


Orthorexic eating behaviour as a coping strategy in patients with anorexia nervosa

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Abstract

Purpose Orthorexia nervosa is defined as the fixation on health-conscious eating behaviour and has recently been discussed as a new variant of disordered eating. The aim of the present study was to analyse orthorexic eating behaviour in an inpatient treatment sample of female anorexics to investigate the relation between anorexic and orthorexic eating behaviour.

Method Female anorexic patients with low ($n = 29$) and pronounced ($n = 13$) orthorexic eating behaviour as well as a matched control group composed of healthy females ($n = 30$) were compared with regard to several aspects of disordered eating, hypochondriacal traits, food consumption frequency and fulfilment of basic psychological needs in terms of eating. Orthorexic eating behaviour was assessed using the Düsseldorf Orthorexie Skala.

Results Fulfilment of basic psychological needs with respect to autonomy and competence is higher in anorexic individuals with pronounced orthorexic eating behaviour compared to patients with low orthorexic eating behaviour. Furthermore, patients with pronounced orthorexic eating behaviour state eating healthy food regardless of calorie content more often. No difference was found for hypochondriacal traits and eating disordered symptoms in general.

Conclusions Orthorexic eating behaviour enhances self-perception of eating behaviour as autonomous and competent, indicating that it might serve as a coping strategy in anorexic individuals. Further research is needed to investigate if this tendency in food selection strategy leads to positive effects in the long term.

Keywords Orthorexia · Anorexia nervosa · Eating disorders · Coping strategy · Self-determination theory

Introduction

In 1997, US-American physician Steven Bratman coined the term *orthorexia nervosa* as a combination of the Greek words *orthós* meaning *proper, correct*, and *órexis* signifying *appetite* [1] to describe the fixation on health-conscious eating behaviour. Other characteristics of orthorexic eating behaviour were found to be ongoing mental preoccupation with healthy nutrition, overvalued ideas concerning the effects and potential health-promoting benefits of foods as well as rigid adherence to self-imposed nutrition rules. Reported prevalence rates of orthorexic eating behaviour vary from 1 to 3 % in Germany [2], with slightly more females being affected. Other studies indicate prevalence rates ranging from 6.9 % [3] to 57.6 % [4] in Italy. The high variance is assumed to reflect rather psychometric limitations in assessing orthorexia with ORTO-15 (e.g. Cronbach's alpha ranging between .14 and .70; [5]), than to prove substantial prevalence, and should therefore be treated with caution [6]. Dunn et al. [7] used additional criteria to determine orthorexic eating behaviour after administering ORTO-15 and revealed a prevalence rate of less than 1 % in an US sample. Recent discussions suggest that at least in some cases of orthorexia, the criteria for a

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mental disorder might be fulfilled [8], though further research is needed to conclude such on an empirical basis.

To date, diagnostic manuals for the classification of mental disorders (DSM-5, ICD-10) do not include orthorexia as a unique diagnostic category. Recently, Moroze et al. [9] proposed classifying orthorexia as the new DSM-5 subcategory avoidant/restrictive food intake disorder, a phenomenon characterised by the avoidance of food, mainly occurring in (early) childhood and typically due to sensory characteristics of qualities of foods (e.g., smell, colour, texture), which is per se not representative of orthorexia [10]. Besides these considerations, it also remains unclear how far orthorexic eating behaviour can be differentiated from anorexic eating behaviour. Bratman himself implied a close relation to anorexia nervosa when creating the similar term orthorexia nervosa [11]. Nonetheless, he assumed the desire to be thin as well as the intentional loss of weight to be irrelevant in orthorexic individuals.

Analysing the theoretical concept of orthorexic eating behaviour in detail reveals several similarities with typical disordered eating behaviours, especially with anorexia nervosa. With both, a cognitive fixation on nutrition is predominant; foods are not selected in accordance with the subjective feeling of hunger, satiety or individual preferences, but according to a cognitive evaluation regarding their calorie content or their presumed beneficial and detrimental effects on health. Empirical evidence for the said fixation can be found in correlations between orthorexic eating behaviour and cognitive control [8]. Rigid selection and progressive reduction of “allowed” foods are prevalent in both anorexia and orthorexia. Until now, it has been assumed that the absence of intentional and significant weight loss distinguished orthorexic eating behaviour from other eating disorders; additionally, no form of body image distortion has been assumed to be part of the orthorexic syndrome [11]. Nonetheless, recent studies came to a different conclusion as correlations between orthorexic eating behaviour and drive for thinness [8]—namely the cardinal feature of anorexia—and perfectionism [12] could be found. Furthermore, individuals with orthorexic eating behaviour were shown to have a distorted perception and evaluation of their body. A recent study suggests that females with highly orthorexic eating behaviour are less satisfied with their body and accept their body less than females with low orthorexic eating behaviour [8]. Similar findings are reported by Brytek-Matera et al. [13], indicating a correlation between orthorexic symptoms and an unhealthy body–self relationship. Thus, difficulties in the perception and acceptance of one’s body also seem to play an important role in orthorexia, which puts even greater emphasis on the close relation between

