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Prevalence of Orthorexia Nervosa in Spanish university students: relationship with body image and eating disorders

Álvaro Ruiz and Yolanda Quiles*

Behavioral Sciences and Health Department. University Miguel Hernández, Elche (Spain).

Título: Prevalencia de la Ortorexia Nerviosa en estudiantes universitarios españoles: relación con la imagen corporal y con los trastornos alimentarios.

Resumen: *Antecedentes*. El objetivo de este estudio fue examinar la prevalencia de la Ortorexia Nerviosa (ON), y analizar su relación con la imagen corporal y conductas características de los Trastornos de la Conducta Alimentaria (TCA), en estudiantes universitarios.
Método. Estudio transversal en el que participaron 534 estudiantes universitarios españoles, 422 mujeres y 112 hombres, con una edad media de 22.04 años (*DT* = 3.41). Se administraron los siguientes instrumentos: cuestionarios variables sociodemográficas y de hábitos alimentarios, el cuestionario ORTO-11-Es, la Teruel Ortorexia Scale (TOS), el Multidimensional Body Shape Relations Questionnaire (MBSRQ-45) y el Eating Attitudes Test (EAT-26).
Resultados. El 30.5% de los estudiantes presentó un alto riesgo de ON. Se observaron mayores tendencias ortoréxicas en mujeres. El grupo que presentaba alto riesgo de ON frente al de bajo riesgo mostró un IMC medio-alto, seguían en mayor medida una alimentación de tipo vegano/vegetariano y presentaban puntuaciones significativamente superiores en el MBSRQ-45 ($p < .00$) y el EAT-26 ($p < .00$).
Conclusiones. Los resultados obtenidos muestran una elevada prevalencia de ON en estudiantes universitarios y su relación con una peor imagen corporal, una mayor preocupación por el aspecto físico y con conductas características de los TCA.
Palabras clave: Ortorexia nerviosa. Prevalencia. Imagen corporal. Trastornos de la conducta alimentaria. Estudiantes universitarios.

Abstract: *Background*. The aim of this study was to examine the prevalence of ON and analyze its relationship with self-image and ED behavior in university students.
Method. Cross-sectional study with a sample of 534 Spanish university students, 422 women and 112 men with an age mean of 22.04 (*SD* = 3.41). Questionnaires administered: a sociodemographic and lifestyle questionnaire, the ORTHO-11-Es, the Teruel Orthorexia Scale (TOS), the Multidimensional Body Self Relations Questionnaire (MBSRQ-45) and the Eating Attitudes Test (EAT-26).
Results. 30.5% of the sample were on high risk of developing ON. Higher orthorexic tendencies were observed in women. Those at high risk of ON showed higher BMI, higher proportion of veganism/vegetarianism and significantly higher scores on the MBSRQ-45 ($p < .00$) and EAT-26 ($p < .00$).
Conclusions. Results showed a high prevalence of ON and its relationship with a worse self-image, concern with physical appearance and ED behaviors.
Keywords: Orthorexia nervosa. Prevalence. Body image. Eating disorders. University students.

Introduction

Nutrition is linked to human survival. It is the basis of health and disease. The notion that society has of it changes depending on culture and historical moment. Nowadays in western societies, the most appreciated value is the physical and mental health of the body, considering healthy eating habits as the optimal way to achieve these goals. This trend translates into an increase of the interest in diet and consumption of healthy and wholesome foods (Álvarez-Munárriz & Álvarez de Luis, 2009). This interest towards the adoption of a healthy nutrition can be taken to the extreme by certain individuals becoming a pathological process known as Orthorexia Nervosa (ON) (Shah, 2012).

ON is defined as a pathological obsession with eating healthy or pure nutrition and the establishment of ritualized and disturbed relationship with nutrition that leads to a restrictive diet, a focused attention on food preparation and ritualized patterns when eating (Bratman, 1997). It involves the concern for the quality of the ingested products over its quantity, focusing on eating whole, organic, hormone and antibiotic-free food. These strict rules entail spending a considerable proportion of time scrutinizing the origin, processing, and packaging of groceries, as well as cataloging, weighing, measuring and planning future menus (Bratman and Knight, 2000).

