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# Orthorexia Nervosa and Perfectionism: A Systematic Review

## *Ortoreksiya Nervoza ve Mükemmeliyetçilik: Sistematik Bir Gözden Geçirme*

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**ABSTRACT**

Ortoreksiya nervoza, sağlıklı beslenmeye yönelik patolojik bir saplantı şeklinde tanımlanmaktadır. Ortoreksiya nervozanın gelişiminde birçok risk faktörünün etkili olduğu bilinmektedir. Bu çalışmada, ortoreksiya nervozanın gelişiminde etkisi olduğu düşünülen mükemmeliyetçiliğin rolünün daha iyi anlaşılması amaçlanmıştır. Bu bağlamda, ortoreksiya nervoza ile mükemmeliyetçilik ilişkisini ele alan çalışmalar gözden geçirilmiştir. PubMed, Wiley Online Library ve SageJournals veri tabanlarında arama yapılmıştır. Taramada "orthorexia", "orthorexia nervosa", "pathologically healthy eating" ve "perfectionism" anahtar sözcükleri kullanılmıştır. Tarama sonucunda, ortoreksiya nervoza ile mükemmeliyetçilik arasındaki ilişkiyi ele alan 17 çalışma incelenmiştir. Çalışmalar örneklem özellikleri, çalışma deseni, ortoreksiya nervoza ölçüm araçları ve çalışma sonuçları açısından değerlendirilmiştir. Çalışmaların sonuçlarına bakıldığında ortoreksiya nervoza ve mükemmeliyetçiliğin ilişkili olduğu görülmektedir. Ayrıca incelenen çalışmalardan yalnızca bir çalışmada ortoreksiya nervoza ile mükemmeliyetçilik arasında zayıf düzeyde bir ilişki olduğu belirlenmiştir. Bununla birlikte, ortoreksiya nervoza ve mükemmeliyetçilik ilişkisine dair daha kapsamlı sonuçlar elde etmek için kültürlerarası yürütülen çalışmalara ihtiyaç olduğu görülmektedir. Son olarak ortoreksiya nervozanın gelişiminde etkili olduğu düşünülen mükemmeliyetçilik kavramının etkili tedavi stratejileri izlenmesinde yol gösterici olabileceği düşünülmektedir.
**Keywords:** Yeme bozuklukları, ortoreksiya, ortoreksiya nervoza, mükemmeliyetçilik, sistematik gözden geçirme

**ÖZ**

Orthorexia nervosa is described as a pathological fixation with healthy eating. Many risk factors contribute to the development of orthorexia nervosa. This study aimed to better understand the role of perfectionism in the development of orthorexia nervosa. In this context, studies on the relationship between orthorexia nervosa and perfectionism were reviewed. In the databases of PubMed, Wiley Online Library and Sage Journals and were searched. The keywords "orthorexia", "orthorexia nervosa", "pathologically healthy eating" and "perfectionism" were used in the search. As a result of the scanning, 17 articles on the relationship between orthorexia nervosa and perfectionism were examined. Studies were evaluated in terms of sample characteristics, study design, orthorexia nervosa measurement tools and study results. The results indicate that orthorexia nervosa and perfectionism are related. In addition, only one study found a weak relationship between ON and perfectionism. However, for more comprehensive findings on the relationship between orthorexia nervosa and perfectionism, cross-cultural studies are needed. Finally, the concept of perfectionism, which is effective in the development of orthorexia nervosa, may be a guide for effective treatment techniques.
**Anahtar sözcükler:** Eating disorders, orthorexia, orthorexia nervosa, perfectionism, systematic review

## Introduction

Healthy eating is one of the major factors influencing human health from early life (Lanigan and Singhal 2009). In particular, it can reduce the risk of life-threatening diseases such as cancer (Gonzalez and Riboli 2010, Nosrati et al. 2017), type 2 diabetes (Afshin et al. 2014), cardiovascular diseases (Mente et al. 2009, Estruch et al. 2013), overweight and obesity (Botchlett et al. 2017). Therefore, healthy eating is considered an environmental protective factor for physical health (Brug 2008). However, healthy eating can have negative consequences for some individuals. Excessive focus on healthy eating can become an obsession over time. This obsession with healthy eating is referred to as orthorexia nervosa (ON) in literature (Malmborg et al. 2017, Oberle et al. 2017).

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The term of ON, proposed in the late 1990s (Bratman 1997), is increasingly being investigated. Bratman (1997) described ON as a pathological obsession with healthy eating. ON typically begins with an effort to improve health or avoid/manage health problems (Novara et al. 2022). It becomes a pathological obsession with strict dieting and avoidance of unhealthy foods or ingredients (Moroze et al. 2015). Individuals with ON obsessively focus on the quality of food, long-term planning, and food preparation. These individuals spend more than three hours a day thinking/preparing food or pondering over meals (Bratman and Knight 2000). They may also experience increased self-esteem and self-worth when they can adhere to healthy eating and strict diet (Barnes and Caltabiano 2017). However, individuals with ON may feel disappointment and intense guilt when they do not adhere to their strict dietary rules. Moreover, they may also feel fear and anxiety about the health implications of this dietary violation (Varga et al. 2013). This may lead to a desire to restrict dietary practices (Koven and Abry 2015).

