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ORIGINAL ARTICLE

Orthorexia nervosa in yoga practitioners: relationship with personality, attitudes about appearance, and yoga engagement

Rita B. Domingues[1] · **Cláudia Carmo**[2]

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Abstract

Purpose Disordered eating symptoms and a high prevalence of orthorexia nervosa can be found in yoga practitioners. Given that yoga is increasingly used as a complementary treatment for eating disorders (ED), understanding the relationship between yoga practice and the development of disordered eating is crucial to guide treatment recommendations. The goal of this work is, therefore, to study the relationships between orthorexia nervosa (ON) and potential risk factors for ON, in an international sample of experienced yoga practitioners.

Method An online questionnaire that included several psychometric instruments was responded by 469 yoga practitioners. Instruments used were the Teruel orthorexia scale, Yoga immersion scale, Passion scale, Frost multidimensional perfectionism scale, Self-discipline scale of NEO-PI-R, Drive for thinness scale of EDI, and Beliefs about appearance scale. Descriptive statistics, correlational analysis and multiple regression were used to evaluate relationships between ON and the other variables.

Results The main predictors of orthorexia nervosa were the drive for thinness and a healthy orthorexia, suggesting that, like in anorexia and bulimia, orthorexic individuals are also concerned with food quantity and physical appearance, rather than just food quality.

Conclusions The potential effects of yoga on eating behaviours and attitudes of long-term practitioners, particularly the high prevalence of orthorexia nervosa and the concern for physical appearance, should be taken into consideration when using yoga as prevention or treatment for eating disorders.

Level of evidence Level V, descriptive cross-sectional study.

Keywords Orthorexia nervosa · Yoga · Risk factors · Perfectionism · Body image

Introduction

Several disordered eating behaviours and attitudes have been associated with yoga practice. Orthorexia nervosa (ON), a fixation on eating proper food [1], has been observed in yoga practitioners [2, 3], and, interestingly, the first description of ON appeared on the non-scientific Yoga Journal [1]. In addition to the pathological ON, a healthy, non-pathological interest in diet designated by "healthy orthorexia" was recently conceptualised and operationalised [4]. ON sets in when there is an intensification of the pursuit for "clean" eating into an unhealthy obsession, with obsessive thinking about food, compulsive behaviours, self-punishment and escalating dietary restriction [5], leading to nutritional deficits, affective problems and social isolation [6]. The prevalence of ON seems to be higher in individuals with health-related occupations [7], including yoga practitioners [3]. In

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✉ Rita B. Domingues
rbdomingues@ualg.pt

[1] Centre for Marine and Environmental Research (CIMA), Universidade do Algarve, Campus de Gambelas, 8005-139 Faro, Portugal

[2] Psychology Research Centre (CIP/UAL), Universidade do Algarve, Campus de Gambelas, 8005-139 Faro, Portugal

addition, several personality traits, such as perfectionism [4, 8], and neuroticism [9] are significantly related to ON. Perfectionism in particular is a well-established risk factor for eating disorders [10, 11], mainly for the development of full-blown ED such as anorexia nervosa and bulimia nervosa [12, 13]. Other risk factors for ON include eating-related factors such as being vegetarian or vegan, lifestyle factors, such as exercise engagement or social media use, among others (for a review, see [7]).

Understanding the relationships between yoga practice and ED-related behaviours and attitudes is critical to establish yoga as a valuable complementary practice for ED, particularly given its increasing use and acceptance by clinicians and patients [14]. Due to its focus on the enhancement of the mind–body connection, yoga may potentially facilitate the acceptance of one's body, which is a critical issue for the prevention and treatment of ED [14–16]. Some studies support the use of yoga for ED prevention, as results suggest that yoga practitioners are at a lower risk of developing eating disorders, given that they present fewer disordered eating symptoms, higher positive body image, and higher body satisfaction [17–19]. However, other studies indicate that the prevalence of dysfunctional eating behaviours such as orthorexia nervosa is higher in yoga practitioners [3, 20], and that a high dosage of yoga practice may be associated with a higher occurrence of ED-related behaviours [21]. Therefore, if a long-term, well-established yoga practice may be associated with or facilitate the development of disordered eating, yoga interventions and treatment recommendations must be reframed, well guided and closely monitored. In this context, the main goal of this work is to evaluate the relationships between orthorexia nervosa and potential risk factors in an international sample of experienced yoga practitioners.

