Master Thesis

A Study on the Relationship between Orthorexia Nervosa and Body Dissatisfaction: What Role does Gender Identity Play?

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Abstract

Eating disorders have significantly increased since the 2000s and are a major health concern. One food-related concern that has not been thoroughly investigated yet is orthorexia nervosa (ON). As individuals with ON are concerned with the quality of food they consume, it has been hypothesized that ON might be an eating disorder. Examining the relationship between ON and known risk factors of other eating disorders might aid in the argument over whether ON should be considered an eating disorder.

This paper examined the relationship between ON and body dissatisfaction (BD), as well as gender differences in this relationship and the constructs. Furthermore, the relationship between ON and BMI was investigated.

The study was conducted with 238 international participants studying in the Netherlands. The Düsseldorf Orthorexia Scale was used to measure ON and the BD subscale of the EDI-2 was used to measure BD. Gender identity was measured with a single question, and individuals identifying as women and men included in the analyses. T-tests were used to evaluate gender differences in ON and BD, and the relationship between ON and BMI was studied using an ANOVA with a post hoc Tukey's test. A correlation analysis was used to assess the relationship between ON and BD, and a multiple regression analysis was used to investigate gender differences in this relationship.

In both BD ($t = 5.098$; $p < .001$) and ON ($t = 3.391$; $p = .004$), significant gender disparities were found, with women reporting more symptoms of both constructs. The current study did not find a statistically significant association between ON and BMI ($F(3, 234) = .631$, $p = .596$).There was a significant association between ON and BD (.310, $p < .001$), with no moderating influence of gender ($p = .099$).

As BD is an established risk factor for other eating disorders, the association between ON and BD lends support to the notion that ON is an eating disorder. Since there is no link between ON and BMI, it is suggested that ON is distinct from other types of eating disorders, with a focus on quality of food consumed instead of quantity of food.

A Study on the Relationship between Orthorexia Nervosa and Body Dissatisfaction: What Role does Gender Identity Play?

The exposure to messages about nutrition and food has increased over the past few years, which has also raised interest in healthy eating habits (Pauzé et al., 2021). This trend benefits society as a nutritious diet is associated with physical health (World Health Organization, 2020). There has been a significant increase in eating disorders from 2000 to 2018, though, highlighting the fact that a strong focus on eating can also be a serious health problem (Galmiche et al., 2019). One food-related issue that has been reported to have grown in recent years and is still not fully understood is the unhealthy preoccupation with so-called "clean" eating and healthful foods, which is called orthorexia nervosa (ON) (Gotart et al., 2021). Due to a lack of research, the underlying mechanisms as well as risk factors and correlates of ON are not well understood (McComb & Mills, 2019). As ON places a high emphasis on food, one working theory is that it is an eating disorder or a precursor to an eating disorder (Barnes & Caltabiano, 2016). As a result, investigating the link between ON and risk factors for eating disorders could help in better understanding ON.

Orthorexia Nervosa

Orthorexia nervosa (ON) is a mental health concern in which healthy and “clean” eating is such a strong emphasis for the individual that it becomes a constant preoccupation (Bratman, 1997), with the term orthorexia literally meaning “proper appetite” (Costa et al., 2017). There is a growing body of literature indicating the most prominent symptoms of ON, such as a desire to follow a healthy diet, and the elimination of foods perceived to be impure and unhealthy, which escalates over time into the restriction of entire food groups, as well as a considerable amount of time spent researching and preparing food, but also a positive attitude toward eating healthy (Barnes & Caltabiano, 2016; Gobin et al., 2021; Dunn & Bratmann, 2016). The positive attitude toward the behavior is particularly problematic because the symptoms are not perceived as ego-dystonic, i.e. not consistent with one’s own self-concept, and hence no need for change is perceived (Gortat et al., 2021). Individuals experiencing ON have also been reported to feel superior to those with differing eating habits, and to associate their self-esteem with diet adherence (Douma et al., 2021; Oberle et al., 2017).

Douma et al. (2021) describe ON as developing in two stages. The first stage being the decision to follow a healthy diet, and the second being the pathological fixation with a healthy diet, resulting in physical, psychological, and social problems.

Due to the exclusion of food groups, ON facilitates malnutrition and weight loss, but it also facilitates the loss of relationships, as individuals experiencing ON frequently avoid social engagements (Koven & Abry, 2015; McComb & Mills, 2019). Furthermore, persistent concern with food quality causes pathological worry and stress, lowering an individual's quality of life (Barnes & Caltabiano, 2016; Koven & Abry, 2015, Oberle et al., 2017).

