



## The Relationship between Preoccupation with Diet and Orthorexia Nervosa: An Integrative Review

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### Abstract

**Introduction:** Orthorexia Nervosa (ON) is the term that defines a pathological obsession with healthy eating and relevant extreme behaviors, which can have physical and psychosocial consequences. Knowing the boundary between a healthy habit and an eating disorder is challenging.

**Objective:** To evaluate the relationship between excessive behaviors in pursuit of healthy eating and the tendency to develop orthorexia nervosa.

**Methods:** An integrative review aimed at answering the question: Is there any relationship between concern about diet and orthorexia nervosa? The search for publications was performed in the IBECs, LILACS, PubMed, Web of Science and Scopus databases using descriptors in English and publication dated between 1997 and 2022. Studies that evaluated the tendency to develop orthorexia nervosa in individuals older than 18 years of age, except for pregnant women, were eligible for analysis.

**Results:** The studies address some determinants of orthorexic behavior, the motivations for healthy eating, the consequences of (pathological) ON, its obstacles and treatment, and the definitions of ON and healthy eating.

**Conclusion:** Special diets seem to be a trigger for ON. However, these may be linked to the diagnosis of chronic noncommunicable diseases, food intolerances or concerns with the prevention of morbidities. That said, it is possible to observe that the tendency to ON is not triggered by eating healthy, albeit obsessively, but the factors related to healthy eating. Therefore, it is necessary to investigate the etiology of obsessively healthy eating to better understand ON.

**Keywords:** Orthorexia nervosa; Obsessive healthy eating; Healthy diet; Eating disorders; Food intake disorders

### Introduction

There is a growing concern with healthy eating in recent decades, although healthy eating is not practiced by a large part of the population. Attention focused on diet is reinforced by knowledge of the many factors that affect human health (e.g., genetic, environmental, behavioral, cultural). However, excessive attention to a healthy lifestyle can have medical and psychological consequences [1,2].

The eating behavior of an individual can be influenced by several factors, such as age, sex, family habits, climate, and cultural and social aspects. Some of these factors can lead to changes in the eating pattern, causing what is known as “eating disorder”. Currently, the literature has consistently observed that there is a greater demand for understanding the eating behavior of individuals or population groups [3-5]. Excessive concern with healthy eating has been studied in recent years, leading to a specific type of eating behavior known as “Orthorexia Nervosa” (ON) or simply “orthorexia” [6-8]. This term, which defines the obsession with healthy eating, was created in 1996 by physician Steve Bratman and refers to people who adopt extremist behaviors in relation to diet and only eat healthy foods [9-11].

This pathological obsession with adequate nutrition is characterized by a restrictive diet, ritualized eating patterns and rigid refusal of foods that are believed to be harmful or impure. Motivated by the desire to achieve optimal health, ON can lead to nutritional deficiencies, medical complications and poor quality of life [12]. The obsessive and compulsive characteristics practiced by orthorexic individuals may influence not only what they eat but also their attitudes when socializing. Individuals who follow these diet-related attitudes and behaviors tend to have a sense of pride and superiority associated with their eating patterns and a critical and disapproving attitude toward individuals who do not subscribe to the same standards.

A healthy diet is qualitatively complete, quantitatively sufficient, harmonious in its composition and appropriate to its purpose and to the individual. Based on this principle, a diet should not involve restrictions, nor is it recommended to classify nutrients as “good” and “bad” or “healthy” and “unhealthy”.

The authors reported that “a biopsychosocial view of healthy eating also implies that the judgment of what is healthy or not depends on many factors, such as individual and family history, culture, religion, economic aspects, personal experience, preferences and aversions, knowledge and beliefs, among others”.

The habit of “eating healthy” according to the perception of the population is a positive characteristic most of the time and very well accepted. Therefore, determining a threshold at which a healthy habit transgresses and becomes an eating disorder is challenging and makes the diagnostic criteria for ON difficult. The habit of “eating healthy” according to the perception of the population is a positive characteristic most of the time and very well accepted. Therefore, determining a threshold at which a healthy habit transgresses and

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Orthorexic behavior is considered pathological from the moment its character becomes inflexible and obsessive, with physical, psychological and social consequences for the individual. The present article aims to assess whether an excessively healthy diet leads an individual to develop orthorexia nervosa?

