

Orthorexia nervosa is associated with positive body image and life satisfaction in Chinese elderly: Evidence for a positive psychology perspective

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Abstract

Objective: Obsessive attention to healthy eating might paradoxically lead to physical and psychosocial impairments, a potential eating disorder termed orthorexia nervosa (ON). An ongoing debate concerns whether ON should be categorized as an eating disorder, an obsessive-compulsive disorder, or a mental disorder at all. A missing voice in this debate is ON in the elderly, which remains unknown, despite health being a more central issue in everyday life during old age. Similarly missing is ON in East Asia, which remains largely unexplored.

Method: The current study investigated ON in 313 Chinese elderly ($M = 67.90$, $SD = 7.94$) using the Chinese version of the Düsseldorf Orthorexia Scale (C-DOS). Questionnaires were used to measure traditional eating disorder symptomatology, body image (body dissatisfaction, body appreciation, and functionality appreciation), lifestyle behaviors (fruit and vegetable consumption and time spent on physical activity), and indexes of well-being (psychological distress, food-related quality of life, and life satisfaction).

Results: ON symptoms were positively related to physical activity, fruit and vegetable (F&V) consumption, body appreciation, functionality appreciation, and life satisfaction, but negatively related to body dissatisfaction. Compared with those without ON, the elderly with ON scored higher on positive psychological/lifestyle measures but lower on negative psychological measures.

Discussion: Contrary to the dominant characterization of ON as a variant of disordered eating, in Chinese elderly ON was associated with several positive lifestyle and psychological measures. Thus, ON in the elderly might not be viewed as a form of disordered eating but can be protective and beneficial.

KEYWORDS

body image, Chinese, disordered eating, elderly, life satisfaction, orthorexia nervosa

1 | INTRODUCTION

People restrict their food intake for various reasons. Health concerns are becoming a prominent reason due to an increase of self-reported food hypersensitivity over the last few decades, including intolerances and allergies (Rona et al., 2007), which makes restricting or avoiding certain

offending foods all but a necessity. The rising rate of obesity in adults and children alike, partly attributed to unhealthy eating behaviors (e.g., excessive intake of fast food and sugary drinks), has also led to public health policies and campaigns that aim to encourage healthy eating.

Heightened awareness of and an interest in healthy eating is beneficial for promoting healthy eating behaviors and other health-

promoting behaviors. This eating or life style is sometimes referred to as healthy orthorexia (Barthels, Barrada, & Roncero, 2019). On the other hand, excessive attention to healthy eating—particularly when guided by peculiar, unsubstantiated beliefs—can also cause stress and may paradoxically reduce health and well-being. In particular, a restrictive diet in which certain foods are rigidly avoided as they are believed to be unhealthy or impure can become distressing and may lead to physical, psychological, and social impairments—a pathological counterpart of healthy orthorexia termed orthorexia nervosa (ON, Cena et al., 2019). ON is a potentially emerging disorder. Based on current understandings, diagnostic criteria for ON have been proposed (e.g., Barthels, Meyer, & Pietrowsky, 2015b; Setnick, 2013), as summarized and discussed by Cena et al. (2019) and Dunn and Bratman (2016). In general, three main indicators are emphasized: compulsive behaviors and obsessive thoughts regarding ostensibly healthy eating; extreme emotional distress from violations of self-imposed restrictive dietary rules; physical and psychosocial impairments (e.g., malnutrition, impaired social, academic, or vocational functioning).

Under this pathological view, ON shares similarities with two eating disorders—anorexia nervosa (AN) and avoidant/restrictive food intake disorder (ARFID)—in terms of eating restriction, but for different reasons. AN patients mainly restrict the *quantity* of food intake and foods that are calorically dense (number of calories) in order to obtain or maintain a very low body *weight*, even though they might evoke healthy eating as a more palatable explanation for restrictive eating behaviors (Depa, Barrada, & Roncero, 2019). ARFID patients mainly restrict food choices based on *sensory* properties of the food, prior *negative experiences* in eating, or simply a lack of *appetite* (Zimmerman & Fisher, 2017). ON, on the other hand, is conceptualized as being due to concerns about the *perceived quality* (healthiness or purity) of foods in order to be *healthy*, without body weight and shape concerns (Cena et al., 2019; McComb & Mills, 2019).

