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ORIGINAL ARTICLE

Food addiction, orthorexia, and food-related stress among dietetics students

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Abstract

Purpose Health sciences, and in particular Nutrition and Dietetics students, have been shown to exhibit an increased prevalence of disordered eating. The aim of the present cross-sectional study was to evaluate other specified feeding and eating disorders (OSFEDs), including stress-related eating, food addiction, and orthorexia, in relation to the dietary intake, among nutrition/dietetics students.

Methods A total of 176 undergraduate students from a Department of Nutrition and Dietetics, in Greece, participated in the study. Dietary intake was recorded, and the prevalence of Eating and Appraisal Due to Emotion and Stress (EADES), food addiction (with the modified Yale Food Addition scale mYFAS), and orthorexia were assessed. Chi-square and *t* tests were performed between sexes, orthorexic and non-orthorexic students, as well as between food-addicted and non-addicted participants. Multiple linear regression analysis assessed relationships between energy intake, BMI or waist circumference, and the food-related psychometric scales.

Results Among participating students, 4.5% had food addiction and 68.2% demonstrated orthorexia. No differences were observed between men and women, concerning the prevalence of food addiction and orthorexia, the sum of mYFAS symptoms, or individual EADES factors. Orthorexic students exhibited increased BMI, reduced energy, and saturated fat intake. In addition, orthorexic men consumed more vegetables. Multiple linear regression analysis revealed that orthorexic behavior was associated with increased BMI, waist circumference and energy intake. Lower BMI was associated with increasing ability to cope with emotion-and-stress-related eating and increasing appraisal of ability and resources to cope with emotions and stress. Emotion-and-stress-related eating was negatively associated with BMI. Appraisal of ability and resources to cope with emotions and stress was associated with the energy intake. Finally, age was positively correlated with the appraisal of outside stressors/influences, indicating increased ability to cope with outside stressors among older students.

Conclusions The study shows that despite the suggested interventions, the problem of OSFEDs among nutrition and dietetics students is still valid. Regular screening, counseling, and education is needed to reduce its prevalence.

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

Keywords Disordered eating · Eating disorders · OFSED · EDNOS · University · Nutrition · College students · University students · EADES · YFAS

Introduction

More than 5 million Americans today suffer from disordered eating [1], the majority of which are women [2]. Apart from the typical eating disorders (EDs), the epidemic of obesity has now revealed several other feeding and EDs (OFSED), including food addiction [3]. Food addiction is common among overweight individuals who consider dieting as an insurmountable challenge, demonstrating the worst weight loss results [4]. In addition, it has been associated with many

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EDs and disordered eating practices, including binge eating disorder [5], compulsive overeating [6], and bulimia nervosa [7]. Medical Nutrition Therapy provided by registered dietitians consists of an integral part of the treatment and management of EDs [8], and disordered eating patterns are frequently identified among several patient groups treated by dietitians [9]. However, according to the literature, dietitians are not as healthy as they appear [10].

Pressured to maintain a healthy body weight and serve as role models [11], dietitians often engage in disordered eating [12]. This obsession related to body image is even extended among students [13], as according to an international study, 77% of nutrition/dietetics students experienced some form of OFSED [10]. In particular, nutrition/dietetics professionals and students appear affected by orthorexia nervosa (ON), an atypical eating disorder characterized by an obsession for "healthy" eating [14]. Table 1 details the recorded prevalence of ON among health sciences students, including nutrition/dietetics majors, worldwide. A variety of tools have been applied to assess ON, many of low psychometric quality. In Italy [15], ON was diagnosed among 35.9% of dietetics students, whereas in Poland [16], 68.6% of the female and 43.2% of the male students were orthorexic. A greater prevalence of ON has been reported among nutrition/dietetics students compared to other majors [15], with the prevalence being reduced among long-term students, compared to the freshmen [16, 24]. Although dietetic students tend to demonstrate healthier eating habits compared to other fields of study [27], they also consist of a high-risk group for EDs [28], and exhibit a greater frequency of vomiting after overeating [29].