## Materials and Methods

This integrative review followed the recommendations and guidelines of the integrative systematic review Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

The searches were performed in the databases PubMed<sup>®</sup> (National Library of Medicine), Web of Science<sup>®</sup>, Scopus<sup>®</sup>, LILACS<sup>®</sup> (Latin American and Caribbean Literature on Health Sciences) and IBECS<sup>®</sup> (Index Bibliographical Español en Ciencias de la Salud).

A publication period of 10 years prior to July 2022 was established as the selection criterion for articles. The identification of the topic was intended to answer the following question: Does excessively healthy eating prompt the development of orthorexia nervosa? The descriptors used were searched in the titles of the studies and were defined based on the terms in the DeCS (Descriptors in Health Sciences) and MeSH (Medical Subject 4 Headings), which are referred to in Portuguese as (“ortorexia nervosa” or “alimentação saudável obsessiva”) AND (“dieta saudável”) AND (“transtornos da alimentação” or “transtornos da ingestão de alimentos”) and in English, such as (“orthorexia nervosa” or “obsessive healthy eating”) AND (“Diet, Healthy”) AND (“eating disorder” or “feeding disorder”). All articles were exported to the Zotero<sup>®</sup> reference manager version 6.0.10, and duplicates were removed.

The following inclusion criteria were established: a) studies that evaluated the tendency to develop ON; and b) adults over 18 years of age. The exclusion criteria were as follows: a) studies that addressed the validation of methods and instruments; b) study population with metabolic disease involving changes in diet; c) pregnant women; and d) articles that were not available in full text.

A double-blind analysis was performed by the authors to identify the preselected and selected studies. Next, the full texts of the eligible articles were read according to the previous step. Thereafter, studies that did not meet the criteria were excluded, and the selected studies were analyzed and interpreted.

## Declaration of ethics

Because this was an integrative literature review, in which there was no direct involvement of human or animal subjects, Research Ethics Committee approval was not necessary.

## Results and Discussion

The search detected 66 studies, as shown in Figure 1. After a complete reading of the preselected articles, 13 studies remained eligible for analysis. Among the selected articles, nine belonged to the field of psychology, and only two were in the field of nutrition, originating in different countries such as Germany, England, the Netherlands, Poland, France, the United States, New Zealand and Brazil.

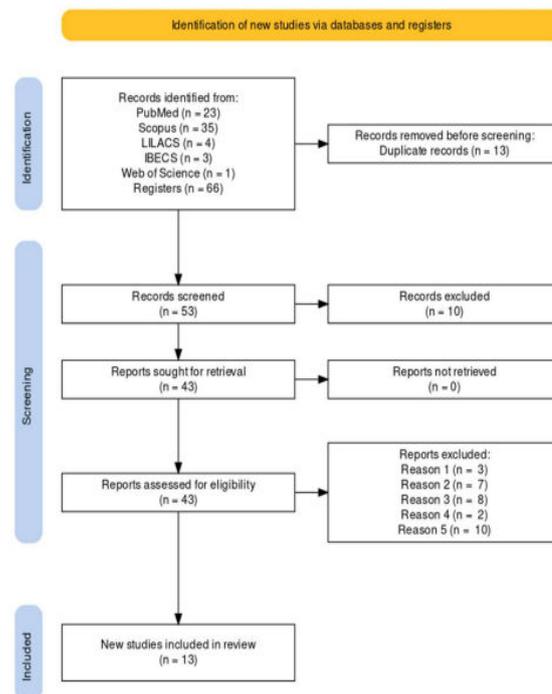


Figure 1: Flowchart of the selection of eligible articles according to the research protocol.

Reason 1: Orthorexia Nervosa (ON) versus body image; Reason 2: ON versus eating disorders; Reason 3: Prevalence studies; Reason 4: Clinical cases; Reason 5: ON versus vegetarianism, construction of the ON concept, endocrine aspects, psychosocial risks, evaluation of instruments.

To corroborate the idea that the subject addressed is of great interest in Europe, an identifying map of the main countries that conduct studies on ON was prepared. A search was performed in the Scopus database with the term “orthorexia nervosa”, and from that, an Excel spreadsheet was generated, identifying the country of origin for each first author. This dataset was exported to the Microsoft Power Bi program. With this information, the maps shown in Figure 2 and 3 were generated.