the orthorexic syndrome and symptoms of other eating disorders.

Analysis of the proposed diagnostic criteria (see [9, 10] for alternative suggestions) reveals overlapping as well as differentiating symptoms regarding orthorexic and anorexic eating behaviour (see Table 1). Both share restriction of food intake, which in anorexia is due to an intense fear of gaining weight, while in orthorexia it is due to pronounced fears of foods considered to be unhealthy according to subjective beliefs. For anorexia to be diagnosed, weight loss must be present—not so for orthorexia, where underweight is not considered to be a core symptom of the potential disorder. Whereas overvalued ideas in orthorexia focus on the effectiveness of nutrition and potential health benefits of foods, dysfunctional thoughts are associated with the body image disorder in anorexic individuals. It is also possible that the body image disorder is present in orthorexia as well (e.g., concerning a *healthy body* rather than a *thin body*) and overvalued ideas regarding food benefits also occur in anorexia (e.g., fears concerning foods containing fats). These considerations suggest a stronger overlap between anorexia and orthorexia than previously assumed: orthorexia might potentially be a subtype or variant of anorexia, possibly a less severe one. A corresponding approach was suggested by Kinzl et al. [14], who raise the question if orthorexia might be a gateway to a more severe eating disorder like anorexia nervosa. Their study assessing orthorexia in dieticians revealed another possible effect: orthorexia might be a coping strategy for anorexic individuals as well.

To date, two studies examined the relationship between orthorexic and anorexic eating behaviour. Barthels et al. [2] report a correlation of .53 between orthorexic eating behaviour and drive for thinness, and a correlation of .27 with body dissatisfaction as two main characteristics of anorexia nervosa. Furthermore, Segura-Garcia et al. [15] revealed that 28 % of patients with anorexia or bulimia have symptoms of orthorexia, with a tendency to rise after treatment to 58 % of patients having orthorexic symptoms. Nonetheless, to date, no study has analysed orthorexic eating behaviour in detail comparing patients with anorexia nervosa to a healthy control group.

The aim of the present study was to analyse orthorexic eating behaviour in anorexic individuals. Therefore, we compared a subgroup of anorexic patients scoring high on orthorexic eating behaviour to a sample with low orthorexic behaviour regarding potential differences in disordered eating behaviour, hypochondriacal traits, fulfilment of basic psychological needs in terms of eating and eating behaviour in general. A matched control group without any eating disorder allowed comparisons to normal eating behaviour.

Table 1 Comparison of diagnostic criteria for orthorexia and anorexia nervosa

Preliminary diagnostic criteria for orthorexia nervosa [8]	Diagnostic criteria for anorexia nervosa [30]
A Enduring and intensive preoccupation with healthy nutrition, healthy foods and healthy eating	Restriction of energy intake relative to requirements, leading to a significantly low body weight in the context of age, sex, developmental trajectory and physical health
B Pronounced fears as well as extensive avoidance of foods considered to be unhealthy according to subjective beliefs	Intense fear of gaining weight or of becoming fat, or persistent behaviour that interferes with weight gain, even though at a significantly low weight
C (1) At least two overvalued ideas concerning the effectiveness and potential health benefits of foods AND/OR (2) Ritualised preoccupation with buying, preparing and consuming foods, which is not due to culinary reasons but stems from overvalued ideas. Deviation or impossibility to adhere to nutrition rules causes intensive fears, which can be avoided by a rigid adherence to the rules	Disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or persistent lack of recognition of seriousness of the current low body weight
D (1) The fixation on healthy eating causes suffering or impairments of clinical relevance in social, occupational or other important areas of life and/or negatively affects children (e.g., feeding children in an age-inappropriate way) AND/OR (2) Deficiency syndrome due to disordered eating behaviour. Insight into the illness is not necessary; in some cases the lack of insight might be an indicator for the severity of the disorder	Subtype Restrictive: weight loss is accomplished primarily through dieting, fasting and/or excessive exercise Binge eating/purging type: during the last 3 month, the individual has engaged in recurrent episodes of binge eating or purging behaviour (i.e., self-induced vomiting or the misuse of laxatives, diuretics or enemas)
E Intended weight loss and underweight may be present, but worries about weight and shape should not dominate the syndrome	Level of severity Mild: BMI ≥ 17 kg/m ² Moderate: BMI 16–16.99 kg/m ² Severe: BMI 15–15.99 kg/m ² Extreme: BMI <15 kg/m ²