Despite its importance, the issue of disordered eating among nutrition/dietetics students and professionals remains an understudied area [12]. In addition, the need for increased awareness and research concerning ON has recently been highlighted [30] and studies assessing orthorexia in relation

Table 1 Prevalence of orthorexia nervosa among health sciences university students

Country	Study year	*N*	School/Department	Tools	Results
Germany [16]	NR	333	Nutrition (freshmen and higher semesters) vs. other majors	BOT	Disinhibition and ON did not differ between nutrition students and controls. Orthorexic tendencies were lower in the more advanced nutrition students
Germany [17]	NR	446	Nutrition science vs. economics	21-item-DOS	A total of 3.3% were classified as having ON and 9.0% were at risk of developing ON. Comparison between fields of study revealed no difference in the prevalence of ON or the risk of developing ON between female nutrition and economics students
Greece [18]	2016	120	Dietetics (women only)	BOT	The majority (62.9%) were diagnosed with ON. The prevalence did not differ among age groups or different years of study. Students with ON reported lower mean energy intake per kg of body weight and had more chances of being normal weight
Italy [15]	2012	440	Dietetics, exercise and sport sciences and biology	ORTHO-15	The prevalence of orthorexia was high in all schools (35.9, 22.5, and 26.5% in dietetics, biology, and exercise and sport science schools, respectively)
Poland [19]	NR	327	Human and nutrition sciences	ORTHO-15	A total of 68.6% women and 43.2% men were diagnosed with ON
Sweden [20]	NR	188	Exercise science vs. business	ORTHO-15	Of 188 students, 76.6% had an ORTHO-15 score indicating ON, with a higher proportion among exercise science students compared to business (84.5 vs. 65.4%)
Turkey [21]	NR	318	Medical school	ORTHO-15	A total of 45.5% of the residence MDs scored below 40 in the ORTHO-15 test
Turkey [22]	NR	878	Medical school	ORTHO-11	The rates of the ORTHO-11 scores between 0 and 15 were 1.9%, between 16 and 30, 57.5%, and ≥ 31, 21.1%. There were 17 students with a score between 0 and 15
USA [23]	NR	448	NR	BOT	The average BOT score was 4.71, near the "health fanatic" range, with Hispanic/Latino subjects and overweight/obese students having significantly higher median BOT scores. Gender, age, and college major were not associated with BOT score
USA [23]	NR	31	Dietetics	NR	ON prevalence was lower among long-term students, compared to more recent ones

BOT Bratman Orthorexia Test [14], *EAT-40* eating attitudes test [24], *MD* medical doctor, *NR* not reported, *ON* orthorexia nervosa, *ORTHO-15* orthorexia nervosa 15 questionnaire [25, 26] *21-item-DOS* Dusseldorf Orthorexia Scale [17]

to the dietary intake are still limited. This is why, the present cross-sectional study was designed, aiming to assess the prevalence of food obsession, orthorexia, and food-related stress, in comparison to the dietary intake of nutrition and dietetics students. In addition, we aimed in delineating possible inter-relations between orthorexia and food addiction in the aforementioned sample.

Methods

A total of 215 undergraduate students of the Department of Nutrition & Dietetics, in Thessaloniki, Greece, aged between 18 and 40 years, agreed to participate in the study. It should be noted that, in Greece, a joint undergraduate degree of Nutrition and Dietetics is offered by all relevant Departments. For 35 students, collected data were incomplete and participants were excluded from the sample, four subjects exceeded 30 years of age and were also excluded, leaving 176 students for the final analyses (mean age 21.7 ± 1.9; 36 men and 140 women). The present cross-sectional study took place during April–June 2016. An anonymous questionnaire was provided to students during morning lectures and anthropometric measurements were performed by three experienced researchers. After completing the questionnaire, one by one, the students were transferred to a small room next to the lab, for the anthropometric measurements. Each student was carrying his/her questionnaire and handled it to one of the three examiners. The anthropometric measurements performed were recorded on the questionnaire sheets by the examiners, who consisted of personnel belonging to different institutes and departments, to minimize participant identification. In addition, each student was provided with a random number, corresponding to his/her questionnaire that provided access to the online completion of food diaries.

Eligibility criteria included being undergraduate students at the Department of Nutrition & Dietetics, and willing to participate in the study. All students who had been diagnosed with a typical eating/psychological disorder and visiting students from the EU were asked to abstain from participating in the study. In addition, students aged above 30 years were excluded from the analyses to ensure sample homogeneity and representability. All data were handled according to the Helsinki Declaration and permission for the study was granted by the Aristotle University's Bioethics Committee. Informed consent was obtained from all individual participants included in the study. No funding was secured for the present project.