However, ON has not been officially recognized as an eating disorder in the DSM-5 or the ICD-10, and there is an intensive debate about whether it should be categorized as an eating disorder, an obsessive-compulsive disorder, or a mental disorder at all (Cena et al., 2019; McComb & Mills, 2019; Strahler, Hermann, Walter, & Stark, 2018; Strahler & Stark, 2020). Central to this debate is the well-being correlates of ON symptoms. On the one hand, people with higher scores on measures of ON symptomatology reported higher levels of physical activity, consumed more fruits and vegetables (Zickgraf, Ellis, & Essayli, 2019), and in some cases were less likely to smoke and consume alcoholic beverages (as reviewed in McComb & Mills, 2019). On the other hand, they had higher scores on measures of disordered eating (Zickgraf et al., 2019), were more likely to have eating disorders previously, reported higher current stress and depression levels, and had poorer body image and lower well-being and satisfaction with life (Barthels et al., 2019; McComb & Mills, 2019; Strahler et al., 2018). Although fruits and vegetables intake and physical activity may correlate with well-being, they can well be due to reasons unrelated to health, such as an avoidance of calorie-dense foods and a drive for thinness in individuals with anorexia. Ultimately, it is the decreased well-being and increased perceived stress that implicate the clinical relevance of the ON condition.

Several important limitations in prior ON studies, however, make it hard to interpret or generalize these findings. First, almost all studies used samples that were *young* (e.g., average age in the 20s or 30s) and of high socioeconomic status (e.g., university students, athletes, and professionals; McComb & Mills, 2019). Therefore, even though with these samples studies observed no or small negative correlations between age and ON scores (McComb & Mills, 2019), the domination of young participants rendered those results not extrapolatable to the elderly. Given that eating disorders such as AN, bulimia nervosa (BN), and binge-eating disorder (BED) have been documented among the elderly (Guerdjikova, O'Melia, Mori, McCoy, & McElroy, 2012; Lapid et al., 2010; Mangweth-Matzek et al., 2006), exploring the manifestations of ON among the elderly is necessary to better understand ON. Moreover, understanding ON in the elderly is also particularly important in light of the uniqueness of the late stage of lifespan, in which health becomes a more central issue in everyday life during this vulnerable period and personal time becomes more abundant as afforded by retirement—both factors conducive to a heightened awareness of healthy eating.

Second, almost all studies concerning ON were conducted in *Western* countries, particularly in Europe, with scarce data available from East Asia. To our knowledge, the only study in East Asia regarding ON was conducted in Chinese university students, showing a positive correlation between ON symptoms and eating inflexibility (He, Ma, Barthels, & Fan, 2019). However, essential information related to body image and well-being was not measured. A better understanding of ON in East Asian cultures as it is related to body image and well-being is crucial toward understanding the cultural manifestations and clinical relevance of ON, for eating disorders in general are strongly linked to cultural beliefs and attitudes (Cummins, Simmons, & Zane, 2005). In the context of ON, nutritional and dietary behavior cannot be separated from the sociocultural background (Strahler et al., 2020).

Third, the majority of ON studies so far have been conducted with a psychometrically *flawed* measure of ON, namely, ORTO-15 (Donini, Marsili, Graziani, Imbriale, & Cannella, 2005), which has been known to lack face validity (for example, three items state: “At *present*, are you alone when having meals?”; “Are you willing to spend more money to have *healthier* food?”; “Do you think that on the market there is also *unhealthy* food?”) and lack internal consistency (Meule et al., 2020).

To overcome these critical limitations, in this study we focused on Chinese elderly using a validated measure of ON, the Dusseldorf Orthorexia Scale (DOS; Barthels, Meyer, & Pietrowsky, 2015a). We chose the DOS for several reasons. First, the DOS was developed using a largely sound procedure, in which item pools was generated based on literature reviews and expert consensus, and item retention was based on exploratory and confirmatory factor analysis. The DOS has 10 items, of which six items assess behaviors and preoccupation, two items assess emotional distress, and two items assess psychosocial impairments. Second, the DOS as well as its Chinese version (He, Ellis, Zickgraf, & Fan, 2019a) show good psychometric properties, including face validity and internal consistency. Third, the DOS sum score has been shown to highly correlate with other major validated measures of ON, including the Eating Habits Questionnaire (EHQ, $r = .79$; Meule et al., 2020) and the Teruel Orthorexia Scale (TOS,

healthy orthorexia subscale, $r = .70$; ON subscale, $r = .76$; Strahler et al., 2020), which indicates that the DOS is generally comparable to other validated measures of ON.