This disorder that originally intends to avoid chronic disease and maximize general health, ends up leading to a scenario where food becomes the axis of the person's life, a way of protection against anxiety and the main source of self-esteem, value and self-meaning (Bratman, 1997). In the long term, it damages diverse areas of the subject's life, which may result in isolation, psychological imbalance, and even nutritional deficiencies due to the omission of certain food groups (Bosi, Çamur & Güler, 2007). Despite the fact that there are no long-term empirical findings of the disorder, the existing evidence shows that it can lead to physical complications derived from malnutrition similar to those observed in patients with severe anorexia (Moroze, Dunn, Craig Holland, Yager & Weitraub, 2015; Park et al., 2011).

Due to its recent unveiling and its complex etiology ON has not been included in the DSM-V or the CIE-10 yet despite the multiple diagnostic criteria proposals and the multiple attempts to conceptualize it (Bratman & Knight, 2000; Dunn & Bratman, 2016; Moroze et al., 2015). In addition,

*** Correspondence address [Dirección para correspondencia]:**
Yolanda Quiles Marcos. Behavioral Sciences and Health Department. University Miguel Hernández. Avda. de la Universidad s/n, 03202 Elche, Alicante (Spain). E-mail: y.quiles@umh.es
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there have been numerous attempts to conceptualize it: as an obsessive compulsive disorder (Shah, 2012), an anxiety disorder (Bartrina, 2007; Parra-Fernández et al., 2018), an addiction (Bratman and Knight, 2000) or an eating disorder (Bratman, 1997).

Regarding the prevalence of ON, the existing studies on this topic are scarce and disparate. It has been investigated in different countries and samples: general population of Lebanon (Sfeir et al., 2019), American (McInerney-Ernst, 2011), university students (Bağci Boci, Çamur y Güler, 2007; Dell'Osso et al., 2018; Donini, Marsili, Graziani, Imbriale y Cannella, 2004; Gorrasi et al., 2019), dietitians (Kinzl et al., 2006; Karakus, Hidiroglu, Keskin & Karavus, 2017) and athletes (Kiss-Leizer, Tóth-Király & Rigó, 2019; Segura-García et al., 2012), among others. These studies place the prevalence of the disorder between 1% and 90% of the population (Parra-Fernández et al., 2018). The existence of this imprecise and disparate data makes it difficult to carry out research on this phenomenon. Additionally, it should be noted that the lack of a unified diagnostic criteria makes it impossible to obtain precise data about the incidence of this disorder.

The only 3 existing studies with Spanish population place the prevalence between 10,5 and 25,2% in the University of Castilla la Mancha's students (Parra-Fernández et al., 2018; Parra-Fernández, Onieva-Zafra, Fernández-Martínez, Abreu-Sánchez & Fernández Muñoz, 2019) and 86% among ashtanga yoga practitioners (Herranz Valera, Acuña Ruiz., Romero Valdespino & Visioli, 2014).

It is required to continue studying the prevalence of ON, as well as its relationship with certain sociodemographic characteristics and eating habits due to the disparate results on the issue. Furthermore, clarification of its relationship with ED is needed, specifically with AN, to conceptualize this phenomenon. Hence, the aim of this study is to investigate the prevalence of ON and analyze its relationship with some variables such as gender, BMI, type of diet, body image and typical behavior of ED in university students.

Method

Subjects

534 students participated in this study. 79% were women and 21% men, aged between 18 and 48 years (M = 22.04, SD = 3.41). Students from 43 Spanish universities, both undergraduate and postgraduate, and from 90 different degrees participated.

98% were single and 73.2 lived with their parents and/or other relatives. 63% reported that their parents or other relatives purchased the food they ate. 16.1% were vegan or vegetarian and 75% had normal weight.