Tools

The Eating and Appraisal Due to Emotion and Stress questionnaire (EADES) [8] was used to evaluate overeating associated with stress and emotions. The questionnaire consists of 49 questions, measuring three main factors, being (1) Emotion-and-Stress-Related Eating, (2) Appraisal of Ability and Resources to Cope with Emotions and Stress, and (3) Appraisal of Outside Stressors/Influences. Negatively toned questions were inverse, so that a higher score indicates an improved ability to cope with stress [8].

The Bratman Orthorexia test (BOT) [14] was used to evaluate ON. It consists of a short, ten-question tool, with yes/no answers. Four positive answers were considered indicative of orthorexia.

The modified Yale Food Addiction (mYFAS) questionnaire [31] was applied to assess food addiction and its symptoms. It consists of nine items, seven assessing one of the seven symptoms of substance dependence according to the DSM-IV criteria (control, attempts, time, activities, problems, tolerance, withdraw, and impairment) and two domains evaluating the presence of a clinically significant impairment or distress [32].

Dietary intake

Participants completed a 3-day food diary online, after receiving a random identification number corresponding to their questionnaire. Collected data were analyzed with the Food Processor (ESHA, Portland, Oregon) software for dietary analysis. Nutrient intake was adjusted for the energy consumption, with the use of the residual method [33].

Anthropometry

Weight was recorded in morning hours, to the nearest 0.1 kg (SECA 874 portable scales), along with stature (SECA 214 portable stadiometer). Body mass index (BMI) was computed as body weight divided by the height squared (kg/m^2). Weight status was determined in accordance to the World Health Organization BMI cutoffs [34]. Waist circumference was measured with a common non-stretchable measuring tape in a horizontal plane, midway between the inferior margin of the ribs and the top of the iliac crest, hips' perimeter was measured at the widest portion of the buttocks, all with the subject standing and at the end of a gentle expiration, according to the WHO guidelines [35].

Statistical analyses

Predictive Analytics Software (PASW) (IBM SPSS, Hong Kong, Hong Kong) was used for data analyses. All data were assessed for normality in distribution. Chi-square and independent samples *t* tests were performed between sexes, between orthorexic and non-orthorexic students, as well as between food-addicted and non-food-addicted participants.

Spearman's coefficient assessed correlations between age and food-related psychological scales.

Multiple linear regression analysis was employed to evaluate the relationship between energy intake, BMI, or waist circumference (dependent variables) with the total BOT, mYFAS, and EADES scores and subscales (independent variables) and was adjusted for sex and age (continuous). In the aforementioned linear regression, dependent variables were logarithmic transformed to improve normality of the residuals and meet the assumption of homoscedasticity.

Reliability of the questionnaires was assessed with either the Cronbach's alpha coefficient for ordered scales and or the Kuder–Richardson formula 20 (KR-20) for dichotomous scales. The KR-20 [36], a measure of internal consistency reliability for measures with dichotomous choices, was applied for the BOT and mYFAS questionnaires, and the Cronbach alpha [37] was applied on the EADES test.

Results

Table 2 presents the summary results of the mYFAS, EADES, and BOT questionnaires. Overall 4.5% of the students had food addiction and 68.2% had orthorexia, with either prevalence being indifferent between sexes. No differences were observed between men and women, concerning, the prevalence of food addiction and orthorexia, the sum of mYFAS symptoms, or the individual EADES factors. The KR-20 coefficient for internal consistency for BOT and mYFAS was 0.600 and 0.603, respectively. The Cronbach's alpha coefficient for the total EADES scale was 0.901 and 0.894 for the Emotion-and-Stress-Related Eating subscale, 0.826 for the Appraisal of Ability and Resources to Cope with Emotions and Stress subscale, and 0.557 for the Appraisal of Outside Stressors/Influences subscale.