To investigate how ON symptoms might be related to disordered eating, we measured both traditional eating disorder symptomatology using the 12-item short form of the Eating Disorder Examination Questionnaire (EDE-QS; Gideon et al., 2016), eating related lifestyle behaviors (fruit and vegetable consumption and time spent on physical activity), and three key aspects of body image—body dissatisfaction from the body dissatisfaction subscale of the Eating Disorder Inventory (EDI-BD; Garner, Olmstead, & Polivy, 1983), body appreciation from the Body Appreciation Scale-2 (BAS-2; Tylka & Wood-Barcalow, 2015), and functionality appreciation from the Functionality Appreciation Scale (FAS; Alleva, Tylka, & Van Diest, 2017). To investigate potential well-being impairments of ON, we measured psychological distress using the Kessler psychological distress scale (K6; Mitchell & Beals, 2011), food-related quality of life using the Satisfaction with Food-related Life Scale (SWFL; Grunert, Dean, Raats, Nielsen, & Lumbers, 2007), and life satisfaction. We also collected demographic information (including health status in hypertension and diabetes) and nutrition knowledge.

If ON is an eating disorder and if the C-DOS accurately measures ON in our Chinese elderly sample, based on previous studies described above, we would expect ON symptoms to be positively associated with disordered eating psychopathology, negative body image, stress, fruit and vegetable consumption, and physical activity, but negatively associated with positive body image, food-related quality of life, and life satisfaction.

2 | METHOD

2.1 | Participants

Participants were recruited from three Chinese cities (Shenzhen and Guangzhou in the south, Qiqihar in the north) via convenience sampling (e.g., by going to elderly activity centers and by asking participants to recommend other potential participants). Eligible elderly participants were limited to those older than 50 years old (e.g., Li et al., 2009). The final sample included 313 Chinese elderly (151 males; 48.2%) aged 51 to 92 years old ($M = 67.90$, $SD = 7.94$). Their BMI ranged from 13.67 to 36.75 kg/m² ($M = 22.70$, $SD = 3.36$). Based on the cut-offs of BMI for Chinese adults (Zhou, 2002), 10.5% were considered underweight ($BMI < 18.5$), 57.8% were healthy weight ($18.5 \leq BMI < 24$), 26.2% were overweight ($24 \leq BMI < 28$), and 5.4% were obese ($28 \leq BMI$). Additional demographic information is presented in Table 1.

2.2 | Procedure

The survey was conducted in a paper-and-pencil format. Participants were asked whether they needed assistance such as reading and

explaining each item in the questionnaires. On average, 126 (40.3%) of the participants filled out the survey via interviews; 187 (59.7%) completed the survey independently.

The study was approved by the Institutional Review Board of the Chinese University of Hong Kong, Shenzhen (No. 1-PSY-H). All participants provided written consent prior to participating and were each compensated with a gift worth about 10 ¥ (1.41\$).

2.3 | Measures

2.3.1 | Demographic information

Information was collected regarding age, gender, marital status, residence, education, ethnicity, height, weight, and health status in hypertension and diabetes.

2.3.2 | Orthorexia nervosa

The Chinese version (He, Ellis, et al., 2019) of the DOS (Barthels et al., 2015a) was used, with a Cronbach's α of .80 in the current sample.

2.3.3 | Physical activity

A single-item was used (Milton, Bull, & Bauman, 2011): "In the past week, on how many days have you done a total of 30 minutes or more of physical activity, which was enough to raise your breathing rate (e.g., playing sports, exercising, briskly walking or cycling)." Seven options, from 0 to 7 days, were provided. This question has been demonstrated to have good validity and reliability (Milton et al., 2011; Scott, Morgan, Plotnikoff, & Lubans, 2015).