While not currently recognized as a mental disorder, diagnostic criteria for ON have been proposed. Although these proposed criteria vary somewhat, experts generally agree that ON involves significant concern about "healthy" eating and adherence to strict food rules by affected individuals (Varga et al. 2013, Dunn and Bratman 2016). Individuals with ON are believed to have concerns about "healthy" eating that dominate their lives and become clinically harmful, in addition to food quality and health-related obsessions and/or compulsions (Varga et al. 2013, Dunn and Bratman 2016). The proposed diagnostic criteria also emphasize that these individuals do not concern themselves with the quantity of food, do not have negative body image, and do not have a desire to lose weight (Varga et al. 2013, Dunn and Bratman, 2016). On the other hand, it is also stated that these individuals intend to lose weight, but body shape and weight concerns are not the main problem (Barthels et al. 2019). Basically, it is a controversial issue whether individuals with ON have a desire to lose weight.

Some researchers have summarized the main diagnostic criteria for ON as a pathological preoccupation with healthy eating, emotional consequences such as stress or anxiety of not following self-imposed dietary rules, and psychosocial restrictions in important areas of life, malnutrition and weight loss (Cena et al. 2019). As mentioned above, it is seen that the diagnostic criteria put forward by different researchers regarding ON differ. It can be said that consistent diagnostic criteria for ON have not yet been determined.

There is some debate about the categorisation of ON due to its similarities with eating disorders (ED) and obsessive-compulsive disorder (OCD). Some researchers (e.g. Brytek-Matera 2012) have suggested that ON should be considered as a different type of eating disorders, others (e.g. Costa et al. 2017) believe it should be included in the OCD spectrum. However, some recent studies (Strahler et al. 2018, Barthel et al. 2020) suggest that ON is similar to eating disorders. ON may be a subclinical and asymptomatic form of eating disorder, according to Strahler et al. (2018). Similarly, Barthel et al. (2020) concluded that ON shares similarities with both OCD and ED, but there is no significant relationship between obsessive-compulsive symptoms and obsession with healthy eating. In other words, the researchers stated that ON may be a type of eating disorder. In sum, although it has not yet been determined in which category of mental disorders ON will be included, recent studies indicate that it is similar to eating disorders.

ON has negative consequences on physical and mental health. Selective eating can lead to malnutrition and weight loss. Health problems such as digestive problems, hormonal imbalance, osteoporosis, heart failure may occur. ON may also lead to other negative outcomes related to mental health, such as poor quality of life, social isolation and emotional dissatisfaction (Catalina Zamora et al. 2005, Brytek-Matera 2012, Moroze et al. 2015).

The prevalence of ON in general population is reported to range from 1-7% (Barthels et al. 2015, Dunn et al. 2017). In a study conducted by Plichta and Jezewska-Zychowicz (2019) with university students using the ORTO 15 scale, the prevalence ranged from 1-28.3%. Depa et al (2017) found a prevalence rate of 3.3% in a study of 446 German university students using the Düsseldorf Orthorexia Scale (DOS). In a study conducted in Turkey using the ORTO-15 scale, prevalence of ON was 45.5% among

318 medical doctors (Bosi et al. 2007). A study of 136 Spanish yoga practitioners determined a prevalence rate of 86% (Valera et al. 2014). As a result, ON prevalence rates vary depending on the tool used and the population.

When studies on gender differences are examined, while some studies (Keller and Konradsen 2013) report higher ON rates among women than men, others indicate that it is more common in men (Fidan et al. 2010). It was also found that there was no association between ON and gender (Donini et al. 2005). Consequently, there are inconsistent results findings of gender differences. It has also been reported that the prevalence of ON is particularly high in some professional groups (performing artists, yoga practitioners, dietitians, etc.) (Alvarenga et al. 2012). Furthermore, 51.8% of regular exercisers (Almeida et al. 2018) and 27.7% of athletes (Bona et al. 2019) reported ON symptoms.

Significant similarities between ON, ED and OCD are often emphasised. Moreover, anxiety and depression have been linked to ON in some studies. Personality traits such as neuroticism, narcissism and perfectionism have also been associated with ON tendencies (Bratman 2017). When the literature is examined, it is seen that perfectionism is related to ON. ON, which has been examined in many aspects especially in recent years, has been associated with perfectionism (Koven and Abry 2015, Costa et al. 2017). Perfectionism is a concept that has been addressed by many authors researchers. Frost and Marten (1990) defined perfectionism as "the tendency to set high standards and make overly critical self-evaluations". According to Brustein (2013), positive traits such as self-efficacy and conscientiousness are associated with high levels of perfectionism. However, perfectionism can become a problem when linked to mental disorders. Excessively high levels of perfectionism, in particular in childhood, can be a risk factor for anxiety, depressive disorders and eating disorders (Bulik et al. 2003, Flett et al. 2016).