Between orthorexic and non-orthorexic students (Table 3), the first demonstrated, on average, increased BMI ($P_{\text{Mann–WhitneyU}} = 0.026$), and decreased energy and saturated fatty acid (SFA) intake ($P_{\text{t–test}} = 0.043$ and 0.049, respectively). When the analyses were repeated for each sex separately, orthorexic men consumed significantly more vegetables (241 vs. 144 g) compared to the non-orthorexic ones ($P_{\text{Mann–WhitneyU}} = 0.033$), without any observed differences in their BMI (24.7 vs. 25.2 kg/m^2, $P_{\text{Mann–WhitneyU}} = 0.377$) or waist perimeter (87.9 vs. 91.3 cm, $P_{\text{Mann–WhitneyU}} = 0.263$). On the other hand, orthorexic women exhibited increased BMI (21.7 kg/m^2 vs. 20.3 kg/m^2, $P_{\text{Mann–WhitneyU}} < 0.001$) and waist circumference (72.4 cm vs. 69.3 cm, $P_{\text{Mann–WhitneyU}} = 0.024$) compared to the non-orthorexic women. In the total sample, multiple regression analysis adjusted for gender and age revealed an association among total BOT score and logarithmically transformed BMI ($\beta = 0.016$, 95%CI = 0.007 to 0.025, $P < 0.001$), logarithmically transformed waist circumference ($\beta = 0.009$, 95%CI = 0.001 to 0.018, $P = 0.038$), and logarithmically transformed energy intake ($\beta = -0.042$, 95%CI = −0.069 to −0.015, $P = 0.002$).

Between food-addicted and non-food-addicted students (Table 4), the first exhibited significantly more emotion-and-stress-related eating ($P_{\text{Mann–WhitneyU}} = 0.010$) as defined by the EADES questionnaire. No differences were observed in the BMI, age, or dietary intake between food-addicted and non-food-addicted students. In the total sample, multiple linear logistic regression failed to reveal any significant relationships between the total mYFAS score and BMI ($\beta = 0.004$, 95%CI = −0.014 to 0.022, $P = 0.675$), waist circumference ($\beta = 0.005$, 95%CI = −0.011 to 0.022, $P = 0.522$), or energy intake ($\beta = 0.001$, 95%CI = −0.052 to 0.054, $P = 0.974$).

Multiple linear regression analysis adjusted for sex and age showed that emotion-and-stress-related eating

Table 2 Results the three tests between male and female students (mean ± SD, or n, %)

	Total ($N = 176$)	Male ($n = 36$)	Female ($n = 140$)	P value
mYFAS				
Sum of *mYFAS* symptoms	1.4 ± 1.0	1.7 ± 1.1	1.3 ± 1.0	0.085[a]
Food addiction	8 (4.5%)	2 (5.6%)	6 (4.3%)	0.667[b]
EADES questionnaire				
Emotion-and-stress-related eating	67.6 ± 11.7	68.8 ± 13.3	67.3 ± 11.2	0.779[a]
Appraisal of ability/resources to cope with emotions and stress	66.6 ± 7.9	65.6 ± 9.0	68.8 ± 7.6	0.313[a]
Appraisal of outside stressors/influences	11.1 ± 2.4	11.4 ± 2.5	11.0 ± 2.4	0.180[a]
BOT				
Sum of questions	4.6 ± 1.9	4.4 ± 2.2	4.6 ± 1.8	0.579[a]
Presence of orthorexia	120 (68.2%)	22 (61.1%)	98 (70.0%)	0.307[c]

BOT Bratman Orthorexia Test [14], *EADES* Eating and Appraisal Due to Emotion and Stress [8], *mYFAS* modified Yale Food Addiction scale [31], *SD* standard deviation

[a]Mann–Whitney *U* test; [b] Fisher's exact test; [c]Chi-square test

Table 3 Differences in the dietary intake, food addiction, and food-related stress among orthorexic and non-orthorexic students (mean ± SD)

	Non-orthorexic ($n=56$)	Orthorexic ($n=120$)	P value
Age (years)	21.8 ± 2.2	21.7 ± 1.8	0.947[b]
BMI (kg/m^2)	21.5 ± 3.5	22.3 ± 2.9	0.026*[b]
EADES			
Emotion-and-stress-related eating	69.3 ± 10.8	66.8 ± 12.0	0.207[c]
Appraisal of ability/resources to cope with emotions and stress	66.8 ± 6.6	66.4 ± 8.4	0.859[b]
Appraisal of outside stressors/influences	11.3 ± 2.3	11.0 ± 2.5	0.179[b]
Sum of food addiction symptoms (mYFAS)	1.5 ± 1.0	1.4 ± 1.0	0.387[b]
Dietary intake			
Energy intake (EI) (kcal/kg)	28.6 ± 10.6	25.5 ± 8.6	0.043*[c]
Protein (g)	63.7 ± 16.8	66.8 ± 18.9	0.309[c]
Carbohydrate (g)	219.1 ± 184.9	195.3 ± 44.3	0.919[b]
Fat (g)	70.8 ± 15.3	69.7 ± 17.2	0.698[c]
Trans fats (g)	2.1 ± 3.0	2.2 ± 4.4	0.553[a]
SFA (g)	24.6 ± 8.2	22.1 ± 7.7	0.049*[c]
MUFA (g)	28.1 ± 11.0	29.5 ± 12.4	0.611[b]
PUFA (g)	8.7 ± 3.5	9.2 ± 3.2	0.369[b]
Fiber (g)	25.6 ± 71.6	16.7 ± 8.0	0.917[b]
Na (mg)	2339.9 ± 1198.2	2260.4 ± 1094.6	0.629[b]

