and divergent validity [18, 26], there are limited studies examining the validity and reliability of the EHQ; thus, more research with further reliability and validity data is needed. Moreover, ON is a recently proposed diagnosis with limited operationalized diagnostic criteria serving to limit our ability to accurately measure and define this construct. Despite these limitations, the results of this study suggest that ON is highly prevalent among individuals with a history of eating disorders, and equally prevalent among males and females, across the lifespan, and most racial groups.

Future research should focus on determining the directional relationship between ON and other eating disorders. It will be important to determine whether ON occurs prior to, in conjunction with, or subsequent to other eating disorders. Such research could further shed light on the nature of the relationship highlighted in this study between ON and eating disorder history and whether there is an underlying commonality or vulnerability that elucidates the relationship [2]. Moreover, further studies should analyze the psychometric properties of the EHQ in other specific samples. Determining its validity and establishing a cutoff score will allow for more accurate assessment of ON. Lastly, future research should aim to further elucidate and define formal diagnostic criteria for ON. Developing a stable definition of ON will allow for future research to develop more psychometrically sound measures of ON that encompass key concepts and diagnostic criteria, further clarifying its accurate prevalence and psychosocial risk

factors associated with ON. Nonetheless, given the result of past literature and our findings, ON needs to be considered a real diagnostic option and a part of the eating disorder category.

## What Is Already Known On This Subject

ON has been demonstrated as highly prevalent in individuals' post-treatment for AN and BN [21]. Additionally, pre-existing or a history of psychopathology was correlated with ON [15]. Particularly, current or past history of eating disorder was significantly correlated with developing ON [5, 21]. However, most studies to date have utilized measures lacking psychometric validity to assess ON and there is a gap in the literature surrounding ON.

## What This Study Adds

Utilizing a more psychometrically sound measure, we found that ON symptomology is more severe in individuals who were previously diagnosed with an eating disorder and/or received previous eating disorder treatment. The results of this study suggest that ON is highly prevalent among individuals with a history of eating disorders, and equally prevalent among males and females, across the lifespan, and most racial groups. This study highlights the importance of distinguishing adaptive healthy eating from ON, which is functionally limiting and problematic. Additionally, these findings emphasize the need for providers serving clients with variations in disordered eating to accurately assess for disordered eating and provide appropriate interventions.

## Declarations

### Funding

No funds, grants, or other support was received.

### Conflicts of interest/Competing interests

The authors have no relevant financial or non-financial interests to disclose.

### Availability of data and material

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

### Code availability

Not applicable

### Authors' contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Audryn Andreoli. The first draft of the manuscript was written by Audryn Andreoli and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

### **Ethics approval**

Approval was obtained from the ethics committee of Florida Institute of Technology. The procedures used in this study adhered to the tenets of the Declaration of Helsinki.

### **Consent to participate**

Informed consent was obtained from all individual participants included in the study.

### **Consent for publication**

Not applicable

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