Instruments

- Socio-demographic data and ad-hoc eating habits questionnaire: A self-reported questionnaire was used to collect sociodemographic data from the participants. It included: age, gender, marital status, type of studies and clinical variables such as weight and height. Their health habits related to their lifestyle and diet were also evaluated. The BMI of each participant was calculated based on the weight and height data provided. The different levels of BMI were established based on the WHO criteria: < 18.5 for underweight, between 18.5 and 24.9 for normal weight, between 25 and 29.9 for overweight and > 30 for obese.
- ORTO-11-Es: A self-reported tool designed and adapted by Parra Fernández et al. (2018) as the best adaptation of the original ORTO-15 questionnaire to Spanish, one of the most widely used tools in this area (Cena et al., 2019). This questionnaire is composed of 11 items answered using a Likert-type scale with 4 response options (never, sometimes, often, and always). This instrument has a reliability of 0.80. Scores below the cut-off point of 25 indicate ON-related behavior.
- Teruel Orthorexia Scale (TOS): It is a two-dimensional inventory developed by Barrada and Roncero (2018). It is composed of 17 items with a four-point Likert-type response scale ranging from: "Not at all" to "Strongly agree". This scale evaluates *Healthy orthorexia* (OS) (dimension made up of 9 items) defined as a healthy interest in diet independent of psychopathology, and *Orthorexia nervosa* (ON) conceptualized as the disorder itself. It has adequate psychometric properties with a reliability of 0.88.
- The Multidimensional Body Self Relations Questionnaire (MBSRQ) (Cash, 1990) in its reduced version and adapted to Spanish by Del Cid, Rabert & Ruiz (2009). It is composed of 45 items that evaluate attitudes towards the "body image" construct, including the evaluative, cognitive and behavioral components of it. These items are answered on a Likert-type scale: one part of the questionnaire evaluates the agreement with various statements (totally disagree, strongly disagree, indifferent, strongly agree and agree) and another considers the level of satisfaction with some parts of the body (very unsatisfied, quite unsatisfied, midpoint, quite satisfied, very satisfied). This questionnaire, which has a reliability of 0.88, is made up of 4 factors: a) *Importance of corporality* (ISC), b) *Behaviors aimed to maintain physical shape* (COMF), c) *Self-evaluated physical attractiveness* (AFA) and d) *Physical appearance care* (CAF).
- The Eating Attitudes Test (EAT-26) (Garner y Garfinkel, 1979; Garner, Olmstead, Bohr y Garfinkel, 1982) adapted to Spanish by Gandarillas, Zorrilla and Sepúlveda (2003). Composed by 26 items with a Likert-type response scale of 6 points (never, rarely, sometimes, frequently, almost always and always) where the participant

responds based on the frequency with which he performs the behaviors presented. These are distributed in 3 dimensions: a) *diet* (D), where concern for thinness and food avoidance behaviors are contemplated; b) *bulimia and concern for food* (B), which includes items of bulimic behaviors; and c) *oral control* (CO), where the pressure by the environment for weight gain and self-control of the intake are contemplated. This questionnaire has a cut-off point of 20 and a reliability of 0.84.

Procedure

Students from different Spanish universities participated in this study which was carried out between March and April 2020. Questionnaires were administered online through GoogleForms since subjects belonged to different universities spread throughout the country. The link to the survey was spread through advertisements on virtual campuses of some universities, via mail, broadcast messages in messenger apps and by social media with the aim of recruiting the largest possible sample.

The student selection was random and by convenience. The inclusion criteria of this study consisted of participants who were university students in the year 2019/2020. Due to its main exploratory objective, no exclusion criteria were considered. 10 students were removed from the study since they did not complete the questionnaires correctly.

The Responsible Research Office of the Miguel Hernández University of Elche approved this study. The completion of the form was completely anonymous, and the students did not receive any compensation or benefit for it. Participants were informed that the data collected would be strictly confidential and used only for the purpose of this study.

Statistical analysis

The statistical analyses were applied using the Statistical Package for the Social Sciences 25.0 (SPSS).

A descriptive analysis of all demographic and clinical variables was carried out. For the analysis of differences: Student's *t*-test was used to calculate the differences in numerical variables in two groups. Chi-square test was used to compare means with categorical variables. Pearson correlation analysis was used for relationship analyses.

