




What do Italian healthcare professionals think about orthorexia nervosa? Results from a multicenter survey

Carla Gramaglia^{1,2} · Eleonora Gattoni² · Daniela Ferrante¹ · Giovanni Abbate-Daga³ · Erika Baldissera⁴ · Simona Calugi⁵ · Giammarco Cascino⁶ · Giovanni Castellini⁷ · Enrico Collantoni⁸ · Angela Favaro⁸ · Enrica Marzola³ · Alessio Maria Monteleone¹⁰ · Palmiero Monteleone⁶ · Maria Ginevra Oriani¹¹ · Caterina Renna¹² · Valdo Ricca⁷ · Pierandrea Salvo⁴ · Paolo Santonastaso⁸ · Cristina Segura-Garcia⁹ · Umberto Volpe¹³ · Patrizia Zeppegno^{1,2} 

Received: 23 July 2021 / Accepted: 17 November 2021
© The Author(s), under exclusive licence to Springer Nature Switzerland AG 2021

Abstract

Purpose Orthorexia nervosa (ON) is an obsession for healthy and proper nutrition. Diagnostic criteria for ON are lacking and the psychopathology of ON is still a matter of debate in the clinical and scientific community. Our aim was to better understand the Italian clinical and scientific community's opinion about ON.

Methods Anonymous online survey for Italian healthcare professionals, implemented with the REDCap platform and spread through a multicenter collaboration. Information was gathered about socio-demographic, educational and occupational features, as well as about experience in the diagnosis and treatment of EDs. The main part of the survey focused on ON and its features, classification and sociocultural correlates.

Results The survey was completed by 343 participants. Most responders (68.2%) considered ON as a variant of Eating Disorders (EDs), and 58.6% a possible prodromal phase or evolution of Anorexia Nervosa (AN). Most participants (68.5%) thought the next DSM should include a specific diagnostic category for ON, preferably in the EDs macro-category (82.1%). Moreover, 77.3% of responders thought that ON deserves more attention on behalf of researchers and clinicians, and that its treatment should be similar to that for EDs (60.9%). Participants thinking that ON should have its own diagnostic category in the next DSM edition had greater odds of being younger ($p = 0.004$) and of considering ON a prodromic phase of another ED, such as AN ($p = 0.039$).

Discussion Our survey suggests that the scientific community still seems split between those who consider ON as a separate disorder and those who do not. More research is still needed to better understand the construct of ON and its relationship with EDs; disadvantages and advantages of giving ON its own diagnosis should be balanced.

Level of evidence V (descriptive cohort study).

Keywords Orthorexia · Eating disorders · Classification · Diagnosis · Health professionals

Introduction

The phrase “orthorexia nervosa” (ON) was introduced in 1997 by Bratman to indicate individuals (“health food junkies”) characterized by an “obsession for healthy and proper nutrition”, following strict dietary rules [1]. The close relationship between food and health plays a relevant role in the current society, which has been described as “orthorexic” [2]. Although in such a context, it might be difficult to clearly

establish the boundary between normal and disordered eating behaviors; features, such as the presence of obsessive thinking patterns, self-punishment ideas, and impairment in daily functioning likely point to a disorder rather than to a simple variant of eating behavior [3]. Furthermore, the excessive fixation on healthy and pure food consumption, the self-prescribed rules and the typical selective and restrictive dieting attitude of orthorexic individuals may eventually lead to health-detrimental consequences (e.g., nutritional deficits and medical complications, as osteopenia, anaemia, pancytopenia, hyponatremia, metabolic acidosis, and bradycardia), which can closely resemble the qualitative and quantitative malnutrition status of Anorexia Nervosa (AN)

✉ Patrizia Zeppegno
patrizia.zeppegno@med.uniupo.it

Extended author information available on the last page of the article

[4, 5]. ON by proxy may exist as well, when these vicious eating habits are imposed on others (e.g., a child) [6]. The prevalence of ON behaviors ranges from 7 to 57% in the general population, from 29 to 34.9% in recent Italian studies involving university students, and can be even higher in some “risk groups”, such as healthcare professionals, dietitians, artistic performers, athletes, yoga practitioners, organic stores customers [7–21]. This high variability may be influenced by cultural or diagnostic issues which can lead to an overestimation of ON actual prevalence [22–24]. There are several questionnaires and scales to measure ON, but the disagreement behind the conceptualization of ON greatly influences their heterogeneity [25, 26]. Despite sometimes described as “a disease disguised as a virtue”, ON does not represent a diagnostic category. Diagnostic criteria have been suggested by Dunn and Bratman [12], but according to the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), it could be recognized as a distinct subtype of “avoidant/restrictive food intake disorder” (ARFID) [27, 28]. Although no universally accepted diagnostic criteria exist for ON, the increasing number of studies in this field in the last decades has yielded four classification approaches, defining possible diagnostic criteria [12, 29–32]. All these approaches are consistent in considering ON as characterized by an obsessional or pathological preoccupation with healthy nutrition, in describing possible psychosocial impairments and emotional consequences when self-imposed dietary rules are transgressed [23]. Nonetheless, despite shared features, the aforesaid approaches differ as far as individual criteria are concerned. Contradictions emerge as there is no agreement about the reflection in the criteria of some topics, which are stressed according to some conceptualizations but not to others, such as the importance of phobic avoidances [29], the absence of any relationship between diet and food allergies or medical conditions [30], the intentionality to lose weight (absent according to Dunn and Bratman 2016 and present according to Barthels, Meyer, and Pietrowsky 2015) [12, 31]. As assessment tools rely on different underlying classification models, they may lead to very different results and measurement errors, as underscored by a recent review [26].

Furthermore, mounting evidence has emphasized the shared clinical features of ON and other mental disorders, such as eating disorders (EDs), obsessive–compulsive disorder (OCD) and obsessive–compulsive personality disorder, somatic symptom disorder, illness anxiety disorder, autism spectrum disorder and psychotic spectrum disorders [33–36]. ON and EDs share features such as eating concerns, perfectionism, anxiety, the displacement onto food of the sense of control individuals cannot achieve or feel with their own life. On the other hand, the two conditions differ as ON individuals focus on “purity” of food rather than on quantity, and on a pure, healthy body rather than on an

extremely thin one. Available evidence points to a complex relationship between ON and EDs, suggesting that ON may precede the onset of a full-syndrome ED, coexist with it, or represent its evolution during remission and recovery phases [11, 35]. Actually, a recent opinion paper suggested that a clear distinction between ON symptoms and an established ED diagnosis is hard, especially from an empirical standpoint, even though—at a conceptual level—ED features as drive for thinness and body dissatisfaction do not belong to ON [37].

As far as ON and obsessive–compulsive personality/disorder are concerned, they share features as well [38, 39] and may be comorbid, although in ON obsessions are perceived as ego-syntonic rather than ego-dystonic as they are in OCD [34]. Furthermore, EDs and OCD are widely acknowledged to be frequently comorbid and to share features. Nonetheless, the opinion paper mentioned above suggested that ON symptoms are actually distinct from OCD [37].