Researchers have claimed that perfectionism is an significant risk factor for the development of eating disorders (Fairburn et al. 2003, Levinson et al. 2017). A meta-analysis has also concluded that perfectionism is a sustaining factor for eating pathology. Perfectionism has a significant effect on ED, as indicated by the moderate effect size of this finding (Stice 2002).

Many studies have shown that people with ED have higher levels of perfectionism than non-clinical and other disorders (Cassin and von Ranson 2005, Lilenfeld et al. 2006, Farstad et al. 2016). Compared to other psychological disorders, higher levels of perfectionism have been found in people with EDs, especially in AN (Bardone-Cone et al. 2007, Limburg et al. 2017). Limburg et al. (2017) examined perfectionism in different psychological disorders and concluded that perfectionism is associated with ED, anxiety and depressive symptomatology.

Some studies have found that perfectionism, which is a risk factor for the development of ED (Bardone-Cone et al. 2007), may also play a role in the development of ON. A positive relationship has been observed between perfectionism and obsession with healthy eating in general population (Barnes and Caltabiano 2017, Oberle et al. 2017). According to Brown et al. (2012), perfectionists strictly interpret expert advice on healthy eating and follow strict dietary rules. Furthermore, it is stated that high standards are related to both the eating process (raw material selection, adherence to dietary rules) and physical well-being (Barnes and Caltabiano 2017).

Similarly, McComb and Mills (2019) also suggest that perfectionism may increase ON tendency. Perfectionism can lead people to experience rigid thoughts and behaviours about their bodies and diets (Stoeber et al. 2017, McComb and Mills 2019). Being perfectionistic can result in rigid thoughts and behaviours about one's body and diet (Stoeber et al. 2017, McComb and Mills 2019). In individuals with ON, perfectionism is associated with the desire to control one's environment and life events (Valente et al. 2019). However, it has been suggested that there is a weaker relationship between perfectionism and ON compared to the relationship between ED and perfectionism (Bartel et al. 2020).

Consequently, it is important to understand the role of perfectionism in ON. To our knowledge, there is no systematic review on the relationship between ON and perfectionism. In this context, the present

study aims to systematically examine the relationship between ON and perfectionism. Finally, this study may provide a better understanding of the role of perfectionism in ON.

## Method

In this study, it was aimed to review the studies examining the relationship between ON and perfectionism. Studies were identified using the following keywords: "orthorexia", "orthorexia nervosa", "pathologically healthy eating" and "perfectionism". In this study, the databases PubMed, Wiley Online Library and SageJournals were scanned according to the PRISMA decision criteria, which are often used in systematic reviews. Since there are databases that are accepted in the literature and include scientific and empirical research on ON, it was decided to use these databases in the current study. A total of 207 studies were identified by scanning the databases PubMed, Wiley Online Library and SageJournals.

Inclusion criteria were studies with participants aged 18 years and older, written in Turkish or English. Exclusion criteria included review studies, studies conducted with children or adolescent groups, case studies, book chapters and qualitative studies. Studies that could not access the full text and were written in a language other than English were also excluded in the review

As a result of the screening, a total of 207 studies were identified. Using the inclusion and exclusion criteria, 190 of 207 studies were excluded. It was determined that three studies were pilot studies, two studies were case studies, 10 studies were book chapters, five studies had a sample of adolescents, 15 studies were review studies and seven studies did not have full text access. After excluding 142 irrelevant studies and four qualitative studies, 17 studies from different databases that met the criteria were evaluated.

## Results

### Methodological Characteristics of the Studies

This section will include information about the sample characteristics, aims, measurement tools, and designs of the studies.

#### *Sample*

The studies included in this review were conducted between 2016 and 2023. The samples of the examined studies consist of adult participants. Study sample sizes ranged from 133 people (Novara et al. 2022) to 860 people (Brytek-Matera et al. 2020a). In terms of gender, the majority of studies have a high proportion of women. In some studies, the difference between genders is quite high (e.g. Strahler et al. 2020). Of the studies included, only one study (Pratt et al. 2021) had a larger number of male participants than female participants. Some studies (Mavrandrea and Gonidakis 2022, Novara et al. 2022) in which the proportions of female and male are quite close are also included in this review. Studies include different sample groups such as yoga practitioners, athletes and university students. In other words, most of the studies were conducted with non-clinical samples. However, it is noteworthy that some studies (e.g. Novara et al. 2021) represented samples of eating disorders (anorexia/bulimia nervosa, binge eating disorder, etc.).

#### *Aims*

The studies reviewed aimed to examine the relationship between ON and perfectionism. However, in addition to examining the relationship between ON and perfectionism, there are some studies (Brytek-Matera et al. 2020b, Brytek-Matera et al. 2022) that also examine cross-cultural comparison, unlike other studies. In short, the aim of the 17 studies examined is to understand the effect of perfectionism on ON, but some studies have additional aims.