ON is not an officially recognized disorder in the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM–5; American Psychiatric Association, 2013) or the International statistical classification of diseases and related health problems (10th ed.; ICD-10, World Health Organization, 2016) (McComb & Mills, 2019). This is due to the lack of agreement on its diagnostic contribution and a clear definition of diagnostic criteria (Costa et al., 2017). Furthermore, as previously stated, one working idea is that ON is a type of eating disorder, but other hypotheses exist; such as ON being a distinct disorder or an obsessive-compulsive disorder (Barnes & Caltabiano, 2016, Oberle et al., 2017).

Perfectionism and high trait anxiety are shared by anorexia nervosa and ON, as is insufficient awareness of their situation (Koven & Arby, 2015, Suciu & Crișan, 2020). The emphasis on food and diet is also similar in ON and eating disorders, however, while anorexia nervosa and bulimia nervosa are primarily concerned with the quantity of food ingested, ON is mainly concerned with the quality of food consumed (Barnes & Caltabiano, 2016). Another major difference is the motive for the behavior, since the goal of anorexia nervosa and bulimia nervosa is weight loss or control, whereas individuals experiencing ON are concerned with being healthy (Koven & Abry, 2015).

The parallels between OCD and ON include recurring, intrusive thoughts about food as well as an exaggerated concern over food impurity; even so, the major difference between OCD and ON is that obsessions about food in ON are ego-syntonic, meaning they are experienced as being compatible with the self, whereas obsessions in OCD are experienced as ego-dystonic (Koven & Abry, 2015).

A lot is still unknown or understudied with regard to ON as it has been ignored by the scientific community for a long time (Koven & Abry, 2015), however interest in it has increased

over the last decade (McComb & Mills, 2019). A regularly used questionnaire to measure ON is the ORTHO-15. Regrettably, it has been demonstrated that this tool is unreliable, and thus data collected using the ORTHO-15 should be interpreted with caution (Niedzielski & Kazmierczak-Wojtaś, 2021). Investigating the association between ON and known correlates and risk factors of eating and obsessive-compulsive disorders is one approach to better understanding how to classify ON. Body-Mass-Index, as well as body image, and more specifically body dissatisfaction, are well-established risk factors for eating disorders (Zakhour et al., 2021) and hence a notion worth investigating.

BMI

While ON can lead to malnutrition and weight loss, its relationship to weight is currently not clear. The body mass index (BMI) is a tool that is frequently used to investigate the relationship between weight and other constructs. It is a statistical index that estimates body fat based on a person's weight and height (Weir & Jan, 2019), and has been repeatedly linked to disordered eating. Because people with ON are concerned about their health and may lose weight as a result of their restrictive eating (Koven & Abry, 2015), there may be a link between BMI and ON. Despite the fact that some studies found a positive relationship between ON and BMI, meaning that individuals with higher ON scores also had a higher BMI (Weir & Jan, 2019), other studies found no significant relationship between the two constructs (Godefroy et al., 2021).

More research into the relationship between ON and BMI is thus required, particularly in order to clarify the link between ON and correlates of eating disorders.

Body Image

Body image is a multifaceted psychological concept that includes cognitive, behavioral, and emotional components, but also subjective evaluation of one’s body (Pauzé et al., 2021). It is a spectrum that ranges from extremely positive body image to negative body image, which is also known as body dissatisfaction. Body dissatisfaction (BD) is the negative perception of the body, and particularly its physical appearance (Bully & Elosua, 2011).

There are currently three models on the development of BD that have empirical validity. According to the sociocultural model, when individuals are pressured to adhere to appearance norms by the media, relatives, and peers, those ideals become internalized and the upward comparison to those goals is what causes dissatisfaction with one's own body (McLean & Paxton, 2018). The biopsychosocial model adds to the sociocultural model by stating that genetic

predispositions to a particular body type, as well as psychological concepts like negative affect and low self-esteem, contribute to the development of BD (Rodgers et al., 2014). Finally, the objectification theory argues that in Western societies, the body is viewed as an object to be perceived and assessed, making individuals observers of their own bodies. As a result, individuals compare their bodies with societal ideals, and a perceived inability to conform with those ideals leads to BD (Tiggemann, 2013).