Methods

Study design

We developed an anonymous, self-report questionnaire, in English, using the online platform Google Forms. Participants were recruited by emails sent to yoga schools in Portugal, UK and USA, asking to share the link of the study with their members; the link was also posted on yoga groups on Facebook. The questionnaire referred that potential participants should possess a good command of English language. The questionnaire included questions to evaluate characteristics of yoga practice and yoga engagement, body and appearance-related variables, personality traits, orthorexia, and sociodemographic information. The questionnaire took approximately 15 min to complete and responses to all questions were mandatory, to avoid missing values. The questionnaire was available from October through December 2018.

Measures

Participants were asked about the characteristics of their yoga practice, namely practice frequency, duration, place of practice, and style practiced (see Supplementary Material). Orthorexia nervosa and healthy orthorexia were assessed with the Teruel Orthorexia Scale [4], a new instrument that measures both a healthy, non-pathological interest in diet (healthy orthorexia), and the negative social and emotional impacts of the extreme preoccupation with eating food believed to be healthy by the individual (orthorexia nervosa). Healthy orthorexia is measured with 9 items (e.g., "I feel good when I eat healthy food"), for a maximum score of 27, and orthorexia nervosa is measured with 8 items (e.g., "I feel guilty when I eat food that I do not consider healthy"), for a maximum score of 24. Both dimensions were answered on a 4-point rating scale (from 0 = completely disagree to 3 = strongly agree; final score for each dimension is the sum of the respective items).

The level of immersion in yoga was measured with the Yoga immersion scale [22, 23], designed to assess the importance of yoga in the self-concept of yoga practitioners (e.g., "The wisdom of yoga affects how I perceive some other things of my everyday life)". This instrument uses a 10 Likert-type rating scale responded on a 6-point rating scale (from 1 = strongly disagree to 6 = strongly agree; total score is the mean of the items). The type of passion for yoga was assessed using the Passion scale [24], a 7-point Likert-type instrument (from 1 = do not agree at all to 7 = completely agree; final score is the mean of the items for each subdimension) that evaluates passion as a strong inclination toward an activity. Two different types of passion are measured with this instrument: harmonious passion, an autonomous internalisation that leads individuals to choose to engage in the activity (e.g., "This activity allows me to live a variety of experiences"), and obsessive passion, a controlled internalisation that creates an internal pressure to engage in the activity (e.g., "My mood depends on me being able to do this activity") [24]. The word "activity" was replaced by "yoga" in the questionnaire.

Perfectionist traits were evaluated using the Frost multidimensional perfectionism scale [25]. The four scales that measure self-oriented perfectionism were used, namely personal standards (setting very high standards for personal evaluation; e.g., "I set higher goals than most people"), organization (importance of and preference for order and organization; e.g., "I am a neat person"), concern over mistakes (negative reactions to mistakes; e.g., "I should be upset if I make a mistake"), and doubts about actions (feeling that projects are not completed in a satisfactory manner; e.g., "I

usually have doubts about the simple everyday things I do"), with 26 Likert-type items responded on a 5-point scale (from 1 = strongly disagree to 5 = strongly agree; final score is the mean of the items). Self-discipline, a facet of conscientiousness considered in the Big Five personality traits model, was measured using the self-discipline subscale of the NEO-PI-R [26]. Self-discipline is defined as the ability of the individual to persist at difficult or unpleasant tasks until completion (e.g., "Once I start a project, I almost always finish it"), and it was measured with 8 Likert-type items responded on a 5-point rating scale (from 1 = strongly disagree to 5 = strongly agree; final score is the mean of the items).

Dysfunctional attitudes about appearance were assessed using the Beliefs about appearance scale [27], with 20 Likert-type items (e.g., "My appearance influences my ability to do things") responded on a 5-point rating scale (from 0 = not at all to 4 = extremely; final score is the sum of the items). The subscale Drive for Thinness of the Eating Disorders Inventory [28] was used to assess respondents' excessive concern with dieting and weight (e.g., "I am terrified of gaining weight"), using 7 items on a 4-point rating scale (from always to never; scoring depends on the item).

Data analysis

Descriptive statistics were used to summarize the data for each scale and sub-scale. Scale reliability were evaluated with Cronbach's alpha; coefficients ≥ 0.8 indicate good internal consistency [29]. An independent samples *t*-test was used to compare orthorexia scores with published scores. Associations among the measured variables were evaluated with Pearson's correlation coefficient. Relationships between orthorexia nervosa and predictor variables (age, gender, personality traits, immersion and passion for yoga, variables related with appearance and eating behaviours) were assessed with multiple regression. A significance level of 0.05 was considered and all analyses were performed with IBM SPSS Statistics v. 25.