2.3.4 | Dietary knowledge

The Dietary Knowledge Scale from the China Health and Nutrition Survey was used, consisting of 12 statements on dietary knowledge (eight true statements and four false statements). Each response was either "correct" (1 point) or "incorrect" (0 point). The total score is used (Zhou, Zeng, Jin, & Cheng, 2017).

2.3.5 | Life satisfaction

A single item was used: "All things considered, how satisfied are you with your life as a whole?" Choices ranged from 1 ("totally dissatisfied") to 5 ("totally satisfied"). This item has been demonstrated to be relatively efficient compared with multiple-item life satisfaction measures (Cheung & Lucas, 2014).

TABLE 1 Descriptive statistics for the study sample ($n = 313$)

	Percentage (n)	Mean (SD)	Range
Gender			
Male	48.2% (151)	/	/
Female	51.8% (162)	/	/
Marital status			
Married	78.5% (245)	/	/
Others (single, divorced, or Widowed)	21.5% (67)	/	/
Residence			
Urban	75.0% (234)	/	/
Rural	25.0% (78)	/	/
Education			
Elementary or lower	12.1% (38)	/	/
Middle school	23.3% (73)	/	/
High school	47.3% (148)	/	/
College	16.0% (50)	/	/
Postgraduate or higher	1.3% (4)	/	/
Ethnicity			
Han	76.7% (240)	/	/
Minority	23.3% (73)	/	/
Hypertension			
Yes	43.6% (136)	/	/
No	56.2% (176)	/	/
Diabetes			
Yes	26.9% (84)	/	/
No	73.1% (228)	/	/
Age	/	67.90 (7.94)	51–92
BMI	/	22.70 (3.36)	13.67–36.75
Physical activity	/	5.08 (2.39)	0–7
Dietary knowledge	/	10.30 (1.52)	5–12
Life satisfaction	/	3.73 (0.89)	2–5
F&V consumption	/	7.81 (3.52)	2–22
Orthorexia	/	24.81 (5.89)	10–40
Psychological distress	/	9.82 (3.95)	6–26
Disordered eating	/	3.85 (5.84)	0–31
Body appreciation	/	39.70 (8.75)	14–50
Functionality appreciation	/	29.42 (5.64)	7–35
Body dissatisfaction	/	22.79 (11.42)	9–54
Food-related quality of life	/	23.19 (5.45)	7–30

2.3.6 | Fruit and vegetable consumption

Two items were used (e.g., Zhou et al., 2015; Zhou, Gan, Hamilton, & Schwarzer, 2017), which have been validated against food-frequency questionnaires (Steptoe et al., 2003): (a) “during the past week, how many portions of fruit did you eat per day?”; and (b) “during the past week, how many portions of vegetables did you eat per day?”. Responses ranged from 1 (“1 portion or less”) to 11 (“10 portions or more”). One portion was defined as two tael

(i.e., 100 g). Examples of one portion fruit and vegetable were provided.

2.3.7 | Psychological distress

The Chinese version (Kang et al., 2015) of the 6-item Kessler psychological distress scale (K6; Mitchell & Beals, 2011) was used. The Cronbach's α was .85 in the current sample.

2.3.8 | Disordered eating symptomology

The Chinese version (He, Sun, & Fan, 2020a) of the 12-item short form of the Eating Disorder Examination Questionnaire (EDE-QS; Gidycz et al., 2016) was used. The Cronbach's α was .91 in the current sample.

2.3.9 | Body appreciation

The Chinese version (Swami, Ng, & Barron, 2016) of the Body Appreciation Scale-2 (BAS-2; Tylka & Wood-Barcalow, 2015) was used. The Cronbach's α was .95 in the current sample.

2.3.10 | Functionality appreciation

The 7-item Functionality Appreciation Scale (FAS; Alleva et al., 2017) was used (e.g., "I appreciate my body for what it is capable of doing."). We translated the FAS based on the standard procedure as recommended in Swami and Barron (2019). The Cronbach's α was .95 in the current sample.

2.3.11 | Body dissatisfaction

The Chinese version (Lee, Lee, Leung, & Yu, 1997; Leung, Wang, & Tang, 2004) of the body dissatisfaction subscale of the Eating Disorder Inventory (EDI; Garner et al., 1983) was used. The Cronbach's α was .95 in the current sample.