Recent research determined that BD has a solid relationship with general psychological distress, including low self-esteem, depressive symptoms, and body dysmorphia, as well as a low quality of life (McLean & Paxton, 2018). A number of risky behaviors are also associated with BD, including smoking and unsafe sexual behavior (McLean & Paxton, 2018). Furthermore, BD can lead to the desire to change one's body, which frequently involves unhealthy eating and exercise habits (Zakhour et al., 2021). In addition, BD is one of the strongest predictors regarding the onset of eating disorders such as BN and AN (McLean & Paxton, 2018).

The literature is inconsistent regarding the relationship between ON and BD. Some studies indicate that there is a link between ON and positive body image (McComb & Mills, 2019), while others find links between ON and body dissatisfaction (Barthels et al., 2020; Pauzé et al., 2021).

Given the scarcity of research on ON and body image, as well as the inconsistent findings, more research into the relationship is required to draw conclusions. Since most mental health issues and risk factors are not gender-neutral, it is also critical to investigate potential gender impacts.

Gender

More knowledge about risk factors is needed to improve the understanding and treatment of mental health problems, and one essential component that must not be overlooked is gender, as risks are often gender-specific (Afifi, 2007). Eating and eating-related disorders affect both men and women, with lifetime prevalence in men ranging from 0.1 to 2.1% depending on the study and disorder and 0.3 to 3.5% in women (Smink et al., 2012), but little is known about gender differences in eating disorder psychopathology (Zakhour et al., 2021).

Women have been reported to be more prone to restricted eating and to have a stronger inclination for healthful eating; due to this, the majority of studies on eating disorders have been conducted on young women (Zakhour et al., 2021). As a result, eating disorders in males are

understudied and thus under-recognized, as there is less evidence on how they manifest (Smink et al., 2012; White et al., 2020). Aside from the underrepresentation of men in eating disorder research, there is also a dispute on the impact of gender on ON. While some research indicates no gender differences (Barnes & Caltabiano, 2016; McComb & Mills, 2019, Barthels et al., 2019), others highlight the fact that being female is a risk factor for ON (Douma et al., 2021). Therefore, further research into gender differences in ON is required.

While the association between body dissatisfaction and gender is not understudied (Bully & Elosua, 2011), the link remains unclear because results have been diverse and conflicting (Liyanage et al., 2021). One reason for this could be that there are different causes of body dissatisfaction in men and women. Women appear to be more concerned with their shape and weight, desiring to be smaller, whilst men appear to be more concerned with being lean and muscular (McLean & Paxton, 2018). However, the literature on whether body dissatisfaction is more prevalent in one of the genders is inconsistent, with some studies finding it to be more prevalent in males (Liyanage et al., 2021) and others finding it to be more prevalent in females (Bully & Elosua, 2011). As a result, further research is required in order to draw conclusions about the association between body dissatisfaction and gender.

Furthermore, only one study has looked at the effect of gender on the link between BD and ON, with previous studies focusing on only one of the constructs (Zakhour et al., 2021). As Zakhour et al. (2021) found a moderating effect of gender, it is thus worthwhile to investigate whether those findings hold up.

This Study

As previously stated, further research into ON is required not only because there is currently limited data available, but also because the majority of this data was obtained using an unreliable assessment tool, the ORTHO-15 (Niedzielski & Kazmierczak-Wojtaś, 2021). Furthermore, greater understanding of the relationship between ON and established risk factors for eating disorders, such as body dissatisfaction, can aid in the argument over the definition of orthorexia nervosa as a condition. Moreover, additional research into gender differences in eating disorders and ON and body dissatisfaction is required, as males have been mostly excluded from research into these matters.

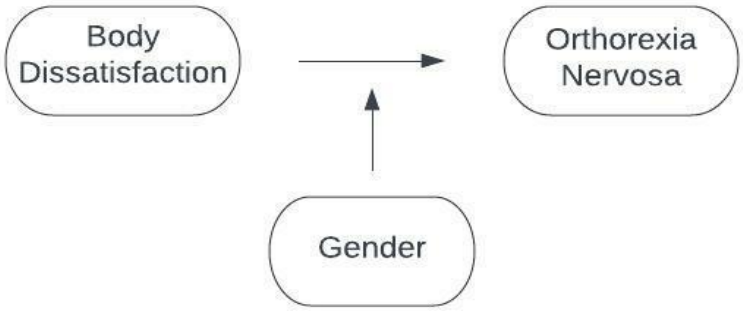
As a result, the purpose of this research is to look into the relationship between orthorexia nervosa and body dissatisfaction, as well as gender disparities in this relationship.