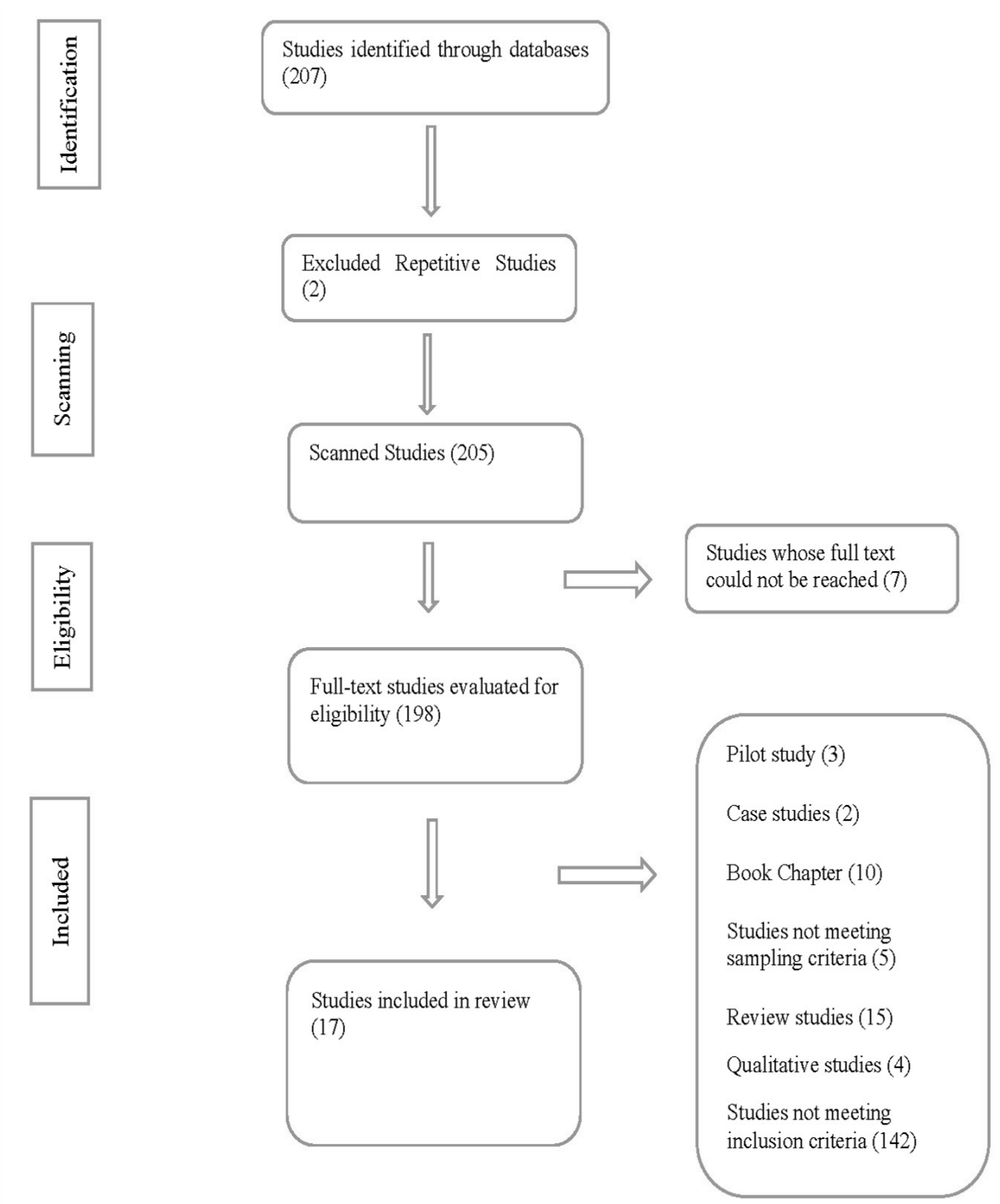


**Figure 1. PRISMA flow chart**

**Table 1. General features and results of studies included**

| Study | Sample | Gender | Aim | Method | Measure-ments | Results |
|---|---|---|---|---|---|---|
| Barlow et al. (2022) | n=286 | 142 female<br>121 male<br>3 Non-binary | Identification of differences between ON and healthy orthorexia | cross-sectional | TOS<br>EHQ<br>DOS<br>FMPS<br>DASS-21<br>FMI | Perfectionism and health anxiety were identified as risk factors for both |

| Study | Sample | Gender | Aim | Method | Measure-ments | Results |
|---|---|---|---|---|---|---|
| | | | | | | ON and healthy orthorexia |
| Barnes and Caltabiano (2016) | n=220 | 174 female 46 male | To investigate whether perfectionism, body image, attachment style and self-esteem are predictors of ON | cross-sectional | MPS MBSRQ-AS RSQ RSES | Results showed higher ON tendencies were significantly associated with higher perfectionism. |
| Bartel et al. (2020) | n=512 | 423 female 89 male | To determine whether ON is a disorder belonging to ED or the spectrum of OCD | cross-sectional | ORTO-15 EDE-Q FMPS FCQ | Compared to OCD symptoms, ON symptoms were more strongly associated with ED symptoms. Both ED and ON symptoms were moderately associated with perfectionism, whereas OCD symptoms were strongly. |
| Brytek-Matera et al. (2020a) | n=860 | 560 female 300 male | Assessment of the prevalence of ON in Spanish and Polish university students and relationship between ON and ED symptoms | cross-sectional and descriptive | DOS EDI | ON prevalence was 2.3% and 2.9% in the Spanish and Polish samples. ON was positively associated with drive for thinness, body dissatisfaction and perfectionism in both Spanish and Polish students. |
| Brytek-Matera et al. (2020b) | n=230 | 175 female 55 male | To determine the profiles of the participants in terms of eating behaviour, OCD symptoms and physical activity and to assess their relationship with ON | cross-sectional | DOS EDI IPAQ OCI-R | Higher levels of OCD, perfectionism and dieting increase risk of ON |
| Brytek-Matera et al. (2022) | n=606 | 495 female 115 male | To investigate the differences between ON | cross-sectional | EHQ OCI-R MPS | Students with high levels of ON were found to |