2.3.12 | Food-related quality of life

The Chinese version (He, Ellis, et al., 2019) of the Satisfaction with Food-related Life Scale (SWFL) was used. The Cronbach's alpha was .95 in the current sample.

2.3.13 | Data analyses

Data were analyzed via R 4.0.0 (R Core Team, 2020). The rates of missing data for all the variables included in the current study ranged from 0% to 0.9%, much lower than the cut-off value of 5% (Schafer, 1999) that requires imputing the missing data.

The previously proposed cut-off score of 30 was developed based on a Germany sample and was used in Chinese undergraduate students, but it might not be suitable for Chinese elderly because of differences in cultures and ages. Thus, to identify individuals characterized by significant ON symptomology, we used two different cut-off scores: (a) the previously proposed cut-off score of 30; (b) one derived from the current study based on the 95th percentile (i.e., 34)—as used in the development study of the DOS (Barthels et al., 2015a).

To explore whether individuals with and without ON differed by demographic variables, we used chi-square tests and provided the Cramer's V, and values of 0.1, 0.3, and 0.5 can be considered small, medium, and large, respectively (Cohen, 1992). Finally, we used multivariate analysis of variance (MANOVA) followed by univariate F tests to examine the differences between individuals with and without ON in lifestyle behaviors, body image measures, and well-being variables. For MANOVA tests, partial η^2 was used to evaluate the effect sizes, with 0.01, 0.06, 0.14 suggesting small, medium, and large effects (Richardson, 2011). For F tests, we also provided Cohen's d to indicate effect size, with values of 0.2, 0.5, and 0.8 indicating small, medium, and large effects, respectively (Cohen, 1992).

3 | RESULTS

3.1 | Preliminary and descriptive analyses

We first examined potential differences between participants filling out the survey via interviews and those filling out the survey independently in age and ON symptoms. The two groups did not differ in age ($t = 0.06$, $p = .948$) or ON symptoms ($t = 0.27$, $p = .787$), and consequently were combined in subsequently data analyses. Table 1 summarizes the descriptive results of the variables used in the current study.

3.2 | Correlation results

Other than a small and significant positive correlation with hypertension status ($r = .11$, $p = .049$), ON symptoms were not correlated with any other demographic variables in this study: gender ($r = .002$, $p = .967$), marital status ($r = -.08$, $p = .175$), residence ($r = -.05$, $p = .385$), education ($r = .01$, $p = .934$), ethnicity ($r = -.04$, $p = .489$), age ($r = .03$, $p = .634$), BMI ($r = -.11$, $p = .059$), and diabetes status ($r = .08$, $p = .145$).

As Table 2 shows, ON symptoms also had negligible and insignificant correlations with dietary knowledge, psychological distress, and disordered eating symptomology (all $ps > .05$). However, ON symptoms were significantly and positively correlated with physical activity ($r = .19$, $p < .001$), fruit and vegetable consumption ($r = .20$, $p < .001$), body appreciation ($r = .22$, $p < .001$), functionality appreciation ($r = .22$, $p < .001$), and life satisfaction ($r = .24$, $p < .001$), but were significantly and negatively correlated with body dissatisfaction ($r = -.12$, $p = .036$).

3.3 | Identification of ON and its demographic correlates

Based on the traditional cut-off value of 30 (Barthels et al., 2015a), 61 (19.5%) were identified as showing significant ON symptomology as measured by the DOS. Using the 95th percentile approach as in

TABLE 2 Correlation analyses between orthorexia and lifestyle and psychological variables

	1	2	3	4	5	6	7	8	9	10
1. Orthorexia	1									
2. Physical activity	.19***	1								
3. Dietary knowledge	.08	.08	1							
4. Life satisfaction	.24***	.12*	.16**	1						
5. F&V consumption	.20***	.21***	.04	.20***	1					
6. Psychological distress	.03	-.08	-.19***	-.30***	-.08	1				
7. Disordered eating	-.06	-.01	-.04	-.20***	.003	.26***	1			
8. Body appreciation	.22***	.25***	.31***	.29***	.16**	-.36***	-.34***	1		
9. Functionality appreciation	.22***	.24***	.27***	.20***	.10	-.19***	-.28***	.56***	1	
10. Body dissatisfaction	-.12*	-.17**	-.16**	-.07	-.01	.25**	.45***	-.44***	-.42***	1
11. Food-related quality of life	-.01	.12*	.15*	.21***	.19***	-.25***	-.16**	.40***	.40***	-.26***