Results

Descriptive and differences analysis and ON prevalence

Table 1 shows the means and standard deviations of the university students in the study variables. Regarding the differences based on gender (see Table 2), and respect to ON, women presented significantly lower mean scores on the ORTO-11-Es ($t(532) = -2.53$, $p < .01$, $d = -.26$) and higher on the TOS Orthorexia Nervosa scale ($t(532) = 2.84$, $p <. 01$, $d = .33$), compared to men.

Table 1.
Desciptive analyses of the study variables.

	Scores		*M*	*SD*
	Min.	Max.		
ORTO-11-Es	13	42	27.9	5.58
TOS	0	43	14.89	7.66
OS	0	27	11.15	5.24
ON	0	24	3.75	3.71
MBSRQ-45	91	200	144.59	17.65
ISC	63	131	97.29	10.53
COMF	7	35	23.84	6.99
AFA	2	10	6.10	2.17
CAF	5	25	17.36	3.38
EAT-26	0	58	8.76	7.97
D	0	33	5.71	5.01
B	0	16	1.05	1.91
CO	0	16	1.99	2.69

Table 2.
Male and female differences in study variables.

	Female (n = 422)		Male (n = 112)		*t*	*p*	*d*
	M	*SD*	*M*	*SD*			
ORTO-11	27.68	5.52	29.16	5.66	-2.52	.01	-.26
TOS	15.23	7.73	13.64	7.27	1.95	.05	.21
OS	11.25	5.15	10.78	5.58	0.84	.40	.09
ON	3.98	3.88	2.87	2.80	2.84	.01	.33
MBSRQ	144.84	17.51	143.64	18.23	0.64	.52	.07
ISC	97.64	10.64	96.00	10.06	1.46	.14	.16
COMF	23.51	6.82	25.06	7.53	-2.09	.04	-.22
AFA	6.00	2.16	6.51	2.17	-2.22	.03	-.24
CAF	17.70	3.29	16.07	3.42	4.63	.00	.49
EAT-26	9.29	8.53	6.74	4.91	3.03	.00	.37
D	6.02	5.31	4.55	3.40	2.78	.01	.33
B	1.11	2.08	0.84	1.35	1.30	.19	.15
CO	2.16	2.82	1.35	1.96	2.87	.00	.33

Regarding ON, mean scores obtained using ORTO-11-Es in this sample was 27.99 (SD = 5.58), being the cut-off point of this scale < 25 (indicative of ON) 163 participants (30.5%) were at a high risk of presenting ON. Using TOS questionnaire, the mean obtained was 14.9 (SD = 7.66). In the *Orthorexia Nervosa* subscale, with possible range of scores from 0 to 24, the mean obtained in this sample was 3.75 (SD = 3.71). In the *Healthy Orthorexia* subscale, with a range of scores from 0 to 27, the mean obtained was 11.2 (SD = 5.24) (Table 1).

The total number of students was divided into two groups, depending on wether they presented high or low risk of ON (according to mean scores in the ORTO-11). Statistically significant differences were found between those participants who followed a vegetarian / vegan type diet compared to those who ate a standard diet ($\chi^2 = 10.6$; $p < .00$) (Table 3). There is a higher percentage of vegan / vegetarian students with a high risk of ON.

University students who were at high risk of ON showed significantly higher means in: BMI scores (t (532) = 2.64, $p <$

.01, d = .24), the TOS (t(532) = 15.4, p < .00, d = 1.38), the MBSRQ-45 (t(532) = 8.12, p < .00, d = .78) and the EAT-26 (t(532) = 11.3, p < .00, d = .93) and its corresponding subscales. Except for the MBSRQ-45 *Self-evaluated Physical Attractiveness* (AFA) subscale, where they obtained significantly lower means than the low-risk group (t(532) = -4.68, p < .00, d = -. 42) (Table 3).

Table 3.
Differences between high-risk and low-risk of ON population according to ORTO-11-Es.