| Study | Sample | Gender | Aim | Method | Measure-ments | Results |
|---|---|---|---|---|---|---|
| | | | and OCD symptoms among university students The aim was to assess the relationship between ON and OCD symptoms | | OBQ | have higher levels of OCD symptoms and perfectionism. |
| Domingues and Carmo (2020) | n=469 | female 84% (sample distributio n not clearly specified) | To examine potential risk factors in the development of ON | cross-sectional and descripti ve | TOS FMPS SDS | A weak/moderate relationship was found between perfectionism and ON |
| Hayes et al. (2017) | n=404 | female 82.7% (sample distributio n not clearly specified) | To examine the prevalence of ON and related disorders in university students | cross-sectional | ORTO-15 EDEQ AAI FMPS OCI-R DASS | ON symptoms were moderately associated with perfectionism, disordered eating, appearance anxiety and obsessive-compulsive symptoms |
| Mavrandrea and Gonidakis (2022) | n=241 | female 49,5% male 51,5% | Investigating the mediating role of perfectionism in exercise dependence and ON | cross-sectional | EDS-R ORTO-15 FMPS | Perfectionism has been found to be a risk factor for exercise addiction and ON. |
| Miley et al. (2022) | n=670 | 588 female 78 male | To examine the association between perfectionism, mindful eating and ON | cross-sectional | BTPS-SF MEBS DOS | A positive relationship was found between perfectionism and ON |
| Novara et al. (2023) | n=187 | 115 female 72 male | To examine which dimensions of perfectionism mostly represent ON. To assess whether dieting affects the presence of ON characteristics and perfectionistic behaviours | cross-sectional | EHQ-21 MPS EDI-3 OBQ | The results emphasised that people with high ON tendencies showed higher perfectionistic traits and ON had a significant association with different aspects of perfectionism. No difference was found between the dieting and non-dieting groups. |

| Study | Sample | Gender | Aim | Method | Measure-ments | Results |
|---|---|---|---|---|---|---|
| Novara et al. (2021) | n=329 | 264 female 65 male | Investigation of differences between clinical and non-clinical groups at high risk of ON | cross-sectional | EHQ-21 EDI-3 OCI-R MPS BAI BDI-II | Perfectionism predisposes to higher ON tendencies. Findings showed that in AN/BN group, eating disorder symptoms and lower BMI were associated with ON. Moreover, in the Obesity/Binge Eating Disorder and Dieting groups, perfectionism is related to ON |
| Novara et al. (2022) | n=133 | 72 female 61 male | Investigation of the role of diet in groups with high/low ON tendency and examine some psychopathological characteristics associated with ON and maladaptive personality traits | cross-sectional | EHQ-21 PID-5 EDI-3 OCI-R MPS BAI BDI-II | The group with high ON tendencies had higher perfectionism scores. Diet may also be a possible factor associated with ON |
| Oberle et al. (2017) | n=459 | 80.8% female 19.2% male | To evaluate whether ON is predicted by demographic variables (gender, BMI) and personality variables (self-esteem, narcissism and perfectionism). | cross-sectional | EHQ SES NPI FMPS | The results showed that narcissism and perfectionism had a positive relationship with ON for both men and women. |
| Parra-Fernándezez et al. (2018) | n=454 | 295 female 159 male | To investigate the prevalence of ON and analyse possible links between ON and psychological characteristics and behaviours | cross-sectional | ORTO-11 EDI-2 | A significant correlation was observed between ON and other psychopathological features of ED (perfectionism, body dissatisfaction, etc.) |

| Study | Sample | Gender | Aim | Method | Measure-ments | Results |
|---|---|---|---|---|---|---|
| | | | common to ED | | | |
| Pratt et al. (2021) | n=150 | 74 female 76 male | To determine whether perfectionistic self-presentation is associated with ON | cross-sectional | PSPS ORTO-15 | Perfectionistic self-presentation is positively associated with ON in exercisers |
| Strahler et al. (2021) | n=608 | 465 female 143 male | Identifying differences and similarities between ON and exercise dependence | cross-sectional | DOS EAI HADS | Perfectionism is a risk factor for exercise dependence and ON. |