Note For the preliminary diagnosis of orthorexia, criteria A, B, C and E must be clearly fulfilled. Criterion D should be fulfilled at least partially. If criterion E is not clearly fulfilled, diagnosing atypical anorexia nervosa is recommended

Methods

Sample

The basic sample consisted of 42 female patients (age: $M = 21.17$, $SD = 6.88$ years; BMI: $M = 15.97$, $SD = 1.52$ kg/m²) diagnosed with anorexia nervosa, of whom 36 were inpatients in a mental health hospital specialised in eating disorders. The remaining six patients were outpatients recruited in assisted living groups, support groups for anorexia nervosa and in ambulant psychotherapeutic treatment. The control group consisted of 30 female participants (age: $M = 22.10$, $SD = 7.43$ years; BMI: $M = 21.83$, $SD = 2.75$ kg/m²) matched according to age and education to the patient sample. All participants gave informed consent. For underage patients both child and parents gave informed consent.

Two different approaches were used to assess orthorexic eating behaviour within the sample. First, patients completed the Düsseldorf Orthorexie Skala (DOS; [2]), a questionnaire designed to assess orthorexic behaviour, though standardised only for the general population. Then,

patients were asked to answer a number of questions concerning their eating behaviour. With a mean DOS score of 32.60 ($SD = 4.70$) points, 35 of 42 anorexic patients (83 %) scored higher than the previously set cutoff of 30 points for orthorexic eating behaviour. Thus, the criterion did not prove to be useful for group assignment. Instead, self-assessed eating behaviour (nutritional rules, focus on *healthy* or *dietary* foods, “avoided” and allowed foods; obtained using questionnaires asking patients to describe their eating behaviour in detail) was evaluated by two independent raters to group patients. This approach resulted in 29 patients assigned to the group *anorexia with low orthorexic eating behaviour* (DOS: $M = 32.83$, $SD = 4.41$, in the following abbreviated with AN) who stated that they avoided foods which could lead to weight gain (e.g., sweets, fatty foods) and described nutritional rules concerning attempts to prevent weight gain (e.g., drinking a lot of water to fill stomach without any calorie intake). 13 patients were assigned to the group *anorexia with pronounced orthorexic eating behaviour* (DOS: $M = 32.08$, $SD = 5.11$, abbreviated ANO) who stated that they focused on healthy foods (e.g., nuts, pulses) and

described nutritional rules focussing on health-conscious behaviour (e.g., choosing organic and non-processed foods). Patient groups did not differ in DOS sum score ($U = 178.000, p = .768$), age ($U = 145.00, p = 0.246$) or BMI ($U = 128.000, p = .135$), but differed significantly from the control group in DOS score ($M = 19.03, SD = 4.54$; AN vs. control: $U(29,30) = 21.50, p < .001, r = -.82$; ANO vs. control: $U(13,30) = 18.00, p < .001, r = -.72$).

Measures

The Düsseldorf Orthorexia Skala (DOS, [2]) consists of ten items to be rated on a four-point-scale ranging from *does not apply to me* (1) to *applies to me* (4), resulting in possible sum scores from 10 to 40 points. The preliminary cutoff score for orthorexic eating behaviour is 30 points. Cronbach's alpha = .84 and a retest reliability of $r = .70$ prove its good psychometric properties [2].

Pathological characteristics associated with anorexic and bulimic eating behaviour were assessed with the three subscales *drive for thinness*, *bulimia* and *body dissatisfaction* of Eating Disorder Inventory-2 (EDI-2, [16], German translation [17]), consisting of 23 items to be rated on a six-point scale ranging from *never* (1) to *always* (6). It has good psychometric properties in clinical as well as in nonclinical samples [16]. Furthermore, the Dresdner Körperbildfragebogen (DKB-35, [18]) was used for multidimensional assessment of body image. It consists of 35 items to be answered on a five-point-scale ranging from *not at all* (1) to *totally* (6), comprising five subscales: *vitality*, *self-acceptance*, *body contact*, *sexual satisfaction* and *self-aggrandisement*. Its psychometric properties are acceptable [18].