The study's main research questions are:

1. Are there differences in the means of BD between women and men?
2. Are there differences in the means of ON between women and men?
3. Is there a relationship between ON and BMI?
4. Is there a relationship between ON and BD?
    - It is hypothesized that there is a positive relationship between the two constructs.
5. Is this relationship moderated by gender?
    - It is hypothesized that the relationship between ON & BD will be stronger for women.

Figure 1

Visualization of the Moderation Research Questions



Methods

Study Design and Procedure

A quantitative cross-sectional design was used for this research. ON was used as a dependent variable and BD and gender were used as independent variables. The questionnaires that were used for this study were part of a larger project on the use of social media in relation to physical and mental health. From March 30th to April 13th, 2022, the survey was distributed using the University of Twente's sona system, which is a web-based tool for managing and scheduling research projects. Anonymity was ensured as only the study team had access to personal data. The survey took approximately 15 minutes to complete. Participants were informed of the survey's purpose, potential risks and benefits, and confidentiality. Participation was entirely voluntary, and consent could be revoked at any time.

Following the exclusion criteria, N = 96 respondents were excluded from the data analysis because they did not complete the survey (N = 84), did not accept the informed consent (N = 4), did not meet the social networking sites requirement of the previous study (N = 3), and provided unrealistic height and weight measurements (e.g. height of 3 meters) (N = 1). Finally, N = 4 participants were excluded because they did not identify as male or female.

This study has been reviewed and approved by the Scientific and Ethical Review Board (VCWE) of the University of Twente.

Participants

The sample consisted of 238 international participants from over 20 countries with most participants coming from Germany (59.24%) and the Netherlands (12.18%). Participants were between the ages of 18 to 34, with a mean age of 21.46 (*SD* = 2.55). Of the sample, 77.73% identified as female. All participants were students who ranged from HBO (high school) to PhD level. A detailed overview of the socio-demographic data can be appreciated in Table 1. Of the sample, 14.7% responded that they had got the diagnosis of a mental health issue at some point in their life, no information was collected on whether such diagnoses were current or in the past. Conditions mentioned included but were not limited to depression, anxiety and eating disorders, which were mentioned by 7 individuals. With regards to treatments for mental health concerns 23.9% of the total sample indicated that they had sought psychological or pharmacological help.

Participation required a decent command of English, enrollment as a student at a university or high school, and being over the age of 18.

Instruments

Socio-demographic Data

The survey collected information about the participants' age, gender, nationality, educational level, weight and height in order to calculate their BMI, mental health diagnosis and treatment, as well as time spent on social media.

Gender identity was measured with the statement “please indicate your gender” with the answer options male, female, non-binary / third gender and prefer not to say. No differentiation was made between individuals whose gender identity corresponded to their sex assigned at birth and those whose gender identity did not correspond to their sex assigned at birth (gender minority). For the analysis only respondents who identified as female or male were included.

BMI

BMI was calculated based on the formula weight(kg) : height(m)². It was then classified in four different categories, namely underweight (< 18.5), healthy weight (18.5 ≤ 25), overweight (25 ≤ 30) and obese (> 30).

Düsseldorf Orthorexia Scale

To measure orthorexia nervosa the Düsseldorf Orthorexia Scale (DOS) was used. The scale is a validated and reliable instrument to assess orthorexia nervosa (Niedzielski & Kazmierczak-Wojtaś, 2021). The English version that was employed in this study showed good psychometric qualities, including excellent concept validity and internal consistency (α = .88) (Chard et al., 2018). The DOS consists of 10 items, such as “Eating healthy food is more important to me than indulgence/ enjoying the food” (item 1) and “If I eat something I consider unhealthy, I feel really bad” (item 6). It is scored on a 4-point Likert scale ranging from “this does not apply to me” (1) to “this applies to me” (4). A total score of 40 can be reached with higher scores indicating a higher chance of ON. Scores of 30 and higher indicate the presence of ON, while scores of 25 to 29 suggest a risk for ON (Chard et al., 2018). In this study, the internal consistency of the scale was good (α = .84).

Body Dissatisfaction

The 9-item Body Image Dissatisfaction subscale of the Eating Disorder Inventory-2 (EDI-2) was used to assess BD. The EDI-2, as well as the body dissatisfaction subscale are reliable and valid tools to assess eating disorders (Nevonen et al., 2006). The Body Dissatisfaction Subscale proved excellent internal consistency with a Cronbach’s alpha of .90 to .94 depending on the studied population (Nevonen et al., 2006). The subscale has 9 items such as "I think my stomach is too big" (item 1) and "I think my thighs are too wide" (item 2), with 5 items being reverse scored (items 3, 4, 5, 7, 9). The questionnaire is scored on a 6-point Likert scale ranging from “never” (1) to “always” (6). A total score of 54 can be reached. A score of 15 or higher suggests BD with higher scores indicating greater BD. In this study, the internal consistency of the scale was good (α = .89).