AAI: Appearance Anxiety Inventory, BAI: Beck Anxiety Inventory, BDI-II: Beck Depression Inventory-Second Edition, BFI-10: Big-Five Inventory, BFNE: Brief Fear of Negative Evaluation Scale, BTPS-SF: Big-Three Perfectionism Scale Short-Form, DASS: Depression Anxiety Stress Scale-21, DOS: Düsseldorf Orthorexia Scale, EAI: Exercise Addiction Inventory, EDEQ: Eating Disorder Examination Questionnaire, EDI-2: Eating Disorder Inventory, EDI-3: Eating Disorder Inventory-3, EHQ-21: Eating Habits Questionnaire-21, FCQ: Food Choice Questionnaire, FMI: Friedberg Mindfulness Inventory, FMPS: Frost Multidimensional Perfectionism Scale, IPAQ: International Physical Activity Questionnaire, MBSRQ-AS: Multidimensional Body-Self Relations Questionnaire-Appearance Scale, MEBS: Mindful Eating Behavior Scale, MPS: Multidimensional Perfectionism Scale, OBQ: Obsessive Beliefs Questionnaire, OCI-R: Obsessive Compulsive Inventory-Revised, PID-5: Personality Inventory for DSM-5, PSPS: Perfectionistic Self-Presentation Scale, RSES: Rosenberg Self-Esteem Scale, RSQ: Relationship Scales Questionnaire, SDS: Sheehan Disability Scale, TOS: Teruel Orthorexia Scale.

### *Measurement Tools*

Different measurement tools were used to evaluate ON in the reviewed studies. Measurement tools such as ORTO-11 (Parra-Fernández et al. 2018) and ORTO-15 (Mavrandrea and Gonidakis 2022), as well as scales such as the Teruel Orthorexia Scale (TOS; Barlow et al. 2023) and the Düsseldorf Orthorexia Scale (DOS; Strahler et al. 2020) were used to evaluate participants' ON tendencies. In some studies, the Eating Habits Questionnaire-21 (EHQ; Novara et al. 2021, Brytek-Matera et al. 2022, Novara et al. 2023) was used to evaluate ON symptoms. The most frequently used measurement tool for the assessment of ON is the ORTO-15, which was developed by Donini and colleagues (2005).

The Eating Disorder Inventory-3 (EDI-3) was used to evaluate symptoms of ED and some psychological characteristics, the EHQ was used to identify ON-related problems, thoughts, concerns and feelings, and the Revised Obsessive Compulsive Inventory (OCI-R) was used to identify OCD symptoms (Brytek-Matera et al. 2022). Some studies (Novara et al. 2023) have assessed basic cognitive domains in the development and maintenance of OCD using the Obsessive Beliefs Questionnaire (OBQ). The Frost Multidimensional Perfectionism (FMPS) was used for the assessment of different perfectionist traits (Novara et al. 2021). The Beck Depression Inventory-II (BDI- II) and Beck Anxiety Inventory (BAI) were also used to evaluate ON-related problems (Novara et al. 2023). Two studies (Barnes and Caltabiano 2016, Oberle et al. 2017) used the Rosenberg Self-Esteem Scale (RSS) to assess self-esteem and self-worth.

### *Study Design*

The majority of the studies have a cross-sectional design. Some studies (e.g. Brytek-Matera et al. 2020a, Domingues and Carmo 2020) use descriptive and cross-sectional designs.

## Study Findings

The results of the studies examined are presented in this section. Studies included in this review have investigated the relationship between ON and perfectionism. When the results were analysed, it was

found that perfectionism was associated with ON in all studies.

Three studies examined the association between perfectionism and ON in university students. Oberle et al. (2016) examined the relationship between ON and some demographic variables (gender, body mass index) and personality traits (perfectionism, narcissism). The results of this study with 459 university students showed that narcissism and perfectionism were positively related to ON in both men and women.

In another study, the prevalence of ON in university students and common psychological characteristics in ON and ED were examined. In this study conducted with 295 female and 159 male participants using the ORTO-11, 17% of all participants were found to be at risk of ON. It was concluded that perfectionism was higher in participants at risk of ON. In addition to perfectionism, body dissatisfaction, impulsivity and drive for thinness were found to be higher in participants with ON tendencies (Parra-Fernández et al. 2018). In sum, ON shares the psychological characteristics of other eating disorders. Finally, in another study (Brytek Matera et al. 2022) conducted with university students, the relationship between ON and OCD symptoms was evaluated. This study differs from the other two in that it is cross-cultural. In this study of 286 Polish and 320 Italian university students, there was an association between ON and high levels of OCD symptoms and perfectionism.

Some studies (Domingues and Carmo 2020, Barlow et al. 2023) have identified risk factors for ON. In these studies, perfectionism was found to be a risk factor for ON. In a study investigating the mediating role of perfectionism in exercise dependence and ON (Mavrandrea and Gonidakis 2022), perfectionism was found to be a risk factor for exercise dependence and ON. The study also found that regular exercisers were particularly prone to ON. Similarly, perfectionism was positively associated with ON in exercisers in another study (Pratt et al. 2021).