An adaptation of the Basic Psychological Needs Scale (BPNS-E, see [19, 20]) was used to assess the fulfilment of basic psychological needs according to the self-determination theory [21] in the context of eating and dieting. It consists of 21 items to be answered on a seven-point scale ranging from *does not apply to me at all* (1) to *does fully apply to me* (7). It comprises the three subscales *competence* (e.g., "People I know compliment me on my diet."), *autonomy* (e.g., "I feel like I am free to decide for myself what I eat.") and *relatedness* (e.g., "I get along with people eating a diet similar to mine.") and has an acceptable reliability of Cronbach's alpha = .79 (unpublished data).

To assess hypochondriacal fears, the Multidimensional Inventory of Hypochondriacal Traits (MIHT, [22], German translation [23]) was used. It consists of 31 items and four subscales, measuring cognitive (*hypochondriacal alienation*), behavioural (*hypochondriacal reassurance*), perceptual (*hypochondriacal absorption*) and affective (*hypochondriacal worry*) components of hypochondriasis.

Items are to be rated on a five-point scale ranging from *strong rejection* (1) to *strong agreement* (5).

Moreover, participants were asked to evaluate the frequency of consumption with respect to distinctive foods on a six-point-scale ranging from *never* (1) to *very often* (6). Considering calorie content and healthiness, foods were assigned to the category *healthy, low-calorie content* (kiwi, orange, bell pepper, spinach, probiotic yoghurt, tea) or *healthy, high-calorie content* (salmon filet, avocado, legumes, nuts, whole-grain bread, rapeseed oil), to compare food selection strategy between the groups.

Design and analysis

The study follows a between-subject design. Analyses were conducted with IBM SPSS Statistics 22 for Windows. For DOS, EDI, DKB-35 and MIHT, sum scores were calculated according to the instructions of the manuals. For BPNS-E, mean scores were calculated. As descriptive data, means (M), standard deviations (SD), relative and absolute frequencies are reported. Nonparametric Kruskal–Wallis tests with factor *group* for independent samples were used due to small samples sizes with a p value of .05. As a post hoc test, Mann–Whitney U test was used, with Bonferroni-adjusted alpha of .017. As effect size, according to the recommendation of Field [24], correlation coefficient r was used. Sample sizes may vary due to missing values.

Results

Table 2 shows the descriptive data and Kruskal–Wallis test results for main effects. Hereafter, Mann–Whitney U post hoc tests with adjusted alpha value are reported.

Regarding key symptoms of eating disorders, patient groups did not differ with respect to drive for thinness [$U(29,13) = 144.00, p = .224$] and body dissatisfaction [$U(28,13) = 103.00, p = .027$], while both groups scored significantly higher in drive for thinness compared to the control group (AN vs. control: $U(29,30) = 91.50, p < .001, r = -.68$; ANO vs. control: $U(13,30) = 50.50, p < .001, r = -.58$). Concerning body dissatisfaction, AN scored significantly higher than the control group [$U(28,30) = 161.00, p < .001, r = -.53$], but there was no difference between ANO and the control group [$U(13,30) = 131.50, p = .093$].

Comparing AN and ANO in terms of body image, they only differed significantly on the subscale self-aggrandisement of DKB-35 [$U(29,13) = 76.00, p < .01, r = -.51$], with ANO scoring higher. In comparison to the control group, AN scored significantly lower on the subscales vitality [$U(28,29) = 96.50, p < .001, r = -.66$], self-acceptance [$U(29,30) = 63.50, p < .001, r = -.73$], body

Table 2 Mean scores (*M*) and standard deviations (*SD*) for anorexia patients with pronounced (ANO) and with low (AN) orthorexic eating behaviour, compared to control group (CG) of healthy females, including test statistics ($\chi^2(2)$, *p*) for main effect *group* via Kruskal–Wallis test