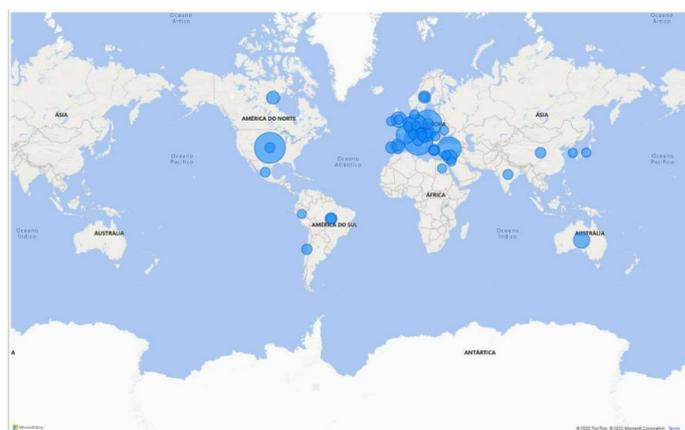


Figure 2: Map of the main countries that published studies on Orthorexia nervosa in 2012-2022.



**Figure 3:** Countries in Europe with publications on Orthorexia Nervosa in 2012-2022.

ON is described by the authors as a pathological obsession with healthy eating, positively related to negative affect and more focused on the quality of food than on the quantity. The discovery of foods and diets that allow the person to feel great and prevent negative sensations, also characterizes orthorexic aspects.

Determining the main attributes of ON as well as analyzing the factors that influence its development represent the objectives of most articles published in recent years. Table 1 shows that systematizing knowledge and exploring motivations that trigger orthorexic behavior are also research interests.

The first step in conceptualizing ON requires having valid and reliable instruments. One of the greatest challenges in diagnosis is the use of a well-established instrument. Questionnaires validated as the Dutch Eating Behavior Questionnaire (DEBQ); Eating Disorder Examination Questionnaire (ED-Q); Eating Disorder Screen for Primary Care (ESP); Eating Habits Questionnaire; Eating-disorders Inventory-3; and Obsessive-Compulsive Inventory-Revised were used as screening tools to select individuals who had some type of eating disorder.

ID	Author/Year	Title	Purpose
1	Barnett et al. [1]	Organivore or organorexic? Examining the relationship between alternative food network engagement , disordered eating , and special diets	To examine the relationship between NFA engagement, ED and special diets
2	Barthels et al. [2]	Orthorexia nervosa and healthy orthorexia as new eating styles	To analyze whether the SO and ON dimensions can be considered new eating styles or basically equivalent to restricted eating behavior
3	Cheshire et al. [3]	What are the key features of orthorexia nervosa and influences on its development? A qualitative investigation	To determine the main defining characteristics of ON and the factors that influence its development
4	Douma et al. [4]	Developmental pathway of orthorexia nervosa: Factors contributing to progression from healthy eating to excessive preoccupation with healthy eating. Experiences of Dutch health professionals	Obtain information on the course of development of ON and the factors that contribute to this type of behavior , through records and analysis of information on patients who meet the criteria for ON
5	Gortart et al. [5]	Orthorexia nervosa-An approach to healthy eating	To systematize the knowledge about the obsessive approach to healthy eating
6	Lewthwait e et al. [6]	That's just healthy eating in my opinion: Balancing understandings of health and orthorexic dietary and exercise practices	To explore people's motivations in adopting and constructing meanings around highly significant and/or problematic eating practices .
7	Martins et al. [7]	Orthorexia nervosa: Reflections on a new concept	To describe orthorexic behavior based on phenomenological discussions and epidemiological data available in studies published to date
8	Plichta et al. [8]	Orthorexic Tendency and Eating Disorders Symptoms in Polish Students: Examining Differences in Eating Behaviors	To explore the AP and other eating inhabits of people with a tendency to AD , symptoms of AD , as well as those who do not have them