Some recent studies have focused on the topic of clinicians’ opinions concerning ON, its diagnosis and classification [38, 40, 41]. Vandereycken performed a study prior to the publication of any diagnostic criteria for ON [38], involving 111 respondents; 25.2% of these professionals interpreted ON as a product of the popular media, and 68.5% agreed that it deserved “more attention from researchers and clinicians”. A recent Dutch study included a total of 160 psychologists, psychiatrists, dietitians, and physiotherapists, most of whom {78%; especially physical health professionals [PHP] rather than mental health professionals [MHP]} maintained that ON should appropriately have a diagnosis of its own [40]. Furthermore, 74% of participants shared the opinion that ON fits within the DSM category of Eating and Feeding Disorders, and overlaps were reported in the descriptions of ON AN and OCD individuals. Similarly, the study by Reynolds & McMahon surveyed health professionals involved in the diagnosis and treatment of EDs: 71% reported the belief that ON should be considered as a clinically recognized ED [41]. Moreover, in a recent German survey involving nutritionists, 70% of respondents declared they had been consulted by people with orthorexic behaviour, and in half of the sample orthorexia was comorbid with EDs or OCD [42].

In summary, despite an increasing number of studies about the topic, the precise nature and psychopathology of ON are still a matter of debate in the clinical and scientific community [33, 34].

Our aim with the current research was to achieve a better and deeper understanding of the Italian clinical and scientific community’s opinion about the construct of ON, with a national mapping replicating the research approach proposed by the studies described above.

The primary aim of the study was to investigate the opinions of healthcare professionals about ON, particularly

whether ON should be considered a stand-alone disorder or not, using an online survey. Our secondary aim, according to previous suggestions in the literature, was to assess the possible differences among different groups of healthcare professionals (e.g., PHP vs MHP; professionals working with EDs vs those who do not; professionals who are aware of the proposed criteria and clinical characteristics of ON and have met patients with these features vs those who are not and have not) regarding the ON construct and its relationship with EDs or other mental disorders.

Methods

This online survey involved in its implementation and spreading several centers working with EDs, in Italy. The study was performed with the collaboration of the Italian Society of Eating Psychopathology (Società Italiana di Psicopatologia dell'Alimentazione, SIPA) and participants were recruited from September 1st, 2020, to October 31st, 2020 via the SIPA mailing list and with snowball sampling. Hence, as a consequence of this recruitment approach, the Italian healthcare professionals involved included a relatively small range of groups; namely, psychiatrists, child neuropsychiatrists, psychologists, psychotherapists, nutritionists, dieticians, nutritionist biologists, and residents in training in these disciplines.

The survey was e-mailed to participants with a brief presentation outlining its aims and a short background about ON; nonetheless, no information about its clinical features was described in the survey presentation (see Supplementary Material 1 for more details about the survey). A reminder was sent to the responsible for the study in any of the centers involved, and it was up to them to further forwarding it to the previously contacted participants. The online survey was implemented with the REDCap platform (REDCap, Vanderbilt University). Participants were asked for informed written consent and their anonymity was granted. The study protocol was approved by the Institutional Review Board of the promoter center (Comitato Etico Interaziendale di Novara, CE178/20).

Information was gathered about sociodemographic, educational, and occupational features; furthermore, questions were asked about experience in the diagnosis and treatment of EDs. Last, the main part of the survey focused on ON and its features, classification (proposed diagnostic criteria, nosography, treatment, and comorbidities), and sociocultural correlates (such as physical exercise, body weight, individualism, food industry, healthy diet, fitness industry, fashion industry, aesthetic surgery industry, TV programs, Internet, social networks, magazines, and books). Details about the questionnaire are available as Supplementary Material (S1).

A sample size of 300 subjects was calculated assuming 95% confidence level, 6% margin of error and considering a degree of variability of 50% (conservative estimate) [43].

Statistical analysis

Normally distributed data were presented as mean and standard deviation (SD), whereas data following a non-normal distribution were presented as median and interquartile range (IQR). The normal distribution was tested using Shapiro–Wilk test. Categorical variables were summarized as counts and percentages. We examined the association between the study variables using univariable and multivariable logistic regression models. The independent variables were incorporated into the multivariable logistic regression model using a stepwise selection process. The significance of each individual variable was assessed using the likelihood ratio test (LRT), with a p value < 0.05 being considered statistically significant. Odds ratio and 95% confidence intervals were calculated.

Analyses were performed using STATA software, version 15 [44].

Results

Four hundred and thirty-six participants clicked on the link, and 343 completed the survey (78.7%).

Most participants were females (75.8%), with a master degree (30.9%) and a specialization (41.7%); regarding employment, the majority were psychiatrists (38.5%), followed by psychotherapists (19.5%) and “other” (15.2%), including physicians, educators/psychiatric rehabilitation technicians, nurses, residents in training and psychology students. Only a minority ($N=47$; 14.5%) were PHP (nutritionists, dietitians, and nutritionist biologists). Participants' mean age was 39.41 years (SD 10.61; range 22–65). Median value for years of working was 10 years (IQR 13).

Regarding work setting, the most represented was hospital, either university, or general (31.5% and 22.4%, respectively); 47.5% of respondents declared they were working with EDs in their usual clinical practice. Considering the whole sample of participants, the median number of new ED cases per year was 6.

ON features were known by 48.7% of respondents, and 58.9% met patients, mostly women, matching ON criteria in their clinical practice. The majority of participants considered ON a variant of EDs (68.2%), and a possible evolution of AN (58.6%), while regarding the possibility for ON to represent an ED prodromal phase, opinions were split (50.4% no, 39.4% yes). Most participants considered ON behavior as more acceptable than an ED (73.8%). The next DSM should include a specific diagnostic category for ON

according to 68.5% of the sample, preferably in the EDs macro-category (82.1%). Exercise-related symptoms should be included in the diagnostic criteria for ON according to the opinion of 56.8% of participants; the most frequent comorbidities for ON were personality traits, such as perfectionism and obsessiveness (78.4%) and OCD (59.5%). ON deserves more attention on behalf of researchers and clinicians according to 77.3% of participants, and treatment should be similar to that for EDs for 60.9% of respondents.

The multivariable model found that participants who thought that ON should have its own diagnostic category in the next DSM edition had greater odds of being younger (< 40 year) (OR = 2.21; CI 95% 1.29–3.80) and of considering ON a prodromic phase of another ED, such as AN (OR = 2.06 CI 95% 1.17–3.61).

Participants considering ON as deserving more attention on behalf of researchers and clinicians had greater odds of considering ON both as a prodromic phase of an ED, such as AN (OR = 2.72 CI 95% 1.05–7.01) or as the evolution of AN (OR = 2.28 CI 95% 1.02–5.10).

When comparing other professions (physicians, educators/psychiatric rehabilitation technicians, nurses, residents in training, and psychology students) versus MHP (psychiatrists/psychotherapists) the first group had greater odds (OR = 3.5; CI 95% 1.3–9.2) of believing that ON should have its own category in the next DSM; no statistical differences were found comparing psychiatrists/psychotherapists vs PHP (nutritionists, dietitians, and nutritionist biologists).

Survey participants aware of ON diagnostic criteria, as compared to those who were not, were more likely to deal specifically with EDs (OR = 3.67 CI 95% 2.28–5.90 $p < 0.0001$) and to consider ON as an evolution of AN (OR = 1.68 CI 95% 1.05–2.70 $p = 0.03$). Similarly, participants who reported having met ON patients in their clinical practice, as compared to those who had not, were more likely to deal specifically with EDs (OR = 2.09 CI 95% 1.29–3.38 $p = 0.003$) and to consider ON as an evolution of AN (OR = 1.80 CI 95% 1.10–2.94 $p = 0.02$).