Group (<i>N</i>)	Group sum scores						Main effect group	
	AN (29)		ANO (13)		CG (30)		Kruskal–Wallis-test	
Scale/item	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)	χ^2 (2)	<i>p</i> *
Age (years)	19.97	(4.52)	23.85	(10.13)	22.10	(7.43)	1.719	.423
BMI (kg/m ²)	16.24	(1.54)	15.39	(1.37)	21.83	(2.75)	51.394	<.001
DOS	32.83	(4.41)	32.08	(5.45)	19.03	(4.53)	45.672	<.001
EDI-2								
Drive for thinness	35.03	(6.37)	33.46	(5.11)	21.93	(8.83)	31.831	<.001
Bulimia	14.73	(6.12)	17.77	(9.82)	13.10	(4.86)	1.634	.442
Body dissatisfaction	45.39	(6.66)	40.31	(7.42)	35.97	(8.36)	17.791	<.001
DKB-35								
Vitality	19.39	(6.01)	21.92	(7.06)	29.17	(5.21)	27.227	<.001
Sexual satisfaction	10.29	(4.33)	12.00	(4.95)	23.24	(5.11)	42.158	<.001
Body contact	16.72	(5.13)	19.92	(5.04)	22.87	(4.66)	17.929	<.001
Self-acceptance	14.10	(4.24)	16.54	(5.64)	25.10	(5.91)	34.154	<.001
Self-aggrandisement	13.93	(3.76)	18.77	(4.13)	20.65	(3.83)	29.318	<.001
BPNS-E								
Autonomy	3.31	(1.07)	4.34	(1.25)	5.27	(1.21)	25.847	<.001
Competence	4.00	(0.91)	4.81	(0.87)	4.00	(0.80)	8.074	.018
Relatedness	3.66	(0.74)	4.43	(0.72)	5.35	(0.66)	37.491	<.001
MIHT								
Alienation	17.75	(5.49)	20.31	(5.28)	16.77	(5.49)	5.272	.072
Reassurance	23.44	(6.22)	25.69	(7.02)	24.83	(5.26)	1.797	.407
Absorption	29.57	(4.91)	30.15	(5.94)	29.37	(4.72)	0.050	.975
Worry	19.14	(6.16)	21.92	(5.96)	19.90	(4.77)	2.757	.254
FCF								
Healthy, high-calorie	16.32	(5.19)	23.54	(3.55)	20.63	(4.87)	16.89	<.001
Healthy, low-calorie	23.41	(4.36)	28.38	(3.23)	22.33	(3.07)	18.02	<.001

Note BMI body mass index. DOS Düsseldorf Orthorexie Skala. EDI-2 Eating Disorder Inventory-2. DKB-35 Dresdner - Körperbildfragebogen. BPNS-E Basic Psychological Needs Scale Eating. MIHT Multidimensional Inventory of Hypochondriacal Traits. FCF food consumption frequency

* Asymptotic *p* value

contact [$U(29,30) = 158.00, p < .001, r = -.55$], sexual satisfaction [$U(28,29) = 27.50, p < .001, r = -.80$] and self-aggrandisement [$U(29,29) = 91.50, p < .001, r = -.67$], while ANO scored significantly lower on the subscales vitality [$U(13,29) = 70.00, p < .01, r = -.50$], self-acceptance [$U(13,30) = 62.50, p < .001, r = -.54$] and sexual satisfaction [$U(13,29) = 29.00, p < .001, r = -.76$]. No differences in comparison to the control group could be found on the subscales body contact [$U(13,30) = 127.00, p = .071$] and self-aggrandisement [$U(13,29) = 132.50, p = .126$].

Regarding fulfilment of basic psychological needs, ANO scored significantly higher on the BPNS-E subscales competence [$U(28,13) = 94.00, p < .017, r = -.39$] and autonomy [$U(28,13) = 95.00, p < .017, r = -.38$] than AN. For relatedness, the difference slightly failed to reach

statistical significance [$U(26,12) = 80.00, p = .017$]. In comparison to the control group, AN scored significantly lower on the scales autonomy [$U(28,29) = 99.50, p < .001, r = -.65$] and relatedness [$U(26,30) = 39.00, p < .001, r = -.77$], but no difference in terms of competence could be found [$U(28,30) = 389.50, p = .634$]. Comparing ANO and the control group, ANO scored higher in competence [$U(13,30) = 94.50, p < .01, r = -.41$] and lower in relatedness [$U(12,30) = 58.50, p < .01, r = -.52$], with no significant differences observed regarding autonomy [$U(13,29) = 108.60, p = .029$].

Concerning hypochondriacal fears, no significant differences could be found with regard to the subscales of MIHT. Descriptively, ANO seemed to have highest scores in all subscales.