9	Rodgers et al. [9]	Orthorexia nervosa, intuitive eating, and eating competence in female and male college students	To evaluate the relationship between the symptoms of ON and the different facets of intuitive eating and eating competence
10	Strahler [10]	Trait mindfulness differentiates the interest in healthy diet from Orthorexia Nervosa	To examine the relationship between orthorexic mindfulness and AP, considering two dimensions: SO and ON
11	Valent et al. [11]	"And it snowballed from there": The development of orthorexia nervosa from the perspective of people who selfdiagnose	Include the perspective of those who share content about ON on Instagram and self-diagnose themselves, to track the development of ON, gain insights into risk factors, symptoms and recovery
12	Valent et al. [11]	"Keep Yourself Alive": From Healthy Eating to Progression to Orthorexia Nervosa to a Mixed Methods Study among Young Women in the Netherlands	To understand the factors that influence the choice of people to follow a diet considered healthy and how these factors may contribute to ON
13	Yakin et al. [12]	Not all personal definitions of healthy eating are linked to orthorexic behaviors among French college women. The cluster analysis study	To explore the typology of young French women based on personal definitions of healthy eating and to examine the differences between the groups regarding their tendencies toward ON, ED and obsessive compulsive behavior

**Table 1:** Characterization of the selected articles; Alternative Food Network (AFN); healthy orthorexia (OS); Orthorexia Nervosa (ON); Eating Disorders (ED); Dietary Patterns (EF).

The ORTO-15 instrument was used by some authors as a metric to determine ON. However, other authors consider that it has limitations and chose to use the Teruel Orthorexia Scale.

ON has been frequently studied by university students in health courses and by health professionals, especially nutritionists. Thus, this population becomes the target of most studies involving this eating disorder, as shown in Table 2. The other studies sought as a study

population Instagram users, young women, and practitioners of "healthy" diets and exercise. Some factors have been described as possible triggers for the development of ON: special diets, external influences (family and/or friends), desire to cure or prevent chronic diseases, past traumas, traumatic events that can lead to dissatisfaction with oneself or with the physical body, need for obsessive control, sexual abuse with shame of the body and the need to feel clean, media and advertisements.

ID	Methodology	Results
1	<b>Instruments:</b> ED-Q <sup>1</sup> and ORTO-15. <b>Study population:</b> Men and women over 18 years of age, university students	No significant associations were found between ED and NPA engagement; Participants with greater commitment to AFN showed greater tendencies to develop ON; Individuals following a special diet were significantly more engaged in AFN and reported greater trends in ON.
2	<b>Instruments:</b> TOS <sup>2</sup> ; DEBQ <sup>3</sup> and PANAS 4 <b>Study population:</b> University students	OS was negatively related to negative affect and positively related to positive affect; the inverse was found in ON; Higher correlations were observed between NO and the dietary restriction factor, although these two factors were not considered equivalent.
3	<b>Instruments:</b> Semi structured interviews. <b>Study population:</b> Health care professionals and individuals prone to ON.	Key features of ON: a) Rigidity and control around food; b) Judgment of adherence to a "healthy" diet as the "right" or moral thing to do; c) Negative impact, exaggerated adherence to a "healthy" diet

		individuals are often trapped in cycles of stress, depression, guilt and feelings of failure Influential factors: external influences (families, traumas, groups/movements) and social influences (society, morality, ethics, social media).
4	<b>Instruments:</b> Semi structured interviews. <b>Study population:</b> Health professionals working in the Netherlands who have experience in the treatment of ED with symptoms of ON.	Social and conventional media were considered triggers for ON; Having experienced a breakup or divorce and not having a good relationship with the family were identified as triggers for the development of ON, as were changes in diet due to health problems.
5	Literature review	Groups most susceptible to ON: athletes, nutritionists, health professionals, medical students, artists, people who have had an eating disorder and those with unique eating habits. Cultural aspects should be considered in the risk assessment for ON. Western culture, through the diet and fitness industry, is an extremely important factor in the development of obsessions with healthy foods and in the pursuit of a perfect and slender figure. Social networks have a significant influence on the promotion of orthorexic behaviors.
6	<b>Instruments:</b> Semi structured interviews. <b>Study population:</b> Individuals older than 18 years of age identified as practicing "healthy" diets and exercise.	Study participants characterized health as a "feeling" positively encompassing feelings and physical sensations and/or avoiding unpleasant physical sensations and future health concerns, attributed to healthy food choices and regular exercise. The high involvement with eating and exercise practices, described as ON, can be understood as an individual pathology.
7	Literature review	Medical students, physicians, nutritionists, people with anxiety, obsessive-compulsive patients and those who value the perfect body are the most vulnerable groups to ON; Patients with anorexia and bulimia are motivated by weight loss, orthorexics seek the "perfect healthy diet"; The economic component is indicated as a limiting factor of the orthorexic condition; The pursuit of "food purity" can lead to nutritional deficiencies and social isolation.
8	<b>Instruments:</b> ORTO-15; ESP5; QFA6. <b>Study population:</b> undergraduate and master's	Tendency to develop ON without symptoms of were more likely to have ON and ED; Those who do not follow a special diet have a lower risk of ON and ED. AD: 48% were students in the health field; Students who ate irregular meals were less likely to have ON; Students who do not skip dinner and supper
9	<b>Instruments:</b> ORTO-7; Intuitive Eating Scale-2. <b>Study population:</b> University students aged 18-25 years.	12% of the participants reported having some chronic disease, 6% were diseases that can affect the diet (celiac, diabetic and anemic individuals); 59% of the women and 47% of the men showed tendencies to develop ON; ON behaviors were significant predictors of less positive eating attitudes.
10	<b>Instruments:</b> TOS <sup>2</sup> and IMF 7 <b>Study population:</b> Convenience sample	Mindfulness was positively correlated with OS and negatively correlated with ON. ON was negatively associated with mindfulness. Mindfulness encourages healthy eating and may protect against food-related pathologies.
11	<b>Instruments:</b> Curve of Snyderman. <b>Study population:</b> Instagram users aged 16-55 years.	63% of respondents defined ON as an obsession with healthy eating and pure and clean foods, a minority considered ON as "salvation" of chronic diseases; Three phases of ON development were identified: onset, progression and help seeking; The majority tried to lose weight during ON, but the aim was health and not appearance;