Data Analysis

All statistical analyses were performed using SPSS 28 for Windows (IBM Corp, 2021).

At first, descriptive statistics i.e. means and standard deviations were calculated for age, ON, and body dissatisfaction. This was done for women, men, and a total of both groups

combined. For categorical variables, like education level, frequencies, i.e. percentages per answer option, were calculated.

To investigate the research questions 1 and 2, independent samples t–tests were performed to test whether men and women differed in BD and ON, and to test research question 3, a one-way ANOVA with a post hoc Tukey's test was performed to compare the means of ON in the four BMI categories.

To test research questions 4 a correlation analysis was conducted, and for research question 5, a moderation analysis was carried out using multiple regression with interaction term. BD in the form of the EDI-2 Body Image Dissatisfaction sub-score was used as a continuous independent variable, gender identity was used as a categorical independent variable with the categories women and men, and the interaction between gender identity and BD was used to test gender as a moderating variable. To avoid potentially problematic multicollinearity the BD variable was centered. DOS scores were used as a continuous dependent variable.

To evaluate the assumptions of a multiple regression, different analysis techniques were used. Scatterplots were utilized to test for linearity, VIF scores were used to test the multicollinearity assumption with the cut-off being 5, and the Durbin-Watson statistic was employed to establish residual independence. A plot of standardized residuals against standardized predicted values was used to test the assumption of homoscedasticity, a P-P plot was used to test normality, and Cook's Distance Values were used to check for outliers.

Results

Descriptive Statistics

The means and standard deviations (SD) for the total group and divided by gender for the descriptive statistics as well as the variables of interest (ON, BD, BMI) can be found in Table 1. According to the cut-off scores, 11.3% of the sample were at risk for ON, whereas 5.5% had ON.

T-tests

Using an independent samples t-test, the means of BD in men and women were compared to see if the genders differed in their dissatisfaction with their bodies. The results indicated that there was a difference between the two ($t = 5.098$; $p < .001$), with women reporting higher BD (see Table 1).

Another independent samples t-test was used to compare the means of ON in men and women. The results indicated that the genders differed in ON (t = 3.391; p = .004), with women reporting higher levels (see Table 1).

Table 1

Descriptive Statistics

		Total	Women	Men	Statistics
N (%)		238 (100)	185 (77.73)	53 (22.27)	
		M (SD)	M (SD)	M (SD)	
Age		21.460 (2.55)	21.090 (1.88)	22.740 (3.88)	
Body Dissatisfaction		27.571 (9.94)	29.243 (9.69)	21.736 (8.54)	5.098*
Orthorexia nervosa		18.874 (5.65)	19.432 (5.86)	16.925 (4.38)	3.391*
BMI		27.571 (9.94)	29.213 (9.69)	21.735 (8.54)	
		N (%)	N (%)	N (%)	
Education level	HBO	78 (32.77)	55 (23.11)	23 (9.66)	
	Bachelor	144 (60.5)	122 (51.26)	22 (9.24)	
	Master	14 (5.88)	7 (2.94)	7 (2.94)	
	PhD	2 (0.84)	1 (0.42)	1 (0.42)	

Note. *p<.005

ANOVA

In addition, an ANOVA was used to explore mean differences in ON in individuals with varied BMIs. The mean of ON in underweight participants was 20.389 (*SD* = 5.802), 18.841 (*SD* = 5.745) in those at a healthy weight, 18.125 (*SD* = 5.229) in those overweight and 19.333 (*SD* = 4.844) in those that were obese. The one-way ANOVA determined that there was no significant difference between ON scores in the different BMI categories (F(3, 234) = .631, p = .596). The Tukey's test similarly revealed no significant differences across the various BMI categories (see Table 2).

Table 2

Tukey's Post Hoc Test

	Underweight	Healthy Weight	Overweight	Obese
Underweight	-	1.548	2.264	1.055
Healthy Weight	-1.548	-	.716	-.493
Overweight	-2.264	-.716	-	-1.208
Obese	-1.056	.493	1.208	-

Note. * p < .005

Correlation Analysis

To test the 4th research question a Pearson correlation coefficient was computed to assess the linear relationship between ON and BD. There was a positive correlation between the two variables, r(236) = .31, p < .001 (see Table 3), indicating that those with higher ON scores also experienced higher BD scores.