Regarding food consumption frequency, the ANO group stated eating foods of both categories more frequently than AN (healthy, low-calorie content: $U(29,13) = 68.00$, $p < .01$, $r = -.51$; healthy, high-calorie content: $U(28,13) = 50.50$, $p < .001$, $r = -.58$). Further, AN stated eating foods of the category healthy, high-calorie content less frequently than the control group [$U(28,30) = 234.50$, $p < .01$, $r = -.38$], with no difference regarding foods of the category healthy, low-calorie content [$U(29,30) = 376.00$, $p = .369$]. The opposite was true for the comparison of ANO: they stated eating foods of the category healthy, low-calorie content more frequently than the control group [$U(13,30) = 34.00$, $p < .001$, $r = -.65$], but there was no difference regarding foods of the category healthy, high-calorie content [$U(13,30) = 124.50$, $p = .061$].

Discussion

The aim of the present study was to investigate orthorexic eating behaviour in a sample of anorexic individuals in psychotherapeutic treatment and healthy controls. Therefore, female patients with the diagnosis of anorexia nervosa were divided into the groups with pronounced and with low orthorexic eating behaviour. In sum, results indicate that both groups display disordered eating behaviour to a comparable degree. Also, body image seems to be disturbed to an equal extent, with one exception: patients with pronounced orthorexic eating behaviour have higher scores on the subscale self-aggrandisement, suggesting that they are able to feel attractive and benefit from showing their body. Surprisingly, hypochondriacal fears do not differ between both patients groups, so they do not seem to play an important role regarding the presence of orthorexic tendencies in patients with eating disorders.

The most remarkable results concern the fulfilment of basic psychological needs in the context of eating and dieting. Patients with pronounced orthorexic behaviour are more satisfied in terms of competence and autonomy, with the subscale relatedness slightly failing to reach statistical significance. Assuming that all patients receive a comparable dietetic treatment, these results suggest that patients with pronounced orthorexic eating behaviour seem to feel more autonomous and more competent while learning to eat in a more normal way. This could indicate that orthorexic eating behaviour might serve as a coping strategy for patients with anorexic eating behaviour. This assumption is supported by the results of Segura-Garcia et al. [15] which indicated orthorexic eating behaviour to be associated with clinical improvement of disordered eating symptoms and a shift towards less severe forms of disturbed eating behaviour. Furthermore, they revealed that orthorexic symptoms

increase within 3 years after treatment, while indicators for disordered eating in terms of anorexic and bulimic behaviour tend to decrease, underlining the possibility of orthorexic eating behaviour as a coping strategy for anorexic individuals. The feeling of self-control, especially the feeling of being able to control food intake, serves as an important reinforcement in the development and maintenance of anorexic eating [25]. Furthermore, anorexic individuals state the sense of autonomy being one part of their wish to recover from their eating disorder [26], thus highlighting the importance of enabling anorexic patients to feel autonomous regarding their eating behaviour. Orthorexic eating behaviour might be a more healthy way to control food intake and to shift their focus from foods with low-calorie content to healthy foods, resulting in a greater variety of allowed foods for former anorexic individuals and less danger of losing weight. The results of reported food consumption frequencies support this assumption: regardless of calorie content, anorexic individuals with pronounced orthorexic eating behaviour state eating healthy foods more frequently. Changing food selection strategy in a more normal way and teaching anorexic patients to increase the variety of allowed foods is an important goal of treatment, suggesting that orthorexic eating behaviour might help anorexic individuals to recover from their eating disorder. Since anorexia still is difficult to treat and has a high lifetime mortality [27], considering orthorexic eating behaviour as a steppingstone in psychotherapeutic treatment might be a promising new approach and a complement to state-of-the-art treatment. Shifting the focus to healthy food and minimizing attention to calorie content might be a first step in recovering from anorexia. Nonetheless, it must be taken into account that the examined patients do not have lower scores on subscales related to disordered eating behaviour, so they have not yet recovered from their eating disorder, possibly reflecting that behavioural changes need time. Further studies should assess orthorexic eating behaviour during treatment and with several follow-up-measurements to investigate orthorexic and anorexic eating behaviour over time.