		Barriers to treatment: lack of recognition/acceptance of the pathological condition; ineffective health care system; lack of empathic and accessible care; sociocultural, financial and institutional barriers.
12	<p><b>Instruments:</b> Semistructured questionnaire; ORTHO-15.</p> <p><b>Study population:</b> Women aged 18-35 years, residing in the Netherlands.</p>	Half of the interviewees were vegans; The perception of healthy eating was "balance" and "moderation"; Foods associated with healthy eating were vegetables and whole grain foods; Factors that lead to healthy eating: need to change the diet due to specific disease, food intolerances; preparation of the body for pregnancy or for better performance; Media are great influencers; Food intolerances, pressure from ideas about beauty and concerns about future chronic diseases were the most significant predictors of concerns with healthy eating.
13	<p><b>Instruments:</b> EHQ8; EDI3 9; OCI-Revisado.</p> <p><b>Study population:</b> French adult female university students</p>	<p>Healthy eating was defined as: "Health benefits"; "Political-ecological"; "Restriction"; "Sociocultural" and "Food avoidance"; leading to three distinct groups: "Self consciousness and the Environment" (SEA); "Restrictive-Avoidant" (RA); "Pursuit of Social Pleasure" (SP). SEA presented higher scores in ON behaviors, suggesting that emphasizing factors such as improving physical/ intellectual performance, preventing physical/mental diseases, respecting sustainability, the ecosystem and animal rights; in personal definitions of healthy eating may be associated with a greater tendency toward ON behaviors.</p> <p>ON behaviors may vary depending on the personal definitions of healthy eating, and these definitions are different from those related to eating disorders and obsessive-compulsive behaviors.</p>

**Table 2:** Methods and Results. Alternative Food Network (AFN); healthy orthorexia (OS); orthorexia nervosa (ON); Eating Disorders (ED); dietary patterns (EF). 1 Eating Disorder Examination Questionnaire; 2 Teruel Orthorexia Scale; 3 Dutch Questionnaire of Eating Behavior; 4 Timeline of Positive and Negative Effects; 5 Eating Disorder Screen for Primary Care; 6 Food frequency questionnaire; 7 Freiburg Mindfulness Inventory; 8 Eating Habits Questionnaire; 9 Eating-disorders Inventory-3; 10 Obsessive-Compulsive Inventory.

Alternative Food Network (AFN); healthy Orthorexia (OS); Orthorexia Nervosa (ON); Eating Disorders (ED); dietary patterns (EF). 1) Eating Disorder Examination Questionnaire; 2) Teruel Orthorexia Scale; 3) Dutch Questionnaire of Eating Behavior; 4) Timeline of Positive and Negative Effects; 5) Eating Disorder Screen for Primary Care; 6) Food frequency questionnaire; 7) Freiburg Mindfulness Inventory; 8) Eating Habits Questionnaire; 9) Eating-disorders Inventory-3; 10) Obsessive-Compulsive Inventory.