* $p < .05$.** $p < .01$.*** $p < .001$.**TABLE 3** Differences between participants with and without ON in lifestyle and psychological variables (cut-off value of 30: $n = 61$ for ON present; $n = 252$ for ON absent)

		ON present mean (SD)	ON absent mean (SD)	<i>F</i>	Cohen's <i>d</i>
Wilks' $\lambda = 0.90$	Physical activity	5.93 (1.78)	4.88 (2.46)	9.46**	0.45
$F(10, 293) = 3.39***$	Nutrition knowledge	10.34 (1.48)	10.30 (1.53)	0.03	0.02
Partial $\eta^2 = 0.10$	Life satisfaction	4.05 (0.85)	3.65 (0.88)	9.62**	0.45
	F&V consumption	8.71 (3.79)	7.62 (3.44)	4.51*	0.31
	Psychological distress	10.02 (4.44)	9.67 (3.74)	0.37	0.09
	Disordered eating	3.84 (6.21)	3.87 (5.83)	0.01	0.01
	Body appreciation	42.28 (7.12)	39.11 (9.10)	6.13*	0.36
	Functionality appreciation	31.24 (3.94)	28.97 (5.93)	7.68**	0.40
	Body dissatisfaction	22.93 (12.51)	22.76 (11.23)	0.01	0.01
	Food-related quality of life	22.98 (4.70)	23.25 (5.65)	0.11	0.05

* $p < .05$.** $p < .01$.

Barthels et al. (2015a) based on the current sample (i.e., a cut-off value of 34), 16 (5.1%) were identified of significant ON symptomology. In both cases, the identification of ON was not related to any of the demographic variables or hypertension and diabetes status, with Cramer's Vs generally less than 0.1 (i.e., small effects).

3.4 | Differences between groups with and without ON

Table 3 shows the differences between participants with and without ON (based on the cut-off of 30) in lifestyle behaviors, body image measures, and psychological well-being variables. The omnibus test of MANOVA showed significant differences between participants with and without ON, $F(10, 293) = 3.39$, $p < .001$, partial $\eta^2 = 0.10$ (medium

to large). Individuals with ON had significantly higher levels of physical activity ($d = 0.45$; small to medium effect size), life satisfaction ($d = 0.45$; small to medium), fruit and vegetable consumption ($d = 0.31$; small), body appreciation ($d = 0.36$; small), and functionality appreciation ($d = 0.40$; small to medium) than those without ON.

For the cut-off value of 34, the MANOVA results showed that individuals with ON and without ON had no overall significant differences, $F(10, 293) = 1.50$, $p = .138$, partial $\eta^2 = 0.05$ (small to medium; Table 4), which might be due to the reduced statistical power caused by the lower number of participants with ON ($n = 16$) when a higher cut-off value was adopted. In terms of effect sizes, compared with those without ON, individuals with ON had higher levels of physical activity ($d = 0.44$; small to medium), life satisfaction ($d = 0.70$; medium to large), fruit and vegetable consumption ($d = 0.26$; small), body appreciation ($d = 0.42$; small to medium), and functionality

TABLE 4 Differences between participants with and without ON in lifestyle and psychological variables (cut-off value of 34: $n = 16$ for ON present; $n = 297$ for ON absent)

		ON present mean (SD)	ON absent mean (SD)	<i>F</i>	Cohen's <i>d</i>
Wilks' $\lambda = 0.95$	Physical activity	6.06 (1.65)	5.03 (2.40)	2.91	0.44
$F(10, 293) = 1.50$	Nutrition knowledge	10.31 (1.25)	10.31 (1.53)	0.001	0.01
$\eta^2 = 0.05$	Life satisfaction	4.31 (0.79)	3.70 (0.88)	7.38	0.70
	F&V consumption	8.69 (2.21)	7.78 (3.59)	1.00	0.26
	Psychological distress	9.81 (5.06)	9.73 (3.81)	0.01	0.02
	Disordered eating	1.50 (2.71)	4.00 (6.00)	2.73	0.42
	Body appreciation	43.24 (6.20)	39.52 (8.92)	2.72	0.42
	Functionality appreciation	31.12 (3.59)	29.31 (5.76)	1.56	0.32
	Body dissatisfaction	20.19 (10.07)	22.94 (11.53)	0.87	0.24
	Food-related quality of life	22.75 (4.07)	23.22 (5.54)	0.11	0.08