Limitations of this study

Our study reveals that in patients with anorexia nervosa, the Düsseldorf Orthorexie Skala does not seem to be able to differentiate between anorexic and orthorexic behaviour, because nearly all patients reach high scores around the 30-point cutoff. This contrasts with almost every item in the DOS containing the word *healthy* and raising the question of how anorexic individuals interpret the word *healthy*. For them, it might be closely associated with *thin* or *non-fat-tening*, respectively. Furthermore, social desirability might play a role, considering the fact that all patients are

undergoing therapeutic interventions to learn a new and healthier eating behaviour. Lastly, high scores may as well simply reflect an undiscovered orthorexic disorder. Considering that the preliminary cutoff was set at the 95 percentile of data collected in the general population [2], DOS scores should be interpreted with caution in patients with disordered eating behaviour. Accordingly, the preliminary cutoff proved to be non-suitable to distinguish between patients with and without pronounced symptoms of orthorexia and an analysis of self-described eating behaviour (nutritional rules, focus on healthy or dietary foods, avoided and allowed foods) had to be used as an alternative criterion for group assignment. Although this approach revealed reasonable results, this should be kept in mind while interpreting the data and emphasising the necessity of more research concerning the DOS and orthorexic eating behaviour in general. Additionally, self-assessment of food consumption frequency might be inaccurate, so further studies should use the more time-consuming method of recorded eating behaviour to assess food consumption frequencies more precisely. Not last, it is worth considering that most of the participants were inpatients being treated in a clinical institution specialised in eating disorders, so results should not be generalized to outpatients without receiving dietetic therapy. Moreover, the motivation behind orthorexia-like eating behaviour should be carefully analysed as it could be used to cover up or deny anorexic symptoms. Lastly, therapeutic success should be measured in future studies, as this could provide more information regarding the assumption of orthorexia serving as a coping strategy for anorexic individuals. At least in the long-term, patients with pronounced orthorexic eating behaviour should not only show a better fulfilment of basic psychological needs, but also a better mental (e.g., less drive for thinness) and physical (e.g., weight gain) state.

Conclusion

The phenomenon of orthorexia nervosa still calls for more research, from defining reliable and valid diagnostic criteria [28] to investigate prevalence and symptomatology in depth. This study is the first to evaluate orthorexic eating behaviour in patients with anorexia nervosa in detail and therefore contributes to a better understanding of the phenomenon. For anorexic individuals, orthorexic eating behaviour appears to be a strategy for compensating anorexic behaviour, allowing patients to eat more while still being highly selective with their choices as well as maintaining control over their eating behaviour. Hence, orthorexic eating behaviour might serve as a coping strategy for anorexic individuals, resulting in a better fulfilment of the basic psychological needs and consequently improving the subjective well-being in the long term [29].

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Compliance with ethical standards

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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

References

1. Bratman S (1997) The health food eating disorder. <http://www.orthorexia.com/>. Accessed 10 June 2016
2. Barthels F, Meyer F, Pietrowsky R (2015) Die Düsseldorfer Orthorexie Skala—Konstruktion und Evaluation eines Fragebogens zur Erfassung orthorektischen Ernährungsverhaltens. *Z Klin Psychol Psychother* 44:97–105. doi:10.1026/1616-3443/a000310
3. 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. doi:10.1007/BF03325060
4. 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:e127–e130. doi:10.1007/BF03325318
5. Koven NS, Abry AW (2015) The clinical basis of orthorexia nervosa: emerging perspectives. *Neuropsychiatr Dis Treat* 11:385–394. doi:10.2147/NDT.S61665
6. Missbach B, Dunn TM, König JS (2016) We need new tools to assess orthorexia nervosa. A commentary on “Prevalence of Orthorexia Nervosa among College Students Based on Bratman’s Test and Associated Tendencies”. *Appetite*. doi:<http://dx.doi.org/10.1016/j.appet.2016.07.010>
7. Dunn TM, Gibbs J, Whitney N, Starosta A (2016) Prevalence of orthorexia nervosa is less than 1 %: data from a US sample. *Eat Weight Disord*. doi:10.1007/s40519-016-0258-8
8. Barthels F, Meyer F, Pietrowsky R (2015) Orthorexic eating behavior. A new type of disordered eating. *Ernahrungs Umschau* 62:156–161. doi:10.4455/eu.2015.029
9. Moroze RM, Dunn TM, Holland C, 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* 56:397–403. doi:10.1016/j.psym.2014.03.003
10. Dunn TM, Bratman S (2016) On orthorexia nervosa: a review of the literature and proposed diagnostic criteria. *Eat Behav* 21:11–17. doi:10.1016/j.eatbeh.2015.12.006
11. Bratman S, Knight D (2000) *Health food junkies: overcoming the obsession with healthful eating*. Broadway Books, New York
12. Barnes MA, Caltabiano ML (2016) The interrelationship between orthorexia nervosa, perfectionism, body image and attachment style. *Eat Weight Disord*. doi:10.1007/s40519-016-0280-x