Results

Four-hundred sixty-nine yoga practitioners completed the online questionnaire. Most participants were female (84%) and 57% were between 35 and 54 years old. Participants came from 54 different countries and 6 continents; countries with the highest percentage of respondents were the United States (29.1%), Portugal (11.9%) and the United Kingdom (9.6%).

Most participants have been practicing yoga for more than 2 years (87.6%) and most of them practice 3 or more times a week (86.2%), for more than 4 h per week (61.6%). The practice happens mostly at home (26.7%) or in class (26.2%). The yoga styles mostly used or with which the practitioners mostly identify themselves with were Ashtanga (54.4%), Hatha (11.1%), Iyengar (10.9%), and Ashtanga-derived styles such as Vinyasa flow, power and rocket yoga (9.6%) (see Supplementary Material).

Scores for orthorexia nervosa (ON) varied between 0 and 22, with a mean value of 5.89 (SD = 4.56) (Table 1). Mean values for healthy orthorexia (HO) were 17.82 (SD = 4.94), ranging between 3 and 27. These scores were significantly higher than scores reported for Spanish university students in two distinct samples that also used the Teruel orthorexia scale, for both orthorexia nervosa and healthy orthorexia (study [4] ON: $M = 3.44$, SD = 3.57, $t(1409) = 11.04$, $p < 0.0001$, $d = 0.60$; HO: $M = 12.52$, SD = 5.22, $t(1409) = 18.29$, $p < 0.0001$, $d = 1.04$; study [31] ON: $M = 4.32$, SD = 4.05, $t(927) = 5.54$, $p < 0.0001$, $d = 0.36$; HO: $M = 12.71$, SD = 5.26, $t(927) = 15.27$, $p < 0.0001$, $d = 1.00$). Table 1 presents descriptive statistics and reliability for the other variables evaluated.

Table 1 Reliability (Cronbach's alpha) and descriptive statistics for the several scales

Scales	Alpha	Mean	SD	Min	Max	Skewness	Kurtosis
Healthy orthorexia	0.814	17.82	4.94	3.00	27.00	− 0.45	− 0.27
Orthorexia nervosa	0.823	5.89	4.56	0.00	22.00	0.78	0.06
Drive for thinness	0.857	3.81	4.65	0.00	21.00	1.53	1.80
Beliefs about appearance	0.955	23.83	16.70	0.00	80.00	0.72	− 0.08
Perfect—concerns mistakes	0.899	2.07	0.83	1.00	4.89	0.95	0.44
Perfect—personal standards	0.790	3.27	0.73	1.29	5.00	− 0.08	− 0.30
Perfect—doubts actions	0.736	2.33	0.86	1.00	5.00	0.48	− 0.29
Perfect—organization	0.886	3.70	0.78	1.33	5.00	− 0.39	− 0.20
Self-discipline	0.813	3.54	0.70	1.50	5.00	− 0.25	− 0.32
Harmonious passion	0.827	5.82	0.93	1.10	7.00	− 0.97	1.55
Obsessive passion	0.882	3.63	1.44	1.00	7.00	− 0.13	− 0.73
Yoga immersion	0.882	4.73	0.91	1.10	6.00	− 0.93	0.88

SD standard deviation. $n = 469$

Several significant and moderate ($r > 0.4$) correlations were found (Table 2). Orthorexia nervosa was moderately associated with healthy orthorexia ($r = 0.394$, $p < 0.001$), drive for thinness ($r = 0.542$, $p < 0.001$), beliefs about appearance ($r = 0.435$, $p < 0.001$), and perfectionism (concern over mistakes, $r = 0.421$, $p < 0.001$; doubts about actions $r = 0.379$, $p < 0.001$). Conversely, healthy orthorexia was not associated with any personality traits or body and appearance-related variables. Beliefs about appearance was significantly and moderately correlated with drive for thinness ($r = 0.477$, $p < 0.001$) and perfectionism (concern over mistakes, $r = 0.557$, $p < 0.001$; doubts about actions, $r = 0.404$, $p < 0.001$). Yoga immersion and harmonious passion were significantly and moderately also correlated ($r = 0.581$, $p < 0.001$).

Multiple regression was used to determine potential predictors of orthorexia nervosa. The regression model (adjusted $R^2 = 0.511$) indicated that drive for thinness, healthy orthorexia, doubts about actions, obsessive passion for yoga, and beliefs about appearance are significant predictors of orthorexia nervosa (Table 3). These predictors explained 51.1% of the variance in orthorexia nervosa. The strongest predictors of ON were the drive for thinness ($\beta = 0.372$; $p < 0.001$) and healthy orthorexia ($\beta = 0.335$, $p < 0.001$).