Table 1 summarizes participants' features, while Tables 2 and 3 report their opinions about the ON construct. Table 4 shows the results of the univariable logistic regression models. Details about professionals working with EDs and not working with ED patients, as well as about MHP and PHP are reported in the Supplementary Materials (Tables S1 and S2).

Discussion

Despite the previous attempts to disentangle the complex questions which still surround ON, in the clinical and scientific community there is still debate about the construct of ON, which goes far beyond theoretical ones, as it determines

whether or not a person with ON will be considered as deserving treatment and, in an affirmative case, what kind of treatment [40]. Hence, an important premise to bear in mind is that we are dealing with a topic for which there are only proposed diagnostic criteria, which may be not familiar to all psychiatrists and even less to PHP. Psychopathological issues regarding ON are complex, as shown by the hypothesis about its relationship with other disorders, hence the conclusions drawn from this research should be taken with caution.

As in previously conducted, similar studies [40, 42], in the one we performed there was a wide agreement about the fact that more attention should be paid to ON. Interestingly, the slightly lower rate described by Vandereycken [38] suggests that the topic still deserves to be better studied and more thoroughly understood despite 10 years of studies. To underline the importance of ON, in the last 10 years, there has been a growing attention from the scientific literature [45].

Participants' general features

In our survey, most participants were female (as in the Ryman et al. and Reynolds & McMahon studies) and psychiatrists [40, 41]. Sample composition was different from previous studies, as in our research PHP were less represented (up to 48% in the study by Reynolds et al.) [41].

Both in the Ryman and in the Reynolds studies, the percentage of respondents who met clients with ON was higher than in ours (63.1% and 85% of respondents, respectively, vs 58.9%) [40, 41]. Surely, the samples were very different, as those described in their studies included a higher percentage of PHP who affirmed to regularly meet clients with ON [40], while in our own there was a significantly lower percentage of PHP.

Participants' beliefs about ON classification, diagnostic criteria, its relationship with EDs and treatment

Interestingly, the rate of respondents recommending a specific diagnostic category for ON in our study was similar to that reported by Ryman and coworkers for MHP and by Reynolds [40, 41].

The discrepancy between PHP and MHP found by Ryman et al. (PHP more likely to have met patients with ON symptoms and more willing to propose a separate diagnosis for ON), seemed to emerge also from our study (PHP had greater odds of believing that ON would deserve a diagnostic category of its own in the next DSM), even though results may be difficult to compare, as our sample included only a minority (19%) of PHP. It is possible that

Table 1 General features of participants

		Median; IQR	
Age (years)		Females 38 [30.5–45] Males 35 [29–48]	
		<i>N</i>	%
Gender	Females	260	75.8
	Males	83	24.2
Educational level	Specialization	143	41.7
	Master degree	106	30.9
	Master	34	9.9
	3 year degree	25	7.3
	PhD	20	5.8
	Other*	3	0.9
	Missing	12	3.5
Job	Psychiatrists	132	38.5
	Psychotherapists	67	19.5
	Psychologists	19	5.5
	Dieticians	19	5.5
	Nutritionist biologists	15	4.4
	Nutritionists	13	3.8
	Neuropsychiatrists	7	2
	Other**	52	15.2
	Missing	19	5.5
	Work setting	University hospital	93
Hospital		55	16
Public outpatient service		44	12.8
Private outpatient service		43	12.5
University		9	2.6
Therapeutic community		8	2.3
Nursing home		5	1.5
Multiple work setting		63	18.4
Other		20	5.8
Missing		3	0.9
Working with EDs in clinical practice	Yes	163	47.5
	No	177	51.6
	Missing	3	0.9
		Median; IQR	
Years of working		10 [4–17]	
N. new ED cases met in 1 year		6 [2–20]	

*Diploma in dance and movement therapy, nursing school and one unknown

**Specialist physician $N=10$; educator/psychiatric rehabilitation technician $N=6$; nurse $N=4$; residents in training $N=22$; psychology students $N=10$)

ON individuals might seek help from PHP as dietitians and physiotherapists to support their “healthy” habits, rather than from MHP [40].

Regarding classification, as compared to participants in the Ryman study, a higher proportion of our respondents was willing to consider ON in the category of EDs rather than in the OCD or anxiety disorders ones (74.2 vs 82.1%

Eating and Feeding Disorders; 56 vs 26.4% OCD; 24 vs 3% anxiety disorders) [40].

Most participants in our study described ON as a variant of another ED, while only a minority of them considered ON as a nonpathological variant of eating behavior; furthermore, almost three-quarters of the sample considered orthorexic behaviors as more socially acceptable than ED-related ones.

Table 2 Participants' opinions about the ON construct: diagnostic criteria, nosography, treatment

	<i>N</i>	%
In what category do you think that ON falls?		
Non pathological variant of eating behavior	36	10.5
Stand-alone pathological condition	32	9.3
Variant of EDs	234	68.2
Related to or other psychiatric disorder	7	2
Missing	34	9.9
Do you think that ON is a prodromal phase of another ED?		
No	173	50.4
Yes	135	39.4
Missing	35	10.2
Do you think that ON can represent a possible evolution of AN?		
No	107	31.2
Yes	201	58.6
Missing	35	10.2
Do you think that orthorexic behavior is more acceptable than ED one?		
No	54	15.7
Yes	253	73.8
Missing	36	10.5
Do you know the proposed diagnostic criteria for ON?		
No	142	41.4
Yes	167	48.7
Missing	34	9.9
Have you met patients matching these criteria?		
No	106	30.9
Yes	202	58.9
Missing	35	10.2
If you did, how many of them were women?		
0–20%	19	9.4
20–40%	26	12.9
40–60%	34	16.8
60–80%	76	37.6
80–100%	43	21.3
Missing	4	2
Do you think that the next DSM should include a specific diagnostic category for ON?		
No	73	21.3
Yes	235	68.5
Missing	35	10.2
If you do, in what macro-category do you think it should be included?		
EDs	193	82.1
Anxiety disorders	7	3
OCD	62	26.4
If you do not, in what category do you think it should be included?		
Anorexia nervosa	19	26
Bulimia nervosa	2	2.8
ARFID	33	45.2
OCD	24	32.9
Generalized anxiety disorder	5	6.9
Other*	12	16.4
Do you think that exercise-related symptoms should be included in the diagnostic criteria for ON?		
No	105	30.6

Table 2 (continued)

	<i>N</i>	%
Yes	195	56.8
Missing	43	12.5
What are the most frequent comorbidities of ON?		
Anxiety	181	52.8
Depression	49	14.3
OCD	204	59.5
Personality traits (perfectionism, obsessiveness)	269	78.4
High ST (Self-Transcendence)	60	17.5
High IQ (Intelligence Quotient)	38	11.1
Family problems	77	22.4
Other	14	4.1
What do you think about the treatment of ON?		
It should be similar to that of EDs	209	60.9
It should be different from that of EDs	75	21.9
No treatment is required	7	2
Other	11	3.2
Missing	41	11.9
Do you think that ON deserves more attention on behalf of researchers and clinicians?		
No	28	8.2
Yes	265	77.3
Missing	50	14.6

*Psychosis, *N*=4; it should not have a diagnostic category, it is not a disorder, *N*=3

Actually, it has been suggested that ON symptoms are highly prevalent in patients with EDs, and might even increase after treatment [11]. Survey participants' beliefs thus seem in line with the clinical observation that ON might be associated both with the clinical improvement of an ED and/or the migration towards less severe forms of EDs. Whether the persistence of ON symptoms might play a role in the relapses and recurrences of EDs still needs to be clarified [11].