	High-risk (n = 163)		Low-risk (n = 371)		t	p	d
	M	*SD*	*M*	*SD*			
TOS	21.31	7.475	12.08	5.82	15.42	.00	1.38
OS	14.50	4.887	9.69	4.68	10.81	.00	1
ON	6.81	4.423	2.40	2.30	15.13	.00	1.25
MBSRQ	153.43	15.647	140.71	17.09	8.12	.00	.78
ISC	103.79	9.095	94.44	9.84	10.35	.00	.99
COMF	25.19	6.605	23.24	7.09	2.99	.00	.28
AFA	5.45	2.297	6.39	2.06	-4.68	.00	-.43
CAF	18.99	2.947	16.64	3.31	7.82	.00	.75
EAT-26	14.03	10.306	6.44	5.24	11.26	.00	.93
D	9.14	6.354	4.21	3.32	11.76	.00	.97
B	2.15	2.637	0.57	1.29	9.26	.00	.76
CO	2.74	3.032	1.66	2.45	4.36	.00	.39

8.6% of the participants exceeded the EAT-26 cut-off point of> 20, indicative score of high-risk of ED. These students showed significantly lower scores (indicative of ON) on the ORTO-11-Es (t(532) = -7.93, p < .00, d = -1.42) and higher on the TOS' *Orthorexia nervosa* scale (t(532) = 10, p < .00, d = 1.51).

6.9% (N = 37) of the students exceeded both scales' cut-off point, the ORTO-11-Es and EAT-26. Of those who scored as high risk on EAT-26 an 80.4% belonged to the high-risk group in ON. 22.7% of university students who were at the high-risk group in ON also belonged to the high-risk group in ED.

Correlation analyses

The results of the correlation analyses between all the study variables, showed significant and negative relationships between the scores obtained in ORTO-11 with BMI, body image (except for the MBSRQ's *Self-evaluated Physical Attractiveness* (AFA) where the correlation was positive) and EAT-26. Moreover, significant positive relationships were found between the TOS' *Orthorexia Nervosa* scale with body image (except for the *Self-evaluated Physical Attractiveness* (AFA) of the MBSRQ where the correlation was negative) and, remarkably, with the EAT-26 and its subscales of *Diet* (D) and *Bulimia and concerns about food* (B). See Table 4.

Table 4.
Correlation matrix of ORTO-11-Es, BMI, TOS, MBSRQ-45, EAR-26 and its scales.

	ORTO11	IMC	TOS	OS	ON	MBSRQ	ISC	COMF	AFA	CAF	EAT26	D	B	CO
ORTO11														
BMI	-.21*													
TOS	-.67**	.02												
OS	-.55**	-.01	.90**											
ON	-.62**	.06	.79**	.45**										
MBSRQ	-.45**	.05	.53**	.55**	.32**									
ISC	-.54**	.12**	.56**	.51**	.44**	.93**								
COMF	-.22**	.04	.36**	.44**	.11*	.82**	.62**							
AFA	.28**	-.26**	-.10*	.14**	-.40**	.08	-.17**	.19**						
CAF	-.42**	-.03	.34**	.27**	.33**	.58**	.56**	.18**	-.13**					
EAT-26	-.47**	.05	.57**	.33**	.71**	.30**	.38**	.10*	-.36**	.38**				
D	-.51**	.11**	.58**	.33**	.72**	.32**	.42**	.12**	-.40**	.38**	.91**			
B	-.39**	.07	.51**	.26**	.67**	.17**	.27**	.02	-.34**	.24**	.80**	.70**		
CO	-.17**	-.13**	.24**	.16**	.28**	.16**	.17**	.06	-.09*	.23**	.66**	.38**	.35**	

Discussion

The aim of this study was to determine the prevalence of ON in the Spanish university population. Obtained results using ORTO-11-Es showed that 30.5% of the sample was at a high risk of developing ON. When comparing this result with the only existent three studies in Spanish population, this result is higher than the obtained by Parra Fernández et al. (2018, 2019) where, also using the ORTO-11-Es in university population, they obtained a prevalence of between 17% and 25.2%. The samples of this studies had a higher proportion of male subjects than this investigation. Assuming that the prevalence of ON is higher in women, this could explain finding this disparity of results. Furthermore, it would be necessary to consider the various contextual factors that could be influencing the participants when they were completing the ORTO-11-Es.