Table 3

Bivariate Correlations

Variable	Orthorexia Nervosa	Body Dissatisfaction	BMI	Age
Orthorexia Nervosa	1			
Body Dissatisfaction	.310* [.190; .420]	1		
BMI	-.051 [-.177; .077]	.404* [.292; .506]	1	
Age	-.014 [-.140; .114]	-.069 [-.194; .059]	.040 [-.088; .166]	1

Note. * p < .001 (2-tailed). Values in brackets indicate the 95% confidence interval.

Moderation Analysis

Testing of Assumptions

The multicollinearity assumption was met based on VIF scores below 5 (*VIF*= 1.110) and tolerance scores above 0.2 (*tolerance scores* = .901). The assumption of independence of residuals also proved satisfactory (*Durbin-Watson* = 1.070), as well as the homoscedasticity assumption, as no funneling was observed in the plot of standardized residuals vs standardized predicted values. Visual inspection of the P-P plot of the model indicated fulfillment of the normality assumption, and Scatterplots showed that the linearity assumption was met. Cook's

Distance values were below 1, which suggests that individual cases did not unduly influence the model.

Multiple Regression Analysis

To test the 5th research question a Multiple Linear Regression was carried out. The model consisted of BD and gender, as well as the interaction between both and explained 10.6 % of variance in ON (R^2 = .106, $F(3, 234) = 9.295$, $p < .001$). A significant positive relationship was found between BD and ON (β = .301, $p < .001$). However, no significant relationship was found between gender and ON (β = -.120, p = .099), as can be seen in Table 4. This indicates that higher BD was associated with higher ON and that women and men did not differ in their experience of ON. No significant interaction between BD and gender was found (b = -.058, p = .472), indicating that the relationship between ON and BD was not influenced by gender. In Figure 2 the findings are visualized with regard to the 5th research question.

Table 4

Multiple Regression Model

		Unstandardized Coefficients		95% Confidence Interval		Standardized Coefficients		
		B	SE	Upper Bound	Lower Bound	β	t	p
1	(Constant)	19.147	.041	18.357	19.937		47.190	< .001
	BD	.171	.041	.091	.252	.301	4.190	< .001
	Gender[a]	-1.627	.983	-3.564	.310	-.120	-1.655	.099
	Interaction	-.069	.096	-.259	.121	-.058	-.720	.472

Note. Dependent Variable: Orthorexia Nervosa.

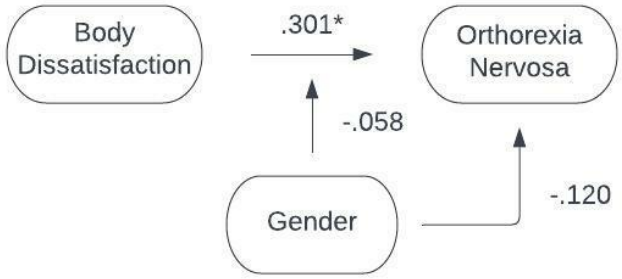
[a] Gender was dummy coded as women = 0, men = 1.

The effect size for the analysis was found to be f^2 = .118, which lies between the convention for a small effect (f^2 = .02) and a medium effect (f^2 = .15).

G*power was used to perform a post-hoc power analysis for the Model with the calculated effect size (f^2 = 0.118), an alpha of .05, and the sample size (N = 238). An adequate power of .998 was found, which indicates that the obtained sample size was adequate for the objective of the study.

Figure 2

Visualization of the 5th Research Question with Statistical Findings



Note. *p < .001

Discussion

The current study investigated the relationship between ON and risk factors of eating disorders, namely BMI and BD, as well as gender differences in the constructs and the relationships between them based on gender identity, specifically women and men.

There were significant gender differences in BD, with women reporting more dissatisfaction with their bodies than men. With regards to ON and BMI the results did not support a relationship between the constructs. The study discovered a link between ON and BD; however gender had no influence on the relationship. Regarding the fourth research question, it can thus be stated that there is a positive relationship between ON and BD, as those who reported greater dissatisfaction with their bodies also reported greater ON tendencies. Concerning the fifth research question, it can be stated that gender did not have a moderating impact on the relationship between BD and ON. However, there were significant gender differences in ON, with women reporting greater ON tendencies than men.