Although the past literature focused on differential diagnosis between ON and other psychiatric disorders, a recent case series from a real-life setting suggested that symptoms suggestive of ON developed in patients who received a previous diagnosis of another psychiatric disorder, thus leading to new perspectives and new research questions regarding ON diagnosis and classification [46].

The interpretation of the results mentioned above should be cautious, as notably approximately 10% of participants did not provide answers to some of the questions concerning the pathological status of ON (e.g., Do you think that the next DSM should include a specific diagnostic category for ON? In what category do you think that ON falls? Do you know the proposed diagnostic criteria for ON?).

Furthermore, as 47.5% of respondents declared they were working with EDs in their usual clinical practice, while the remaining did not and "only" 48.7% declared to know ON

features and proposed diagnostic criteria, the results of the current survey should be considered in the light of participants' features. In other words, the findings emerged from this survey cannot be equated to a panel of experts' opinion about ON but rather, as in the similar previous works available in the literature, as reflecting the opinion of healthcare professionals working in a real-world context.

A further important topic raised by Ryman as well as by Vandereycken is whether a diagnosis would be beneficial for ON patients or not [38, 40]. On the one hand, if a diagnosis exists, patients' suffering is more likely to be recognized and properly treated: hence, the treatment availability, access, and appropriateness would be enhanced. On the other hand, the presence of a diagnosis entails the risk of stigmatization, of over-diagnosis (false-positives) and, consequently, of over-treatment and over-medicalization of a preferred lifestyle [47].

Ryman et al. argue that DSM diagnoses should be representative of reality, therefore, if a condition occurs in real life, it should have a place in the DSM [40]. Nonetheless, considering the stringent assumptions for which a syndrome can be codified within the DSM, ON could still be far from reaching this step. The role of social factors, including social media was emphasized by participants in the Vandereycken study, with around 25% of them actually considering ON a product of the popular media [38].

Table 3 Participants' opinions about the ON construct: factors affecting ON

How much does this variable impact on ON?	Not at all N (%)	A little N (%)	Moderately N (%)	A lot N (%)	Very much N (%)	Missing N (%)
Physical exercise	10 (2.9)	45 (13.1)	78 (22.7)	119 (34.7)	50 (14.6)	41 (11.9)
Body weight	6 (1.7)	48 (14.0)	105 (30.6)	109 (31.8)	30 (8.7)	45 (13.1)
Individualism	17 (5.0)	31 (9.0)	105 (30.6)	109 (31.8)	36 (10.5)	45 (13.1)
Materialism	33 (9.6)	60 (17.5)	104 (30.3)	74 (21.6)	23 (6.7)	49 (14.3)
Capitalism	42 (12.2)	63 (18.4)	94 (27.4)	70 (20.4)	23 (6.7)	51 (14.9)
Food industry	7 (2.0)	25 (7.3)	74 (21.6)	117 (34.1)	76 (22.2)	44 (12.8)
Diet and/or slimming food	3 (0.9)	22 (6.4)	45 (13.1)	112 (32.6)	115 (33.5)	46 (13.4)
Fitness industry	5 (1.5)	24 (7.0)	52 (15.2)	125 (36.4)	93 (27.1)	44 (12.8)
Fashion industry	17 (5.0)	66 (19.2)	84 (24.5)	82 (23.9)	49 (14.3)	45 (13.1)
Aesthetic surgery industry	27 (7.9)	78 (22.7)	91 (26.5)	70 (20.4)	34 (9.9)	43 (12.5)
TV programs and/or movies	10 (2.9)	45 (13.1)	106 (30.9)	92 (26.8)	43 (12.5)	47 (13.7)
Internet	3 (0.9)	18 (5.2)	64 (18.7)	127 (37.0)	82 (23.9)	49 (14.3)
Social networks	5 (1.5)	13 (3.8)	58 (16.9)	110 (32.1)	110 (32.1)	47 (13.7)
Magazines and books	14 (4.1)	73 (21.3)	120 (35.0)	61 (17.8)	27 (7.9)	48 (14.0)
Advertising billboards	23 (6.7)	72 (21.0)	104 (30.3)	70 (20.4)	27 (7.9)	47 (13.7)
Thinness as ideal of beauty	7 (2.0)	48 (14.0)	79 (23.0)	90 (26.2)	68 (19.8)	51 (14.9)
Muscular/athletic body as ideal of beauty	3 (0.9)	24 (7.0)	82 (23.9)	104 (30.3)	77 (22.4)	53 (15.4)
Perception/belief that fast food is unhealthy	1 (0.3)	11 (3.2)	63 (18.4)	113 (32.9)	105 (30.6)	50 (14.6)
Perception/belief that biological/vegan is healthy	0 (0.0)	6 (1.7)	47 (13.7)	114 (33.2)	125 (36.4)	51 (14.9)
Perception/belief that low carb/gluten free is healthy	0 (0.0)	11 (3.2)	53 (15.4)	129 (37.6)	99 (28.9)	51 (14.9)
Perception/belief that regular physical exercise is the best for the body	7 (2.0)	21 (6.1)	78 (22.7)	124 (36.1)	63 (18.4)	50 (14.6)
Fast food	36 (10.5)	63 (18.4)	105 (30.6)	65 (18.9)	24 (7.0)	50 (14.6)
Healthy diet	3 (0.9)	15 (4.4)	65 (18.9)	128 (37.3)	80 (23.3)	52 (15.2)

Our belief is that caution should be adopted, because not all conditions occurring in real life are actual disorders, but may be nonpathological variants of human behavior, especially in the context of an “orthorexic society”.

Maybe a solution to find a balance between the two opposite risks of under- and over-diagnosis and to disentangle the complex question whether a given behavior represents a disorder or not, could be turning back to psychopathology and to a very careful assessment of patients' history and experience (as suggested also by Ryman) [40], especially to the meaning and impact that a certain behavior has in their own life. The importance of a careful assessment seems mandatory also considering the results we found concerning the fact that while 48.7% of survey respondents affirmed to know ON features, up to 58.9% of participants reported having met ON patients. This discrepancy can suggest the need for healthcare professionals to gain a deeper and psychopathologically informed knowledge about ON, in order to avoid “anecdotal” diagnoses.

Participants' beliefs about risk and predisposing factors for ON

A wide variety of factors potentially affecting ON emerged from our survey (Table 3); the ten ones receiving greatest consensus (percentage of “a lot” plus “very much” answers) were the following: perception/belief that biological/vegan is healthy (69.7%), perception/belief that low carb/gluten free is healthy (66.8%), diet and/or slimming food (66.2%), social networks (64.1%), perception/belief that fast food is unhealthy (63.5%), fitness industry (63.5%), internet (60.9%), food industry (56.3%), perception/belief that regular physical exercise is the best for the (54.5%), muscular/athletic body as ideal of beauty (52.8%).