In contrast, our prevalence is lower than the 86% obtained by Herranz Valera et al. (2014) in the population of ashtanga yoga practitioners. They used the English version of ORTO-15 and the sample had a higher average age and proportion of vegetarian and vegan subjects than that observed in university students. This could explain the observed disparity of results.

The prevalence found in this study is similar to those showed in Italian university students research. While with

the original version of the ORTO-15 Donini et al. (2004) showed a prevalence of 6.9%, Dell Osso et al. (2018) found an index of 34.9%, Gorrassi et al., (2019) of 29%, Gramaglia et al. (2019) of 37.05% and Bo et al. (2014) of 25.9%. However, the prevalence obtained in this research is lower than Hungarian and Turkish scores. Thus, the study by Varga et al. (2014) using an adapted and validated version of this tool, the ORTO-11-Hu, showed a prevalence of 74.2%. In Turkish medical students, applying the validated and adapted version of ORTO-11, the studies by Bağci Boci et al. (2007) and Fidan et al. (2010) showed a prevalence of 45.5% and 43.6%. The study by Reynolds (2018) in Australian university students showed a prevalence of 21% using the ORTO-15.

According to Parra Fernández et al. (2018) this disparity of results could be attributed to the sociocultural factors associated with food in each of the different countries studied. Other authors ascribe these differences to the internal structure of the questionnaire and the use of different versions and cut-off points of the questionnaire when analyzing and interpreting the results (Missbach et al., 2015).

The obtained in this study and in other similar ones could be explained due to the existing media pressure towards the concern of physical health, consumption of healthy, quality and "pure" foods that is present in trends such as "Realfooding" or "Clean Eating" to which society, specifically young people, are continuously bombarded (Marcos Retuerta, 2019).

In addition, this study also aimed to analyze the relationship between ON and diverse features such as genre, BMI, type of diet, body image and ED features in university students.

A negative correlation was found between BMI and the ORTO-11-Es scores, where significant differences were also observed in the high-risk group. Which means that subjects with lower scores on this scale (higher risk of ON) presented a higher BMI (normal or overweight). Similar results were found by Fidan et al. (2010) and Gramaglia et al. (2019) who hypothesize that this relationship is caused due to being overweight or obese generates humiliating feelings in people that motivate the person to start diets and consume healthy food. However, other investigations offer different results, sometimes has been found a positive relationship between both values (Dell Osso et al., 2018) or no relationship at all (Aksoydan et al., 2009; Brytek-Matera, 2015; Donini et al., 2004; Gorrasi et al., 2019; Karakus et al., 2017; Parra Fernández et al. 2018; Varga et al., 2014).

Considering the type of diet, a higher prevalence of ON was observed among vegetarian/vegan individuals. These results are consistent with those obtained by Herranz Valera et al. (2014) in a Spanish population of ashtanga yoga practitioners and by Dell'Osso et al. (2018) in Italian university students. This could be explained because these individuals, by restricting their diet to a certain group of food and paying more attention to it, show a greater tendency to present ON behaviors.

It is undeniable the overexposure that women suffer to social media pressure towards the ideal of thinness and beauty standards in today's society. This could explain the obtained results in gender features: differences were shown in the mean scores of the female population in said inventory and the TOS' *Orthorexia Nervosa* subscale, which would reveal a greater prevalence of ON in women. Similar results were found in studies with Spanish university students (Parra-Fernández et al., 2018, 2019).

However, the findings of previous research on this regard are inconsistent. While some studies show a higher prevalence in women (Bağci Boci et al., 2007; Dell ' Osso et al., 2018; Gorrasi et al., 2019; Gramaglia et al., 2019; Parra Fernandez, 2018; Ramacciotti et al. 2011; Sanlier, Yassibas, Bilici, Sahin & Celik, 2016; Segura Garcia et al., 2012), others do it in men (Donini et al. 2004; Fidan et al. 2010; Karakus et al, 2017) and others do not show differences at all (Aksoydan et al., 2009; Bo et al., 2014; Brytek-Matera et al., 2015; Segura-García et al, 2015; Varga et al., 2014).