Gender & Body Dissatisfaction

With regards to the gender differences in BD the results of the current study support previous studies that indicated more BD in women (Bully & Elosua, 2011; McLean & Paxton, 2018). This could be due to women's increased attention to their appearance and desire to lose weight (McLean & Paxton, 2018), which may arise from more acute body shame feelings brought on by their upbringing which places more value on appearance (Zakhour et al., 2021). According to studies, women have internalized an unrealistic ideal body type in response to the

strong and convincing cultural emphasis on thin bodies for women, whereas for males, such cultural expectations are not as rigorous, resulting in less BD (Forbes et al., 2001). This finding could also be explained by the age group that was investigated, as prior research indicates that BD increases with age in women but remains stable in men after the age of 15 (Bully & Elosua, 2011).

However, the results might also be a reflection of how BD was measured, as the EDI-2 primarily focuses on BD related to feeling too large. As previously stated, there appears to be a disparity in the causes of BD, with males preferring to be more muscular rather than slimmer (Duran et al., 2020; Zakhour et al., 2021). It is possible that there would not have been a difference in BD if unhappiness with muscularity had been measured as well. This is further supported by a study by Liyanage et al. (2021), which discovered that male teenagers in Sri Lanka were twice as dissatisfied with their bodies as female adolescents, because they desired larger bodies.

Therefore, the only inference that can be made in light of the current findings is that women are more dissatisfied with their bodies regarding a desire to be thinner.

Gender & Orthorexia Nervosa

Men and women reported considerably different mean ON levels, with women reporting significantly more symptoms. Those results are not in line with previous studies as the majority of research has indicated that there are no significant differences between genders in ON (Barnes & Caltabiano, 2016; McComb & Mills, 2019, Barthels et al., 2020).

In a study by Douma et al. (2021) however, health care professionals from the Netherlands were interviewed about their experiences with ON, and they agreed that being a woman was a risk factor for ON. This could be related to women being more prone to restrictive eating, due to more focus on such in their upbringing, and having a greater desire for nutritious eating (Zakhour et al., 2021). It has also been found that men are less inclined to follow a healthy diet on purpose, possibly because healthful eating is regarded as feminine (Nelson & Fleming, 2019).

According to the current findings, women appear to have more ON symptoms than men, possibly due to a societal perspective that views healthy eating as a feminine trait.

BMI & Orthorexia Nervosa

As previously stated, there is still disagreement about whether ON is related to BMI. The current study's findings support the notion that this is not the case, and they are consistent with previous research (Godefroy et al., 2021).

However, there are also studies that have discovered a relationship between the constructs. The type of measure used, as well as the strength of the relationship, could be an explanation for those differences. Using the ORTHO-15, Gramaglia et al. (2019) and Missbach et al. (2015) discovered weak relationships between ON and BMI. Because the ORTHO-15 has been shown to be an unreliable and invalid measure of ON, all findings made with the scale should be interpreted with caution though (Niedzielski & Kazmierczak-Wojtaś, 2021). It is therefore possible that an insignificant link favoring BMI differences was overstated as a result of using unreliable measurements, given the weak relationship that was found.

Godefroy et al. (2021) created a structural model of ON and determined that the eating pattern of ON suggests a limited decrease in BMI, since BMI was only moderately related to ON dimensions. This is also consistent with the definition of ON, as the emphasis is on being healthy rather than losing weight (Barnes & Caltabiano, 2016). Individuals with ON are concerned with the quality of food, therefore spending a lot of time planning what they eat, but not eating less than people without ON; and as a result, weight loss is rare or only occurs minimally. Moreover, no weight gain can be observed as a result of the concern for food quality and nutritional value.

In light of the existing findings, it is reasonable to state that there is no association between ON and BMI.

Moderation Effects

Orthorexia Nervosa & Body Dissatisfaction

The results that showed an association between BD and ON are partially in line with previous research (Barthels et al. 2020; Pauzé et al., 2021). Some researchers assumed that weight changes were only an indirect result of ON since the focus of people displaying ON symptoms is on the quality of food consumed rather than the quantity (Barnes & Caltabiano, 2016). As a result, it was suggested that no relationship between ON and BD should be observed. Nonetheless, the findings of several studies suggested a link between the constructs.