Reynolds suggested the following as possible contributing factors: dietary trends, health misinformation, fitspiration, social media, thin ideal, social pressures, lack of control in other aspects of life [41]. Further risk factors have been identified, similar to those linked to EDs and/or OCD (such as excessive exercise, anxiety, obsessiveness, low

Table 4 Results of the univariable logistic regression models

	Do you think that ON is a prodromal phase of another ED? (yes vs no)	Do you think that ON can represent a possible evolution of AN? (yes vs no)	Do you think that orthorexic behavior is more acceptable than ED one? (yes vs no)	Do you know the proposed diagnostic criteria for ON? (yes vs no)	Have you met patients matching these criteria? (yes vs no)	Do you think that the next DSM should include a specific diagnostic category for ON? (yes vs no)	Do you think that exercise-related symptoms should be included in the diagnostic criteria for ON? (yes vs no)	Do you think that ON deserves more attention on behalf of researchers and clinicians? (yes vs no)
Working with EDs in clinical practice (yes vs no)	OR 1.5 IC95%(1.0–2.4) <i>p</i> = 0.07	OR 1.5 IC95%(1.0–2.5) <i>p</i> = 0.07	OR 0.8 IC95%(0.5–1.5) <i>p</i> = 0.56	OR 3.7 IC95%(2.3–5.9) <i>p</i> < 0.0001	OR 2.1 IC95%(1.3–3.4) <i>p</i> = 0.003	OR 1.3 IC95%(0.7–2.2) <i>p</i> = 0.37	OR 0.7 IC95%(0.4–1.1) <i>p</i> = 0.10	OR 1.6 IC95%(0.7–45.3) <i>p</i> = 0.26
<40 years old vs >=40 years old	OR 0.9 IC95%(0.6–1.4) <i>p</i> = 0.69	OR 1.4 IC95%(0.9–2.2) <i>p</i> = 0.16	OR 1.3 IC95%(0.7–2.3) <i>p</i> = 0.40	OR 0.7 IC95%(0.4–1.1) <i>p</i> = 0.13	OR 1.0 IC95%(0.6–1.6) <i>p</i> = 1.0	OR 2.1 IC95%(1.3–3.6) <i>p</i> = 0.005	OR 1.6 IC95%(1.0–2.6) <i>p</i> = 0.06	OR 1.9 IC95%(0.9–4.2) <i>p</i> = 0.11
Participants who think ON is a variant of EDs vs other	OR 2.7 IC95%(1.6–4.9) <i>p</i> = 0.001	OR 1.9 IC95%(1.1–3.2) <i>p</i> = 0.018	OR 0.6 IC95%(0.3–1.2) <i>p</i> = 0.13	OR 1.2 IC95%(0.7–2.1) <i>p</i> = 0.42	OR 1.0 IC95%(0.6–1.7) <i>p</i> = 0.96	OR 3.4 IC95%(1.9–6.0) <i>p</i> < 0.0001	OR 1.4 IC95%(0.8–2.3) <i>p</i> = 0.25	OR 5.9 IC95%(2.6–13.3) <i>p</i> < 0.0001
Do you think that the next DSM should include a specific diagnostic category for ON? (yes vs no)	OR 2.0 IC95%(1.1–3.4) <i>p</i> = 0.016	OR 1.3 IC95%(0.8–2.3) <i>p</i> = 0.27	OR 1.06 IC95%(0.5–2.1) <i>p</i> = 0.87	OR 0.7 IC95%(0.4–1.2) <i>p</i> = 0.24	OR 1.6 IC95%(0.9–2.7) <i>p</i> = 0.10	–	OR 1.3 IC95%(0.7–2.3) <i>p</i> = 0.33	OR 17.4 IC95%(6.7–45.3) <i>p</i> < 0.0001
Do you think that ON deserves more attention on behalf of researchers and clinicians? (yes vs no)	OR 3.1 IC95%(1.2–7.9) <i>p</i> = 0.02	OR 2.7 IC95%(1.2–5.9) <i>p</i> = 0.02	OR 1.3 IC95%(0.5–3.4) <i>p</i> = 0.57	OR 1.0 IC95%(0.5–2.2) <i>p</i> = 0.94	OR 1.7 IC95%(0.8–3.8) <i>p</i> = 0.17	OR 17.4 IC95%(6.7–45.3) <i>p</i> < 0.0001	OR 1.5 IC95%(0.6–3.2) <i>p</i> = 0.36	–
Do you know the proposed diagnostic criteria for ON? (yes vs no)	OR 1.04 IC95%(0.7–1.6) <i>p</i> = 0.85	OR 1.7 IC95%(1.0–2.7) <i>p</i> = 0.03	OR 1.1 IC95%(0.6–2.0) <i>p</i> = 0.72	–	OR 1.9 IC95%(1.2–3.1) <i>p</i> = 0.006	OR 0.7 IC95%(0.4–1.2) <i>p</i> = 0.24	OR 0.8 IC95%(0.5–1.2) <i>p</i> = 0.30	OR 1.0 IC95%(0.5–2.2) <i>p</i> = 0.94
Have you met patients matching these criteria? (yes vs no)	OR 1.3 IC95%(0.8–2.1) <i>p</i> = 0.30	OR 1.8 IC95%(1.1–2.9) <i>p</i> = 0.02	OR 0.8 IC95%(0.4–1.6) <i>p</i> = 0.59	OR 1.9 IC95%(1.2–3.1) <i>p</i> = 0.006	–	OR 1.6 IC95%(0.9–2.7) <i>p</i> = 0.10	OR 0.8 IC95%(0.5–1.3) <i>p</i> = 0.29	OR 1.7 IC95%(0.8–3.8) <i>p</i> = 0.17

Statistically significant result *p* < 0.05 are in bold

self-esteem, perfectionism, detail-focus, social media, thin ideal, high harm avoidance, low self-directedness), and actually also from our survey it emerged that body weight issues were considered a “a lot” to “very much” relevant factor by more than 70% of respondents. Nonetheless, there is still uncertainty about the causes that actually contribute to the symptoms of ON [48–50].

Treatment of ON

The rate of participants stating that the treatment of ON should be similar to that of EDs was lower in our sample than in the study by Reynolds et al. (60.9 vs 75%) [41]. A recent study involving a small sample pointed out that ON is likely a “safety behavior” for patients, as it is usually believed for EDs [5]. From this standpoint, motivation and willingness to treatment might be relevant problems for ON as well as for AN.

Differences between groups of healthcare professionals

Participants who held the belief that ON should have its own diagnostic criteria had greater odds of being younger (<40 years old), to consider ON a variant of an ED and as a prodromal phase of an ED (especially AN), and to claim for more attention to ON on behalf of researchers and clinicians.

It is likely that younger clinicians, as compared to older ones, are more used to think in terms of diagnostic criteria rather than in those of psychopathology. In the specific situation of ON, a psychopathological approach seems necessary to clearly discriminate between behaviors which represent a nonpathological variant of eating habits and those which, on the contrary, are symptoms of a disorder. We think that the same behavior may be related to very different motives, and it is only going beyond the behavior and addressing these deeper reasons that it could be possible to make a correct psychopathological diagnosis. Furthermore, it seems that diagnostic criteria are warranted to allow the description of a clinical picture which would otherwise be at risk of being improperly classified as an unspecified feeding or eating disorder, which could be counterproductive, or even harmful [51]. The close relationship suggested between ON and EDs may point to cases where ON could actually be a disguised form of AN.