Discussion

Overall, the occurrence of orthorexia nervosa in our sample was mostly associated with a drive for thinness and a healthy concern about diet (measured as healthy orthorexia). Scores for orthorexia nervosa and healthy orthorexia in our sample of experienced yoga practitioners were significantly higher than scores reported for Spanish university students [4, 30]. A high prevalence of orthorexic behaviours was also found in a sample of Spanish Ashtanga yoga practitioners [3] and in Hungarian gym attendees practicing yoga [31]. Yoga practitioners belong to the health-related occupations that have been consistently linked to a high prevalence of ON, alongside gym-goers [31, 32], athletes [33], medical students [34], or dieticians [35, 36]. However, ON rates can also be high in the general population [37, 38], so it remains unclear whether yoga and other health-related occupations are relevant risk factors for the development of ON [7]. It must be noted, though, that most studies measuring ON in specific populations have used the questionnaire ORTO-15, which has been the target of much criticism due to its poor psychometric properties [39].

Rather than the yoga practice itself, a factor that can promote the adoption of eating habits associated with orthorexia is the identification of the practitioner with yoga philosophy. Drawing from ancient yoga texts, many yoga schools and

Table 2 Correlations between gender, personality, eating behaviours and yoga attitudes variables

		1	2	3	4	5	6	7	8	9	10	11	12
1.	Gender												
2.	Drive for thinness	− 0.074											
3.	Beliefs about appearance	0.009	**0.477****										
4.	Perfectionism concerns mistakes	− 0.043	0.396**	**0.557****									
5.	Perfection. personal standards	0.012	0.269**	0.292**	**0.426****								
6.	Perfectionism doubts actions	0.041	0.253**	**0.404****	**0.593****	0.213**							
7.	Perfectionism organization	− 0.036	0.138**	0.116*	0.035	0.334**	0.015						
8.	Self-discipline	− 0.005	− 0.043	− 0.204**	− 0.239**	0.193**	**− 0.455****	0.345**					
9.	Harmonious passion	− 0.040	− 0.064	− 0.055	− 0.082	0.069	− 0.065	0.148**	0.071				
10.	Obsessive passion	0.022	0.183**	0.248**	0.282**	0.154*	0.249**	0.099*	− 0.099*	**0.422****			
11.	Yoga immersion	− 0.006	− 0.058	− 0.021	− 0.109*	0.053	− 0.002	0.152**	0.041	**0.581****	0.321**		
12.	Healthy orthorexia	0.004	0.089	0.058	0.003	0.205**	0.033	0.186**	0.135**	0.292**	0.185**	0.351**	
13.	Orthorexia nervosa	− 0.005	**0.542****	**0.435****	**0.421****	0.253**	0.379**	0.154**	− 0.116*	0.082	0.383**	0.138**	0.394**

Significant correlations are marked with *$p < 0.05$ and **$p < 0.01$ (two-tailed). Moderate and strong correlations ($r > 0.40$) are in bold. $n = 469$

Table 3 Predictors of orthorexia nervosa in a sample of yoga practitioners

	B	SE	*β*	*p*
Constant	− 4.546	1.560		0.004
Drive for thinness	0.365	0.038	0.372	0.000
Healthy orthorexia	0.309	0.033	0.335	0.000
Obsessive passion	0.611	0.125	0.193	0.000
Doubts about actions	0.615	0.242	0.117	0.011
Beliefs about appearance	0.023	0.012	0.086	0.045
Concern over mistakes	.535	0.273	0.098	0.051
Personal standards	− 0.314	0.253	− 0.050	0.216
Organization	0.222	0.220	0.038	0.313
Self-discipline	− 0.171	0.277	− 0.026	0.536
Harmonious passion	− 0.358	0.213	− 0.073	0.094
Yoga immersion	0.164	0.211	0.033	0.437
Age 18–24	1.313	0.974	0.046	0.178
Age 25–34	0.539	0.448	0.048	0.230
Age 35–44	0.403	0.394	0.041	0.306
Age 55–64	0.203	0.493	0.016	0.681
Age 65	− 0.534	0.818	− 0.023	0.515
Gender	0.345	0.431	0.027	0.424

Gender is coded with a dummy variable where 0 = women and 1 = men. Age 45–54 was excluded from the model

teachers advise their students to "eat clean", and preferably to adopt vegetarian or vegan diets to comply with the yogic principle of non-violence [40, 41]. Certain yoga traditions dictate such consumption practices [2], and students may feel pressured to adopt specific eating habits, becoming vegetarian or vegan due to concerns for animal welfare. Indeed, animal welfare was the most important motive for eating a vegan diet in a sample of German vegans, but this concern was not associated with orthorexic eating behaviours [42]; in that sample, orthorexic behaviour was related with health, aesthetics and healing motives [42]. Therefore, being vegan for ethical reasons may be a protective factor regarding the development of orthorexia [42, 43]. Other common yogic practices such as vegetarianism, cleanses, detoxes, or fasting, may trigger orthorexic thinking, particularly in individuals oriented towards body vigilance and body control, thus more susceptible to disordered eating [2]. Indeed, a healthy interest in diet, identified as "healthy orthorexia" in the Teruel orthorexia scale, was one of the strongest predictors of orthorexia nervosa in our sample of yoga practitioners.