In the studies included in this systematic review, perfectionism was found to be associated with ON. In some studies, perfectionism was found to have a weak/moderate relationship with ON. Domingues and Carmo (2020) examined the relationships between ON and potential risk factors with 469 yoga practitioners. It was found that there was a weak/moderate relationship between perfectionism and ON. Bartel et al. (2020) found that ON symptoms were strongly associated with symptoms of ED compared to OCD. However, both ED and ON symptoms were moderately associated with perfectionism, whereas OCD symptoms were strongly. Furthermore, a study with university students found that ON symptoms were moderately related to perfectionism (Hayes et al. 2017).

It is seen that most of the studies reviewed were conducted with non-clinical groups. Different sample groups such as university students, yoga practitioners, athletes are included in the studies examined. On the other hand, Novara et al. (2021) examined the differences between clinical and non-clinical groups. In this study, 329 participants were divided into four groups as anorexia/bulimia (90), obesity/binge eating disorder (54), dieting group (91) and control group (no dieting) (94). Findings showed that ON tendencies were higher in anorexia/bulimia, obesity/binge eating disorder and dieting groups compared to the control group. Findings showed that in AN/BN group, eating disorder symptoms and lower BMI were associated with ON. The findings also showed that eating disorder symptoms and low BMI were associated with ON in AN/BN group. In addition, perfectionism traits were found to be associated with ON in obesity/ binge eating disorder and dieting group.

The term 'healthy orthorexia' is also used in literature. Healthy orthorexia is the adoption of healthy eating habits that are protective for one's health (Brytek-Matera et al. 2015). A study of the differences between healthy orthorexia and ON is also included in this review. This study found perfectionism and health anxiety to be risk factors for both ON and healthy orthorexia (Barlow et al. 2023)

Within the scope of this review, there are two studies examining the role of dieting on ON. Novara et al. (2022) investigated the role of dieting in groups with high/low ON tendencies. More psychopathological characteristics (obsessive-compulsive symptoms, perfectionism, anxiety and depression) were found in dieters and non-dieters with high ON tendency. Another study (Novara et al. 2023) evaluated whether dieting affects the presence of ON traits and perfectionistic behaviours.

The results showed that dieting increased ON tendency. People with high ON tendencies were also more perfectionistic. In sum, it was emphasized that ON has a significant association with perfectionism. Furthermore, people with ON also tend to be perfectionistic, whether they're dieting or not.

In literature, a limited number of studies examining the relationship between socio-cultural context and ON. Two studies evaluated in this review include an cross-cultural comparison. The first was conducted with Polish and Italian university students (Brytek Matera et al. 2022). The results showed that Polish students had a higher level of ON tendency compared to Italian. Previous cross-cultural studies have shown that societies that value pleasure rather than health (e.g. Southern Europe) have more healthy eating behaviours (Vaillancourt et al. 2019). The Mediterranean diet, which is especially common in countries such as Italy, is considered as a healthy diet and is associated with positive health-related outcomes (Schwingshackl et al. 2015). According to the results of the study, the reason for the low level of ON tendency in Italians compared to Polish is the presence of a gastronomic culture that includes the Mediterranean diet (Brytek Matera et al. 2022). Other study (Brytek Matera et al. 2020b) examined factors linked to ON and the association between ON-ED symptoms among Spanish and Polish university students. In both Spanish and Polish students, ON was found to be positively associated with the drive for thinness, body dissatisfaction and perfectionism. It was also found that the ON prevalence was higher in Spanish students compared to Polish students. To conclude, it can be said that social context is effective on eating behaviour. In addition, the study also found that levels of perfectionism and ON were positively related.

## Discussion

The relationship between ON and perfectionism is systematically examined in this study. Most of the studies included are 2020 and beyond. Only three studies (Barnes and Caltabiano 2016, Hayes et al. 2017, Parra-Fernándezez et al. 2018) were conducted before 2020. In other words, the concept of ON has been studied especially in recent years.

The current systematic review includes studies conducted with different groups (university students, yoga practitioners, athletes, etc.). A contribution of this study is that it assessed the relationship between ON and perfectionism in multiple populations. In general, the results suggest that ON is related to perfectionism. Results showed that high levels of perfectionism were associated with high ON tendencies. Some studies found a strong association between ON and perfectionism, while others found a weak association.

Initially, people with ON choose to follow a healthy diet. Afterwards, healthy eating habits intensify and can become problematic. However, not all diets are linked to ON. Other factors, such as food concerns, impairment of social functioning, malnutrition and weight loss can also play a role in the development of ON (Bratman 2017). This review includes two studies that examined the effect of diet on ON. However, the results were not consistent. Previous research has suggested that diet may be a risk factor for ON (Barthels et al. 2018). It has been emphasised that following a healthy diet is not a dysfunctional behaviour, but dieting may be an important etiological factor for ON (Novara et al. 2021). In conclusion, the effect of diet on ON should be further investigated based on inconsistent findings.