Participants claiming that ON should receive more attention from a clinical and research standpoint were more likely to consider ON a variant of an ED, and either as a prodromal phase or an evolution of AN. A behavior that can either precede or follow a severe disorder like AN certainly deserves to be considered with attention. In case it precedes the development of AN/BN, ON may be a possible warning sign; in case it follows an ED, it can seem that the patient is

recovered even though he/she is not, as he/she may likely try to disguise his/her problem into a more socially acceptable behavior. In any of these two cases, more attention should be paid, from a clinical standpoint, and more research efforts are required for a better understanding of the problem.

Findings concerning respondents who declared working with EDs and those who knew the diagnostic criteria for ON are intuitive as practitioners specifically working in the field of EDs are expected to be more aware about the ON construct and having met ON patients. Furthermore, results further point to the hypothesis of a close relation between ON and other EDs.

Strengths and limitations

Consistent with other similar studies [40, 41], the importance of the one we performed lies in its potential to raise interest and awareness in the research and clinical community, and to value their experience and opinion. Strengths of our study include the sample size, the involvement of several ED centers in Italy, and the total number of completed online surveys achieved, even though the survey was performed in a rather difficult moment, at the beginning of the second wave of the COVID-19 pandemic. Some limitations need to be underscored: the questionnaire we used was not validated; the actual response rate could not be calculated, as the snowball sampling approach was used, making it impossible to know exactly how many mails were sent and how many of those who received the questionnaire actually responded. As data were gathered anonymously for this survey, we could not adopt any control system on the veracity reported by the participants about their experience in the field of EDs (e.g., publications in the field of EDs, actually working in a treatment center for EDs), and regrettably we did not ask information about number of years working with ED patients. Overall, as in similar studies, we relied on self-report, subjective and retrospective data.

As underscored in the Ryman et al. study, it cannot be excluded that mostly professionals with a specific interest in the topic might have answered the survey, so possible limits in the representativeness of the sample should be considered, as for most studies of this kind [40]. Nonetheless, considering the whole sample of participants, the median annual number of new ED cases was quite small, and not all respondents were actually involved in the treatment of EDs in their everyday clinical practice (47.5% regularly work with EDs). Furthermore, a quite high percentage of survey participants 41.4% declared to have no knowledge about ON diagnostic criteria, and this information was missing for 9.9% of the sample, and this should be borne in mind when interpreting results.

Conclusions

This survey aimed to achieve an in-depth knowledge about the Italian clinical and scientific community's opinion on ON. This could be a starting point for understanding the point of view of healthcare professionals working in the real-world on the one hand, and how to improve their knowledge about the topic, on the other. Briefly, the findings described above suggest that the Italian clinical and scientific community still seems split between those who consider ON as a separate disorder and those who do not. Despite knowledge and research about the topic has increased in the last years, according to our survey, there is still likely a certain degree of confusion and misinformation about it, as suggested by knowledge about the proposed diagnostic criteria (41.4% reported having no knowledge about ON diagnostic criteria). As a clear understanding of the ON phenomenon and knowledge about its proposed diagnostic criteria still seem far from being satisfactory, and considering that our results suggest that some professionals actually meet and treat individuals with ON, it should be underscored the importance of training and education in this field and the need of greater caution concerning diagnosis. Furthermore, the clinical picture that seems to emerge from participants' opinions is quite close to that of AN, or at least to one phase of AN, rather than to that of a separate clinical entity. More research is still needed to better understand the construct of ON and its relationship with EDs; disadvantages and advantages of giving ON its own diagnosis should be balanced to allow patients actually showing these symptoms to have access to treatment, while limiting overdiagnosis and overtreatment of nonpathological behavioral variants.

What is already known on this subject?

Orthorexia nervosa (ON) indicates individuals characterized by an "obsession for healthy and proper nutrition", following strict dietary rules. It is difficult to clearly establish the boundary between normal and disordered eating behaviors and the excessive fixation on healthy and pure food consumption, which may eventually lead to health-detrimental consequences which can closely resemble the malnutrition status of Anorexia Nervosa (AN). There is an increasing number of studies about the topic, but the precise nature and psychopathology of ON are still controversial and a matter of debate in the clinical and scientific community.

Although some studies have been performed in real-world samples of healthcare professionals (including

mental health and physical health professionals) in other countries, to our knowledge none was available in Italy, even though several Italian studies have focused on ON and its prevalence in different at-risk populations.

What does this study add?

This study is the first attempt to address the topic in the Italian clinical and scientific community, which according to our results still seems split between those who consider ON as a separate disorder and those who do not. According to participants' opinions, the clinical picture of ON is quite close to that of AN, or at least to one phase of AN, rather than to that of a separate clinical entity. According to our survey, more research is still needed to better understand the construct of ON and its relationship with EDs, and to understand how to improve healthcare professionals' knowledge about the topic.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s40519-021-01336-9>.

Author contributions CG, PZ, EG conceived the study; CG, PZ, EG, AMM, PM developed the survey; all the authors were involved in the spreading of the survey; DF analysed the results; CG, PZ, EG drafted the manuscript; all the authors revised and further developed the draft of the manuscript and contributed with important intellectual content.

Funding This study received no funding.

Data availability The authors confirm that the data supporting the findings of this study are available within the article.

Declarations

Conflict of interest The authors declare that they have no conflicts of interest.

Ethical approval The authors declare that all the procedures comply with the ethical standards of the relevant national and institutional committees on human experimentation, and with the Helsinki Declaration of 1975, as revised in 2008. The study protocol was approved by the Institutional Review Board of the promoter center (Comitato Etico Interaziendale di Novara, CE178/20).

Consent to participate Written informed consent was obtained from all participants included in the study.

Consent for publication The authors hereby consent to publication of the article.

References


1. Bratman S, Knight D (2000) Health food junkies. Orthorexia nervosa. Overcoming the obsession with healthful eating. Broadway Books, New York