Another strong predictor of ON in yoga practitioners was the drive for thinness. By definition, orthorexic individuals are concerned with the quality of food, rather than the quantity, and weight loss is not considered a primary motivation for ON [44, 45]; however, the relationship between ON and the desire to be thin in our sample of yoga practitioners suggests otherwise. Our results are supported by other recent studies; for instance, the main motive predicting orthorexia nervosa in a sample of Spanish university students was weight control [30]. The criteria of food quantity and preoccupation with body weight versus food quality and preoccupation with food pureness to distinguish between anorexia/bulimia and orthorexia, respectively, may prove inaccurate. On one hand, anorectic individuals do care about the quality of their food [46], and preoccupation with food quality often emerges in anorectic and bulimic patients after treatment [47]. On the other hand, and contrary to the accepted definition of orthorexia nervosa, a desire to be thin and dysfunctional attitudes towards physical appearance can occur in individuals with orthorexic behaviours.

Besides lifestyle, eating-related and body and appearance-related risk factors, personality risk factors, particularly perfectionism, can also be linked to orthorexic tendencies. We found weak/moderate associations between perfectionism and orthorexia nervosa in our sample, and the sub-dimension "doubts about actions" emerged as a significant predictor of ON. We are not aware of other studies that have evaluated the relationship between ON and perfectionism in yoga practitioners, but in other populations, namely in Spanish [4, 48] and American [8, 49] university students, perfectionism was also associated with greater ON tendencies. Self-discipline was not related with any other personality trait or disordered eating variable, except for an inverse correlation with the "doubts about actions" sub-dimension of perfectionism. Practitioners who reported practicing more frequently and longer practices scored higher on self-discipline, but no relationship was found with other characteristics of yoga practice.

Methodological limitations

Although significant associations between orthorexia nervosa and risk factors were found in our study, the issue of reverse causality is worth mentioning as a potential pitfall. A descriptive, cross-sectional study does not allow discerning between causal effects (yoga triggers orthorexia nervosa due to yoga's dietary guidelines and associated peer-pressure) and selection (individuals with a tendency for orthorexic attitudes and behaviours will find a home in yoga, given yoga's emphasis on pureness and clean eating). Finally, official diagnostic criteria for orthorexia nervosa are still not available [39] and most scales that measure ON have been criticized due to their poor psychometric characteristics. We used a relatively new instrument, the Teruel orthorexia scale (TOS) [4], which has not yet been the target of criticism regarding its ability to detect ON [39, 50]; however, the TOS has only been used, to the best of our knowledge, with Spanish university students [4, 30, 51], which may hamper its representativeness and applicability to other populations. In addition, TOS

does not allow a clear distinction between an orthorexic and a non-orthorexic individual, as threshold values for ON diagnosis are not available—but then again, neither are diagnostic criteria for ON, which would be essential to establish cut-off values.

Conclusions

This study aimed to evaluate the occurrence of orthorexia nervosa in an international sample of experienced yoga practitioners and associations with personality and appearance/body-related variables. Our results showed that mean scores for ON were higher than for the general population, in agreement with previous studies that have found a high prevalence of ON in yoga users. The main predictors of ON were a healthy interested in diet and a drive for thinness, suggesting that individuals with orthorexic tendencies are concerned not only with food quality, but also with physical appearance, overeating, and, consequently, with food quantity, as in anorectic and bulimic individuals. Yoga has been increasingly used as a complementary practice for the prevention and treatment of disordered eating, but the long-term effects of yoga practice on disordered eating behaviours are still not clear.

What is already known on this subject?

Some studies indicate that yoga practitioners may present high levels of orthorexia nervosa and other dysfunctional eating behaviours.

What does this study add?

The prevalence of ON in experienced yoga practitioners is high. Orthorexic individuals show a preoccupation with body weight and healthy eating.

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Compliance with ethical standards

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

Ethical approval Since this was a non-experimental, anonymous, voluntary survey, no ethical approval was required.

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

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