Note: * $p < .05$, ** $p < .01$.

appreciation ($d = 0.32$; small), but lower levels of body dissatisfaction ($d = 0.24$; small) and disordered eating symptomology (0.42; small to medium).

4 | DISCUSSION

Is ON better characterized as a new lifestyle, featuring an intense interest in healthy eating, fitness, and a healthy lifestyle more generally, or as a new eating disorder, entailing physical and psychosocial impairments (e.g., malnutrition, weight loss, fatigue, emotional instability, social isolation, diminished quality of life)? In this study, we focused on the Chinese elderly using a validated measure of ON, that is, the DOS, and measured traditional eating disorder symptomatology, negative and positive body image (body dissatisfaction, body appreciation, and functionality appreciation), lifestyle behaviors (F&V consumption and time spent on physical activity), and indexes of well-being (psychological distress, food-related quality of life, and life satisfaction). In this novel context of Chinese elderly, our results significantly extended previous findings in several ways.

Perhaps the most surprising and novel finding was that ON symptoms were found to be positively associated with several positive psychological indexes, that is, body appreciation, functionality appreciation, and life satisfaction. This finding was substantiated by both correlation results and direct group comparisons. To our knowledge, our study was the first to look at the relationship between ON and *positive* body image. We chose to study body appreciation because body appreciation is not simply the absence of body dissatisfaction, but rather a related yet distinct construct that is closely associated with well-being (He, Sun, Lin, & Fan, 2020; He, Sun, Zickgraf, Lin, & Fan, 2020; Swami, Weis, Barron, & Furnham, 2018). From a pathological perspective of ON, one would naturally expect to see a negative association of ON with body appreciation, functionality appreciation, food-related quality of life, and life satisfaction. By revealing a positive association of ON, as measured by the DOS, with

several positive psychological indexes in a Chinese elderly sample, our results challenge this perspective.

We found that ON symptoms were positively correlated with F&V consumption in the Chinese elderly, consistent with a previous study using the EHQ in a sample of young Americans (Zickgraf et al., 2019). This finding dovetails with the popular belief held by the Chinese that a healthy diet means intake of "more vegetables and fruits, less meat and oil" (Banna, Gilliland, Keefe, & Zheng, 2016). Similarly, we also found that ON symptoms were positively correlated with time spent on physical activity in Chinese elderly, extending several prior studies in Western young samples, including athletes and students (McComb & Mills, 2019). These results point to an intimate link between interest in healthy eating and interest in fitness—both can be health-promoting and do not fit squarely with the pathological view of ON.

Indeed, we did not find an association between ON and psychological distress, which calls into question the clinical relevance of ON in the elderly population. If anything, we found that ON in our sample was negatively correlated with body dissatisfaction, suggesting a protective role of ON in negative body image in the elderly. Similarly, ON was not correlated with traditional disordered eating symptomology, suggesting a dissociation with other disordered eating. Together with ON symptoms' associations with body appreciation, functionality appreciation, and life satisfaction as discussed above, these results provide initial support for a positive psychology perspective of ON among the elderly.

That an interest in healthy eating can be positive is hardly surprising, whether at an advanced age or at a young age, as captured by healthy orthorexia (Barthels et al., 2019), which can potentially lead to the adoption of health-promoting eating and other lifestyle behaviors. In contrast, excessive focus on healthy eating, as captured by ON, has been found to be associated with psychosocial impairments in extant research (McComb & Mills, 2019). In the context of the late stage of lifespan, however, when the issue of health becomes much more prominent and personal time more abundant, it might be that even preconceived "excessive" focus on healthy eating can be beneficial

rather than detrimental to well-being, as it may lead to a number of health-promoting behaviors and higher life satisfaction. This disparity is analogous to the “excessive” focus on hand hygiene and physical distancing in a pandemic, which can be beneficial and only appears “excessive” when compared with regular time.