2. Nicolosi G (2006) Biotechnologies, alimentary fears and the orthorexic society. *Tailoring Biotechnol* 2(3):37–56
3. Bratman S (2017) Orthorexia vs. theories of healthy eating. *Eat Weight Disord* 22(3):381–385. <https://doi.org/10.1007/s40519-017-0417-6>
4. Park SW, Kim JY, Go GJ, Jeon ES, Pyo HJ, Kwon YJ (2011) Orthorexia nervosa with hyponatremia, subcutaneous emphysema, pneumomediastinum, pneumothorax, and pancytopenia. *Electrolyte Blood Press* 9:32–37. <https://doi.org/10.5049/EBP.2011.9.1.32>
5. Fixsen A, Cheshire A, Berry M (2020) The social construction of a concept-orthorexia nervosa: morality narratives and psychopolitics. *Qual Health Res* 30(7):1101–1113. <https://doi.org/10.1177/1049732320911364x>
6. Cuzzolaro M, Donini LM (2016) Orthorexia nervosa by proxy? *Eat Weight Disord* 21(4):549–551. <https://doi.org/10.1007/s40519-016-0310-8>
7. Donini LM, Marsili D, Graziani MP, Imbriale M, Cannella C (2004) Orthorexia nervosa: a preliminary study with a proposal for diagnosis and an attempt to measure the dimension of the phenomenon. *Eat Weight Disord* 9:151–157. <https://doi.org/10.1007/BF03325060>
8. Bağcı Bosi AT, Camur D, Guler C (2007) Prevalence of orthorexia nervosa in resident medical doctors in the faculty of medicine (Ankara, Turkey). *Appetite* 49:661–666. <https://doi.org/10.1016/j.appet.2007.04.007>
9. Fidan T, Ertekin V, Işıkay S, Kirpınar I (2010) Prevalence of orthorexia among medical students in Erzurum, Turkey *Compr psychiatry* 51:49–54. <https://doi.org/10.1016/j.comppsy.2009.03.001>
10. Valera JH, Ruiz PA, Valdespino BR, Visioli F (2014) Prevalence of orthorexia nervosa among ashtanga yoga practitioners: a pilot study. *Eat Weight Disord* 19:469–472. <https://doi.org/10.1007/s40519-014-0131-6>
11. Segura-García C, Ramacciotti C, Rania M, Aloï M, Caroleo M, Bruni A, Gazzarrini D, Sinopoli F, De Fazio P (2015) The prevalence of orthorexia nervosa among eating disorder patients after treatment. *Eat Weight Disord* 20:161–166. <https://doi.org/10.1007/s40519-014-0171-y>
12. Dunn TM, Bratman S (2016) On orthorexia nervosa: a review of the literature and proposed diagnostic criteria. *Eat Behav* 21:11–17. <https://doi.org/10.1016/j.eatbeh.2015.12.006>
13. Ramacciotti CE, Perrone P, Coli E, Burgalassi A, Conversano C, Massimetti G, Dell'Osso L (2011) Orthorexia nervosa in the general population: a preliminary screening using a self-administered questionnaire (ORTO-15). *Eat Weight Disord* 16(2):127–130. <https://doi.org/10.1007/BF03325318>
14. Valera JH, Ruiz PA, Valdespino BR, Visioli F (2014) Prevalence of orthorexia nervosa among ashtanga yoga practitioners: a pilot study. *Eat Weight Disord* 9(4):469–472. <https://doi.org/10.1007/s40519-014-0131-6>
15. Segura-García C, Papaiani MC, Caglioti F, Procopio L, Nisticò CG, Bombardiere L, Ammendolia A, Rizza P, De Fazio P, Capranica L (2012) Orthorexia nervosa: a frequent eating disordered behavior in athletes. *Eat Weight Disord* 17(4):e226–e233. <https://doi.org/10.3275/8272>
16. Domingues RB, Carmo C (2021) Orthorexia nervosa in yoga practitioners: relationship with personality, attitudes about appearance, and yoga engagement. *Eat Weight Disord* 26(3):789–795. <https://doi.org/10.1007/s40519-020-00911-w>
17. Gorrasi ISR, Bonetta S, Roppolo M, Abbate Daga G, Bo S, Tagliabue A, Ferraris C, Guglielmetti M, Arpesella M, Gaeta M, Gallé F, Di Onofrio V, Liguori F, Liguori G, Gilli G, Carraro E (2020) Traits of orthorexia nervosa and muscle dysmorphia in Italian university students: a multicentre study. *Eat Weight Disord* 25(5):1413–1423. <https://doi.org/10.1007/s40519-019-00779-5>
18. Dell'Osso L, Abelli M, Carpita B, Massimetti G, Pini S, Rivetti L, Gorrasi F, Tognetti R, Ricca V, Carmassi C (2016) Orthorexia nervosa in a sample of Italian university population. *Riv Psichiatr* 51(5):190–196. <https://doi.org/10.1708/2476.25888>
19. Dell'Osso L, Carpita B, Muti D, Cremone IM, Massimetti G, Diadema E, Gesi C, Carmassi C (2018) Prevalence and characteristics of orthorexia nervosa in a sample of university students in Italy. *Eat Weight Disord* 23(1):55–65. <https://doi.org/10.1007/s40519-017-0460-3>
20. Voglino G, Parente E, Bert F, Lo Moro G, Corradi A, Lapicciarella M, Gualano MR, Siliquini R (2021) Orthorexia nervosa, a challenging evaluation: analysis of a sample of customers from organic food stores. *Psychol Health Med* 26(4):478–486. <https://doi.org/10.1080/13548506.2020.1771386>
21. Bert F, Gualano MR, Voglino G, Rossello P, Perret JP, Siliquini R (2019) Orthorexia nervosa: a cross-sectional study among athletes competing in endurance sports in Northern Italy. *PLoS One* 14(8):e0221399. <https://doi.org/10.1371/journal.pone.0221399>
22. Dunn TM, Gibbs J, Whitney N, Starosta A (2017) Prevalence of orthorexia nervosa is less than 1%: data from a US sample. *Eat Weight Disord* 22:185–192. <https://doi.org/10.1007/s40519-016-0258-8>
23. Cena H, Barthels F, Cuzzolaro M, Bratman S, Brytek-Matera A, Dunn T, Varga M, Missbach B, Donini LM (2019) Definition and diagnostic criteria for orthorexia nervosa: a narrative review of the literature. *Eat Weight Disord Stud Anorex Bulim Obes* 24(2):209–246. <https://doi.org/10.1007/s40519-018-0606-y>
24. Gramaglia C, Brytek-Matera A, Rogoza R, Zeppegno P (2017) Orthorexia and anorexia nervosa: two distinct phenomena? A cross-cultural comparison of orthorexic behaviours in clinical and non-clinical samples. *BMC Psychiatry* 17(1):75. <https://doi.org/10.1186/s12888-017-1241-2>
25. Valente M, Syurina EV, Donini LM (2019) Shedding light upon various tools to assess orthorexia nervosa: a critical literature review with a systematic search. *Eat Weight Disord* 24(4):671–682. <https://doi.org/10.1007/s40519-019-00735-3>
26. Opitz MC, Newman E, Alvarado Vázquez Mellado AS, Robertson MDA, Sharpe H (2020) The psychometric properties of orthorexia nervosa assessment scales: a systematic review and reliability generalization. *Appetite* 155:1–12. <https://doi.org/10.1016/j.appet.2020.104797>
27. American Psychiatric Association (2013) Diagnostic and statistical manual of mental disorders DSM-5, 5th edn. American Psychiatric Publishing, Arlington
28. Attia E, Becker AE, Bryant-Waugh R, Hoek HW, Kreipe RE, Marcus MD, Mitchell JE, Striegel RH, Walsh BT, Wilson GT, Wolfe BE, Wonderlich S (2013) Feeding and eating disorders in DSM-5. *Am J Psychiatry* 170:1237–1239. <https://doi.org/10.1176/appi.ajp.2013.13030326>
29. Setnick J (2013) The eating disorders clinical pocket guide, second edition: quick reference for healthcare providers. Understanding Nutrition, Dallas
30. Moroze R, Dunn T, Craig Holland J, Yager J, Weintraub P (2015) Microthinking about micronutrients: a case of transition from obsessions about healthy eating to near-fatal “orthorexia nervosa” and proposed diagnostic criteria. *Psychosomatics* 56(4):397–403. <https://doi.org/10.1016/j.psych.2014.03.003>
31. Barthels F, Meyer F, Pietrowsky R (2015) Orthorexic eating behavior. *Ernährungsumschau*. <https://doi.org/10.4455/eu.2015.029>
32. World Health Organization (2004) ICD-10: international statistical classification of diseases and related health problems: tenth revision, 2nd edn. World Health Organization, Geneva
33. Koven NS, Abry AW (2015) The clinical basis of orthorexia nervosa: emerging perspectives. *Neuropsychiatr Dis Treat* 18:385–394. <https://doi.org/10.2147/NDT.S61665>