According to McComb and Mills (2019), previous research has shown that those who are anxious about their weight and who place a high value on their appearance are more likely to develop ON. Barthels et al. (2020) found that ON is associated with a desire for thinness as well

as low self-acceptance, linking it to BD. Furthermore, they suggested that even young females with slightly elevated levels of ON may be predisposed to Anorexia nervosa and Bulimia nervosa features. Therefore, it was suggested that BD be regarded as a key feature of ON (Barthels et al., 2020). Additionally, Pauzé et al.'s (2021) study linked ON to both explicit and implicit measures of body dissatisfaction, such as the desire to lose fat and gain muscle as well as dissatisfaction with one's body fat/muscle. Since BD is a risk factor and predictor of eating disorders, the findings could be explained by ON's similarities to other eating disorders, i.e. sharing symptoms of perfectionism, high trait anxiety, and a lack of insight into their situation, with Anorexia nervosa (Koven & Arby, 2015; Suciu & Crișan, 2020). Given the association of ON with known risk factors for eating disorders, as well as the distinct presentation of ON compared to other eating disorders, i.e. focus on quality of food vs quantity of food in AN, and no relationship to BMI, the findings support the notion that ON should be considered a distinct eating disorder.

As there are studies that have linked ON to positive body image and health orientation though (Anastasiades & Argyrides, 2022; McComb & Mills, 2019), it has been argued that there may be different types of ON, implying that there may be a healthy and an unhealthy form of ON (Anastasiades & Argyrides, 2022; Pauzé et al., 2021). It would be assumed that individuals exhibiting symptoms of "healthy ON" would focus primarily on consuming healthy food, and based on this positive attitude toward what they eat, they might have a positive attitude toward their body. However, because the current study was not meant to distinguish between these characteristics of ON, no conclusions can be drawn about this hypothesis.

Moderation Effect

In contrast to what was discovered in the present study, an earlier study suggested that gender influences the link between BD and ON. Zakhour et al. (2021) discovered that women have a stronger linkage between BD and ON, but the present study did not discover a significant moderating effect of gender. However, Zakhour et al. (2021) noted that there were substantial limitations to the study that should be considered, such as the fact that it was conducted in Lebanon and thus may not be generalizable to western countries, as well as the fact that the BD measure employed was not validated for the country. Furthermore, no explanation was provided as to why this association was stronger for females.

No firm conclusions can be drawn at this point since this appears to be the only other study that examined a moderating influence of gender on the relationship between BD and ON.

Nevertheless, based on the current study's findings and the shortcomings of the study by Zakhour et al. (2021), it appears that the relationship between ON and BD is the same for men and women.

Strengths & Limitations

A limitation of this analysis is the cross-sectional nature of the results, which does not allow for causal conclusions. Furthermore, the study was not very inclusive, as it only included people who identified as men or women. Including gender minorities, such as those who identify as non-binary, genderqueer, or gender non-conforming, may have lead to different results, as gender minorities are particularly affected by BD (Goldhammer et al., 2019). The use of a body dissatisfaction measure that might not have accurately captured the feeling of BD in both investigated genders was a significant restriction, as was already highlighted. Another limitation of this study is that it relied on a convenience sample because recruitment was limited to student networks, and the majority of participants were recruited through the University of Twente's "sona-system", so the majority of participants were Behavioral Science Management students.

However, the current study's generalizability was strengthened by a representative sample of 238 participants from over 20 countries.

The good psychometric properties of the EDI-2 and the DOS were another strength of this study. Both scales are valid and reliable tools for assessing the intended construct (Nevonen et al., 2006, Niedzielski & Kazmierczak-Wojtaś, 2021), with high Cronbach's alphas in this study. Furthermore, the DOS measures ON better than other, more commonly used scales such as the ORTHO-15 (Niedzielski & Kazmierczak-Wojtaś, 2021).

Future Research

More study on the relationship between ON and BD, as well as other predictors and risk factors of eating disorders, is required before we can draw conclusions on how to define ON. Furthermore, such research should seek to distinguish between healthy and unhealthy features of ON in order to discover whether they are, in fact, distinct entities. In those studies, it should also be an aim to explore how gender influences the relationship, as research in this area is limited and hence no conclusions can be drawn at this time.

More studies should be conducted on the relationship between BD and gender, where BD is conceptualized not only as feeling too large but also as being dissatisfied with one’s

muscularity, as it seems like this differentiation might be the reason for the gender differences in BD.

Furthermore, more research on the relationship between ON and BMI is required, with ON measures that are reliable and valid.

Conclusion

ON is a construct that has received increased attention in recent years, but there is still much that is unknown. Because ON is linked to negative aspects such as a low quality of life, more research into the condition is needed.

The findings of this study imply that ON is an eating disorder and is associated with risk factors of such, such as BD, while presenting in a unique way; i.e. emphasizing healthfulness rather than quantity of food ingested and not being related to weight. As a result, more study should be conducted on ON in order to understand the symptomatology and better assist those who suffer from it, and prevent the development of it in those at risk.

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