From this perspective and based on several measures on well-being and positive body image in the current study, ON in the elderly might be what healthy orthorexia is in younger individuals as documented in extant research. This positive perspective of ON suggests that ON could be protective rather than being a mental disorder in the elderly. This perspective puts ON at odds with mainstream eating disorders in the elderly, including AN, BN, and BED, which are associated with significant morbidity, including a wide range of secondary health issues, from cardiac to gastric conditions (Guerdjikova et al., 2012; Lapid et al., 2010; Mangweth-Matzek et al., 2006).

In addition to the conceptual issue raised above, our results also suggest that, in the DOS, the proposed cutoff score of 30 for ON as derived from the general population may not be appropriate for the elderly, as this cutoff score yields an estimated 1–8% of ON cases in the general population and college students (e.g., 7.8% in Chinese college students; He, Ma, et al., 2019), but 19.5% in the Chinese elderly here. Using a cut-off value of 34 (i.e., 95th percentile based on the current sample) might be more appropriate. But in both scenarios, ON cases had higher positive body image and life satisfaction than non-ON cases. Ultimately, if ON as measured by the DOS is not pathological but protective in the elderly, then the value of the cutoff score as a diagnostic means appears to lose its meaning and ON might not be the right term to use in this situation.

Several limitations of the current study need to be noted. First, we did not measure normative healthy eating, as the DOS was developed to measure only pathologic health-focused eating (i.e., ON). Future studies may use the EHQ or the TOS, which have a subscale that measures normative healthy eating, to compare normative healthy eating and ON in the elderly and examine the effect of ON after controlling for normative healthy eating. Second, our study focused on eating-related psychosocial impairments (two items in the DOS and food-related quality of life in SWFL) and general well-being impairments (stress as measured by K-6 and life satisfaction), but did not measure physical impairments such as malnutrition and weight loss. Previous research shows that physical and psychosocial impairment items in a new ON inventory loaded onto a single factor and should be combined into a single impairment criterion (Oberle, De Nadai, & Madrid, 2020). Nevertheless, from a diagnostic perspective, measuring malnutrition, weight loss, and other relevant physical impairments would help clinical diagnostics of ON. Third, as the conceptualization and understanding of ON is still in flux, measures of ON, including the DOS, require further validation. Although the DOS measures ON rather than healthy orthorexia, it might be possible that the DOS also captures aspects of healthy orthorexia. In particular, some items in the DOS may need to be re-evaluated (e.g., “I have certain nutrition rules that I adhere to”; “I like that I pay more attention to healthy nutrition than other people”), as they seem to capture healthy orthorexia rather than pathological orthorexia. In addition,

potential diagnostic rule-out criteria may need to be included (e.g., caloric restriction for weight loss; distorted perception of weight and shape). It is also not clear whether differences in the comprehension of the items between young and elderly participants might influence their answers on the scale, although we did not find a difference between participants filling out the survey independently and those through interviews. Future research should therefore aim to bring more clarity to the concept of ON and establish consensus regarding its conceptualization and measurement.

In conclusion, we show that ON symptoms in Chinese elderly as measured by the DOS were associated with several positive measures (body appreciation, functionality appreciation, and life satisfaction) and lifestyle behaviors (F&V consumption and time spent on physical activity). ON symptoms were not associated with psychological distress, food-related quality of life, or disordered eating symptomology, but negatively correlated with body dissatisfaction, suggesting a protective role of ON in negative body image. These results provide initial evidence for a positive psychology perspective of ON, suggesting that ON in the elderly might be beneficial and protective and thus is more consistent with healthy orthorexia than with a mental disorder.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Jinbo He designed the study, Yiqing Zhao and Hengyue Zhang acquired the data, Jinbo He, Yiqing Zhao, Hengyue Zhang and Zhicheng Lin analyzed the data, Zhicheng Lin and Jinbo He interpreted the data and wrote the manuscript. All authors approved the final version of the manuscript for submission.

DATA AVAILABILITY STATEMENT

Data are available from the correspondence author upon request.

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