The role of individual factors in the development of ON is highlighted in the literature. However, some researchers emphasise the importance of cultural factors. Nicolas (2006) suggests that cultural as well as individual factors may influence ON and describes ON as a psycho-cultural syndrome rather than an individual pathology. Similarly, Dibartolo and Rendon (2012) claimed that perfectionism can be influenced by sociocultural factors. Therefore, future studies should examine cultural factors to understand the role of cultural differences in ON.

Healthy eating and physical exercise have positive impacts on physical and mental health. On the other hand, both can become an obsession and lead to negative consequences such as emotional distress, malnutrition and weight loss (Strahler et al. 2021). Many studies have found a significant positive

association between ON and physical exercise (Segura-Garcia et al. 2012, Malmborg et al. 2017, Oberle et al. 2018, Rudolph 2018). Two studies included in this review (Strahler et al. 2020, Mavrandrea and Gonidakis 2022) also investigated the similarities between exercise addiction and ON. The results indicated that perfectionism is a risk factor for exercise addiction and ON. It was also found that ON tendency was remarkable in regular exercisers.

Some studies (Bartel et al. 2020, Brytek-Matera et al. 2020a) found significant parallels between ON and ED. Bartel et al. (2020) suggested that ON should be considered as disordered eating behaviour. Considering that perfectionism associated with strict nutrition rules is associated with ON (McGregor 2017), it can be concluded that ON is more related to the spectrum of ED. Although ON and BED share similarities, it is important to identify the motivation behind food choice and eating behaviours.

Koven and Abry (2015), in their study of the clinical presentation of ON, suggest that anxiety, cognitive rigidity and perfectionism are common features in ON, YB and OCD. As a matter of fact, in the studies examined within the scope of the this review, it is seen that the relationship between perfectionism and ON is emphasised. The majority of the studies in this review suggest that perfectionism also plays an important role in YB and OCD. It is estimated that the reason why perfectionism is a common trait seen in ON, YB and OCD may be due to the transdiagnostic nature of this concept (Hessler-Kaufmann et al. 2021).

It is important to consider determining the differences between ON, which is characterized by excessive mental preoccupation with healthy eating (Donini et al. 2005) and healthy eating. If the measurement tools to be used in research include the differences between healthy eating and ON, ON will be determined clearly and accurately. When the studies included in this review are examined, it is seen that diverse measurement tools are used to evaluate ON. The ORTO-15 developed by Donini et al. (2005) has been used most widely. However, ORTO-15 has been criticized for only measuring concerns about healthy eating. It does not assess pathological eating (Barnett et al. 2016). It is known that some tools (e.g. ORTO-11) do not have a specific cut-off score and different cut-off scores are used in the studies (Fidan et al. 2010). However, two studies (Domingues and Carmo 2020, Barlow et al. 2022) used the TOS. It has been described as an important assessment tool in terms of its ability to determine the difference between healthy and pathological eating (Barthels et al. 2019). Therefore, using this tool to assess may help to accurately identify those prone to developing ON. It is also considered necessary to develop other instruments related to ON.

Strengths of this study include the use of the PRISMA protocol and the investigation of the relationship between ON and perfectionism in multiple populations. Moreover, a strength of this study is that the included studies were conducted in diverse countries. This review includes studies conducted in European countries (e.g. Spain, Italy, Poland) as well as in countries such as the USA, UK and Canada. On the other hand, it can be considered a limitation that all studies conducted in Western countries. Therefore, findings about ON and perfectionism may not generalise to non-Western cultures. The current review includes two studies (Brytek-Matera et al. 2020b, Brytek-Matera et al. 2022) based on a cross-cultural comparison of ON and related symptoms. In particular, given that perfectionism may be influenced by sociocultural factors (Dibartolo and Rendon 2012), it is important to conduct studies across diverse cultural groups. Thus, the relationship between perfectionism and ON in diverse cultures can be better understood.

An important limitation of this review is that most studies were cross-sectional. In cross-sectional studies, limited conclusions regarding generalisability and causality can be drawn. Longitudinal studies are needed to provide information on how ON changes over time or to determine whether perfectionism is a risk factor for ON. A limitation of this review is that only studies that were written in English and had full-text access were included. It is also noted that some measurement tools used in the included studies have no specific cut-off score. Using measurement tools without specific cut-off scores is another limitation of the current study. Because these tools may not accurately assess ON.

## Conclusion

To date, numerous studies have shown that perfectionism contributes to developing ED. The current study also suggests that perfectionism has an effect on ON, as on ED. The results indicate that there is a positive relationship between ON and perfectionism. In other words, it can be suggested that perfectionism may increase one's tendecy to ON. Moreover, it is recommended that future research examine articles published in different languages for a comprehensive perspective on the relationship between ON and perfectionism. Different databases may also be used in future studies. Studies published in different languages and using different databases can provide more comprehensive and clearer conclusions. It is also important to develop instruments for the assessment of ON.

Overall, this study highlights the concept of perfectionism which is related to ON. Perfectionism can be a guide both in determining ON tendency and in effective intervention. It is also known that ON has no recognised diagnostic criteria. Therefore, this study should be useful for diagnostic assessment. With this perspective, this study, which examines the relationship between ON and perfectionism, can make an important contribution for literature.

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