ED (AN and BN) are more prevalent in women, showing a ratio of 9:1 (Gramaglia et al., 2019; Steinhausen, 2002). This investigation's results are consistent with this fact since significantly higher scores were observed in women on the EAT-26. These findings, accompanied by a higher incidence of ON in the female population, as well as the high negative correlation between EAT-26 and ORTO-11-Es and positive with the TOS' *Orthorexia Nervosa* scale, highlight the relationship of ON with ED, especially with AN.

Regarding deviant eating attitudes related to ED, the results of this study showed a significant negative relationship between scores on the ORTO-11 and the EAT-26. This has also been observed in multiple studies even when other versions of those instruments such as the ORTO-15 and EAT-40 were used (Brytek Matera et al., 2015; Fidan et al., 2010; Gorrasi et al., 2019; Gramaglia et al., 2017). How ON and ED are related is a complex matter and it is still far for being fully understood (Gramaglia et al., 2019; Varga et al., 2014). There are diverse hypotheses that range from considering ON as a new independent disorder forming a new EDNOS to its conceptualization as a behavioral pattern of AN (Parra Fernández et al., 2019). Furthermore, in terms of its temporal relation, it has been studied that ON could act as a predecessor or successor to an ED (Dell'Osso et al, 2017; Koven & Senbonmatsu, 2013).

Despite these findings, the temporal pattern between both disorders is still uncertain and it highlights the need to deepen its research in clinical samples. According to Bratman (2014), the main distinction between AN and ON is that the former is an obsession with weight and the latter an obsession with the purity of food. However, it is undeniable that ON and ED are two phenomena that appear very frequently together.

In this study, people with higher tendencies towards ON showed a worse body image. Giving more importance to corporality and presenting a greater concern for physical appearance, weight, health, disease, and diets. These university

students manifested behaviors to maintain physical shape (exercising, improving physical strength, etc.), greater care for physical appearance and a worse self-evaluation of their physical attractiveness.

These results allow us to conclude that the prevalence of ON in Spanish university students is 30.5%. It is more frequent in women, in subjects with a medium-high BMI, in vegan/vegetarian individuals, in those who present a worse perception of their own body image, and greater behaviors to the care of the physical aspect and typical of ED, showing a high relationship with these disorders.

This research presents some limitations that must be considered. As for the implemented psychometric instruments, since they are self-administered the reliability of the data collected decreases depending of the different interpretations that the respondents could make of the questionnaires. Moreover, some aspects of the ORTO-15 (the original version of ORTO-11) have been criticized several times in the existing literature. Some authors question its psychometric properties (Cena et al., 2019; Missbach et al., 2015; Varga et al., 2013). Some others state that this tool does not determine if the presence of orthorexic behaviors implies a real pathology, so the results obtained with that instrument tend to overestimate the true prevalence of the phenomenon (Clifford & Blyth, 2019; Dunn & Bratman, 2016; Ramacciotti et al, 2011; Reynolds, 2018).

Also, the mechanisms underlying the relationship between the studied features and ON are unknown since this research did not consider personality traits, cultural and biological factors that could influence the development of the disorder. In addition, the cross-sectional nature of this study impedes determining the temporal pattern between ON and ED. Therefore, future longitudinal investigations in clinical samples are required to determine how these disorders interact.

It should also be considered that this study was carried out in March and April 2020 in a period of confinement due to the COVID-19 crisis. The answers provided by the subjects could be biased by the conditions of this situation.

Despite all the said limitations, this study aimed to clarify the relationship between ON and body image, as well as with ED, and demonstrates the relationship between these variables. The results are consistent with the existing literature on the matter. However, there are some inconsistencies with the previous studies that show the lack of consensus when conceptualizing the disorder, its etiology, factors involved and consequences. It is also needed the establishment of an accepted diagnostic criteria for the matter. The absence of these elements makes it difficult to measure ON and reduces the possibility of describing how it interacts with other variables. Hence, future research is required to provide a detailed definition, characterization, and a joint diagnostic criterion of the disorder and to clarify its relationship with ED and other psychopathological dimensions.

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