34. Vaccari G, Cutino A, Luisi F, Giambalvo N, Navab Daneshmand S, Pinelli M, Maina G, Galeazzi GM, Kaleci S, Albert U, Atti AR, Ferrari S (2021) Is orthorexia nervosa a feature of obsessive–compulsive disorder? A multicentric, controlled study. *Eat Weight Disord*. <https://doi.org/10.1007/s40519-021-01114-7>
35. Brytek-Matera A, Rogoza R, Gramaglia C, Zeppegno P (2015) Predictors of orthorexic behaviours in patients with eating disorders: a preliminary study. *BMC Psychiatry* 15:252. <https://doi.org/10.1186/s12888-015-0628-1>
36. Brytek-Matera A, Fonte ML, Poggiogalle E, Donini LM, Cena H (2017) Orthorexia nervosa: relationship with obsessive–compulsive symptoms, disordered eating patterns and body uneasiness among Italian university students. *Eat Weight Disord* 22(4):609–617. <https://doi.org/10.1007/s40519-017-0427-4>
37. Meule A, Voderholzer U (2021) Orthorexia nervosa-it is time to think about abandoning the concept of a distinct diagnosis. *Front Psychiatry* 12:640401. <https://doi.org/10.3389/fpsy.2021.640401>
38. Vandereycken W (2011) Media hype, diagnostic fad or genuine disorder? Professionals' opinions about night eating syndrome, orthorexia, muscle dysmorphia, and emetophobia. *Eat Disord* 19:145–155. <https://doi.org/10.1080/10640266.2011.551634>
39. Volpe U, Atti AR, Cimino M, Monteleone AM, De Ronchi D, Fernández-Aranda F, Monteleone P (2015) Beyond anorexia and bulimia nervosa: what's "new" in eating disorders? *J Psychopathol* 21:415–423
40. Ryman FVM, Cesuroglu T, Bood ZM, Syurina EV (2019) Orthorexia nervosa: disorder or not? opinions of dutch health professionals. *Front Psychol* 15(10):555. <https://doi.org/10.3389/fpsyg.2019.00555>
41. Reynolds R, McMahon S (2020) Views of health professionals on the clinical recognition of orthorexia nervosa: a pilot study. *Eat Weight Disord* 25(4):1117–1124. <https://doi.org/10.1007/s40519-019-00701-z>
42. Barthels F, Lavendel S, Müller R, Pietrowsky R (2019) Relevance of orthorexic eating behavior in nutrition counseling and nutrition therapy. Results of a nationwide survey among German nutritionists. *Ernährungs Umschau* 66(12):236–241. <https://doi.org/10.4455/eu.2019.048>
43. Cochran WG (1963) Sampling techniques, 2nd edn. John Wiley and Sons Inc., New York
44. StataCorp (2017) Statistical software: release 15.0. Stata Corporation, College Station
45. Hay P (2021) Is orthorexia nervosa a healthy way of being or a mental health disorder? Commentary on He et al. (2020). *Int J Eat Disord* 54(2):222–224. <https://doi.org/10.1002/eat.23465> (Epub 2021 Jan 5. PMID: 33399216)
46. Rania M, de Filippis R, Caroleo M, Carbone E, Aloï M, Bratman S, Segura-Garcia C (2021) Pathways to orthorexia nervosa: a case series discussion. *Eat Weight Disord* 26(5):1675–1683. <https://doi.org/10.1007/s40519-020-00948-x>
47. Widdows H (2018) Perfect me: beauty as an ethical ideal. Princeton University Press, Princeton
48. Douma ER, Valente M, Syurina EV (2021) Developmental pathway of orthorexia nervosa: factors contributing to progression from healthy eating to excessive preoccupation with healthy eating. Experiences of Dutch health professionals. *Appetite* 158:105008. <https://doi.org/10.1016/j.appet.2020.105008>
49. Brytek-Matera A (2021) Vegetarian diet and orthorexia nervosa: a review of the literature. *Eat Weight Disord* 26(1):1–11. <https://doi.org/10.1007/s40519-019-00816-3>
50. Barthels F, Abbate-Daga G, Donini LM (2021) Vegan diet and orthorexia. *Eat Weight Disord*. <https://doi.org/10.1007/s40519-021-01135-2>
51. Uher R, Rutter M (2012) Classification of feeding and eating disorders: review of evidence and proposals for ICD-11. *World Psychiatry*. <https://doi.org/10.1016/j.wpsyc.2012.05.005> (Blackwell Publishing Ltd)

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Authors and Affiliations

Carla Gramaglia^{1,2} · Eleonora Gattoni² · Daniela Ferrante¹ · Giovanni Abbate-Daga³ · Erika Baldissera⁴ · Simona Calugi⁵ · Giammarco Cascino⁶ · Giovanni Castellini⁷ · Enrico Collantoni⁸ · Angela Favaro⁸ · Enrica Marzola³ · Alessio Maria Monteleone¹⁰ · Palmiero Monteleone⁶ · Maria Ginevra Oriani¹¹ · Caterina Renna¹² · Valdo Ricca⁷ · Pierandrea Salvo⁴ · Paolo Santonastaso⁸ · Cristina Segura-Garcia⁹ · Umberto Volpe¹³ · Patrizia Zeppegno^{1,2} 

¹ Università del Piemonte Orientale UPO, Novara, Italy

² Azienda Ospedaliero Universitaria Maggiore della Carità, Via Solaroli 17, 28100 Novara, Italy

³ Department of Neuroscience, University of Turin, Turin, Italy

⁴ Eating Disorders Centre Portogruaro, AULSS 4 Veneto Orientale, Portogruaro, Italy

⁵ Department of Eating and Weight Disorders, Villa Garda Hospital, Garda, Verona, Italy

⁶ Department of Medicine, Surgery and Dentistry, "Scuola Medica Salernitana" University of Salerno, Salerno, Italy

⁷ Psychiatric Unit, Department of Neurological and Psychiatric Sciences, University of Florence, Florence, Italy

⁸ Department of Neuroscience, University of Padova, Padova, Italy

⁹ Department of Medical and Surgical Sciences, University Magna Graecia of Catanzaro, Catanzaro, Italy

¹⁰ Department of Psychiatry, University of Campania L. Vanvitelli, Napoli, Italy

¹¹ Mental Health Department, AV2 ASUR Marche, Jesi, Italy

¹² Center for the Treatment and Research On Eating Disorders, Mental Health Department, ASL Lecce, Lecce, Italy

¹³ Department of Clinical Neurosciences/DIMSC, School of Medicine, Section of Psychiatry, Polytechnic University of Marche, Ancora, Italy