13. Brytek-Matera A, Donini LM, Krupa M, Poggiogalle E, Hay P (2015) Orthorexia nervosa and self-attitudinal aspects of body image in female and male university students. *J Eat Disord* 3(2):1–8. doi:[10.1186/s40337-015-0038-2](https://doi.org/10.1186/s40337-015-0038-2)
14. Kinzl JF, Hauer K, Traweger C, Kiefer I (2006) Orthorexia nervosa in dieticians. *Psychother Psychosom* 75:395–396. doi:[10.1159/000095447](https://doi.org/10.1159/000095447)
15. Segura-Garcia 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. doi:[10.1007/s40519-014-0171-y](https://doi.org/10.1007/s40519-014-0171-y)
16. Garner DM (1991) *Eating disorder inventory-2 manual*. Psychological Assessment Resources Odessa, FL
17. Paul T, Thiel A (2005) *Eating disorder inventory-2*. Deutsche version. Hogrefe, Göttingen
18. Matthes J, Franke GH, Jäger S (2012) Psychometrische Prüfung des Dresdner Körperbildfragebogens (DKB-35) in einer nicht-klinischen Stichprobe. *Z Med Psychol* 21:21–30. doi:[10.3233/ZMP-2011-2028](https://doi.org/10.3233/ZMP-2011-2028)
19. Gagné M (2003) The role of autonomy support and autonomy orientation in prosocial behavior engagement. *Motiv Emotion* 27:199–223. doi:[10.1023/A:1025007614869](https://doi.org/10.1023/A:1025007614869)
20. Baard P, Deci E, Ryan R (2004) Intrinsic need satisfaction: a motivational basis of performance and well-being in two work settings. *J Appl Soc Psychol* 34:2045–2068. doi:[10.1111/j.1559-1816.2004.tb02690.x](https://doi.org/10.1111/j.1559-1816.2004.tb02690.x)
21. Deci E, Ryan R (2000) The “what” and “why” of goal pursuits: human needs and the self-determination of behavior. *Psychol Inq* 11:227–268. doi:[10.1207/S15327965PLI1104_01](https://doi.org/10.1207/S15327965PLI1104_01)
22. Longley SL, Watson D, Noyes R Jr (2005) Assessment of the hypochondriasis domain: the multidimensional inventory of hypochondriacal traits (MIHT). *Psychol Assess* 17:3. doi:[10.1037/1040-3590.17.1.3](https://doi.org/10.1037/1040-3590.17.1.3)
23. Witthöft M, Haaf A, Rist F, Bailer J (2010) Erfassung von Krankheitsangst mit dem Multidimensional Inventory of Hypochondriacal Traits (MIHT). *Diagnostica* 56:2–12. doi:[10.1026/0012-1924/a000005](https://doi.org/10.1026/0012-1924/a000005)
24. Field A (2013) *Discovering statistics using IBM SPSS statistics*, 4th edn. Sage, London
25. Fairburn CG, Shafran R, Cooper Z (1999) A cognitive behavioural theory of anorexia nervosa. *Behav Res Ther* 37:1–13. doi:[10.1016/S0005-7967\(98\)00102-8](https://doi.org/10.1016/S0005-7967(98)00102-8)
26. Nordbø RHS, Gulliksen KS, Espeset EMS, Skårderud F, Geller J, Holte A (2008) Expanding the concept of motivation to change: the content of patients’ wish to recover from anorexia nervosa. *Int J Eat Disorder* 41:635–642. doi:[10.1002/eat.20547](https://doi.org/10.1002/eat.20547)
27. Papadopoulous FC, Ekblom A, Brandt L, Ekselius L (2009) Excess mortality, causes of death and prognostic factors in anorexia nervosa. *Brit J Psychiat* 194:10–17. doi:[10.1192/bjp.bp.108.054742](https://doi.org/10.1192/bjp.bp.108.054742)
28. Cuzzolaro M, Donini LM (2016) Orthorexia nervosa by proxy? *Eat Weight Disord*:1–3. doi:[10.1007/s40519-016-0310-8](https://doi.org/10.1007/s40519-016-0310-8)
29. Deci E, Ryan R (1985) *Intrinsic motivation and self-determination in human behavior*. Pantheon, New York
30. American Psychiatric Association (ed) (2013) *Diagnostic and statistical manual of mental disorders (DSM-5)*. 5 edn. American Psychiatric Publishing, Washington