The intensive search Other attitudes strongly related to the development of ON are the past or present use of a special diet; individuals with high involvement in the Alternative Food Network; and the search for "food purity" due to the increased awareness of the contamination of food by toxins in the soil, water and air.

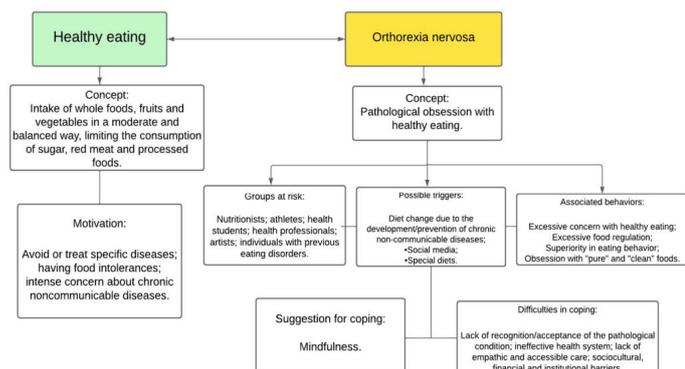
The intensive search for "food purity" brings a selectivity characteristic of orthorexic individuals; this attitude can lead to a deficiency of micronutrients and lead to iron deficiency/anemia, osteoporosis due to lack of calcium, and hypovitaminosis due to vitamin B12 deficit, among other nutritional deficiencies.

Healthy eating was defined as a health benefit, and the main factors that lead to this eating behavior were the avoidance or treatment of specific diseases, food intolerances and an intense concern about chronic noncommunicable diseases.

One study reported that ON was defined as an obsession with healthy and clean or pure food and attributed this behavior to harmful effects on physical, mental or social well-being. However, a minority of the participants did not see ON as a problem but as a "salvation" for chronic diseases. While the majority believed that recovery was possible, respondents agreed that ON is a condition that will always remain in the subconscious. Additionally, in this study, some barriers to the treatment of ON were identified, such as lack of recognition/acceptance of the pathological condition; ineffective health system; lack of empathic and accessible care for individuals; and sociocultural, financial and institutional barriers.

In summary, the eligible articles in this study address the triggers for ON, the motivations for healthy eating, the consequences of (pathological) ON, its obstacles and treatment, as well as the definitions of ON and healthy eating by the interviewees and the different instruments used for evaluation.

Thus, to draw a possible distinction between the concepts of healthy eating and the development of orthorexic tendencies, a summary of the main points found in the articles selected in this study was prepared, as shown in Figure 4.



**Figure 4:** Concept and characteristics of healthy eating and orthorexia nervosa.

In this study, associated methodologies were applied, such as the development of a search strategy, the use of indexed descriptors and a delimited period for publications, aiming at current publications on the analyzed object. We also did not use filters for language and study design, which did not impose limits on the world scientific literature.

It is noteworthy that because of its broader methodological approach, the integrative review allows the inclusion of experimental and nonexperimental studies, providing a better understanding of the phenomena analyzed, in addition to allowing the incorporation of studies with definition of concepts, review of theories and evidence, and analysis of instruments and 14 methodological problems. The main relevance of the integrative review is to synthesize research based on available scientific knowledge on the subject, directing its application in health practices. This purpose was achieved in this study, which reinforces the importance of the results found.

## Conclusion

Special diets seem to be a trigger for ON. However, they may also be linked to the diagnosis of chronic noncommunicable diseases, food intolerances or concerns about preventing morbidities. That said, it is possible to observe that it is not the fact of eating healthy, even obsessively, that leads to ON, but its etiology. Therefore, it is necessary to investigate the cause of obsessively healthy eating to better understand ON. In this context, it is possible to conclude that eating healthy in itself is not directly related to ON and that there is a fine line between concern for healthy eating and ON.

## Limitations

The exclusion of articles not found in full is a limitation of this study because they could provide interesting information for analysis. However, the impossibility of reading the full text would compromise the assessment of eligibility. Another limitation is the nonuse of an instrument to analyze the quality of articles, which would make the study more robust, even though this is not a methodology applied to integrative reviews.

However, it is important to note that care was taken with the elaboration of the search strategy, selection criteria, double-blind

analysis and how much the results found contributed to filling gaps in the literature regarding healthy eating and a tendency to develop ON.

## Declaration of competitive interests

The authors have no conflicts of interest.

## Acknowledgments

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