BMI Body Mass Index, *EADES* Eating and Appraisal Due to Emotion and Stress [8]; *EI* Energy Intake, *mYFAS* Modified Yale Food Addiction Scale [31], *MUFA* Mono-unsaturated Fatty Acids, *NS* not significant, *PUFA* poly-unsaturated fatty acids, *SD* standard deviation, *SFA* saturated fatty acids

* Significant differences

[a]Energy-adjusted nutrient intakes

[b]Mann–Whitney *U* test

[c]Independent samples *t* test

was associated with logarithmically transformed BMI ($\beta=-0.002$, 95%CI = −0.004 to −0.001, $P=0.004$), but not with logarithmically transformed waist circumference ($\beta=-0.001$, 95%CI = 0.002 to 0.001, $P=0.454$) or energy intake ($\beta=0.004$, 95%CI = −0.0003 to 0.009, $P=0.068$). Furthermore, appraisal of ability and resources to cope with emotions and stress was associated with the energy intake ($\beta=0.009$, 95%CI = 0.003 to 0.016, $P=0.005$) and BMI ($\beta=-0.003$, 95%CI = −0.005 to −0.001, $P=0.004$), both logarithmically transformed. In addition, appraisal of outside stressors/influences was not associated with any dietary or anthropometric measure (logarithmically transformed BMI, $\beta=-0.004$, 95%CI = −0.011 to 0.004, $P=0.320$), (waist circumference, $\beta=-0.001$, 95%CI = −0.006 to 0.008, $P=0.856$) (energy intake, $\beta=0.001$, 95%CI = −0.021 to 0.023, $P=0.934$). Finally, age was positively correlated with the appraisal of outside stressors/influences (Spearman's $\rho=0.237$, $P=0.002$), indicating that older students were more able to cope with outside stressors, and no further significant correlations were observed concerning the remaining psychological scales.

Discussion

Our study indicates that a great number of dietetics students in the present sample were prone to orthorexia and a small percentage demonstrated food addiction. Orthorexic students demonstrated increased BMI and reduced energy and SFA intake. On the other hand, food-addicted students were more sensitive to emotional- and stress-related eating.

Dietetics students carry the multifactorial burden of learning nutrition and health information, conforming to the healthy ideals and providing a role model [7]. This struggle is probably propelling the high prevalence of orthorexia observed in the majority of participants herein. In our sample, orthorexic students were «adhering» to the healthy eating guidelines by consuming less energy and SFA, while in their majority, they were of normal body weight. As Ozenoglu and associates [13] have noted, students' training on Nutrition and Dietetics often has obsessions related to body image, often leading to restricted eating, as a result of professional stressors. In the sample herein, men with orthorexia consumed significantly more

Table 4 Differences in the dietary intake[a] and stress-related eating between food-addicted and food addiction-free students (mean ± SD)

	Food addiction-free ($n=168$)	Food-addicted ($n=8$)	*P* value
Age (years)	21.8 ± 2.0	21.1 ± 0.6	0.284
BMI (kg/m^2)	22.0 ± 3.2	22.3 ± 2.3	0.484
EADES			
Emotion-and-stress-related eating	68.1 ± 11.5	58.3 ± 12.3	0.010*[b]
Appraisal of ability/resources to cope with emotions and stress	66.8 ± 7.5	61.8 ± 12.8	0.089
Appraisal of outside stressors/influences	11.1 ± 2.5	10.6 ± 1.7	0.426
Sum of food addiction symptoms (*mYFAS*)	1.3 ± 0.9	3.4 ± 0.7	< 0.001*
Dietary intake			
Energy intake (EI) (kcal/kg)	26.7 ± 9.5	22.8 ± 5.7	0.284
Protein (g)	65.4 ± 18.1	75.2 ± 20.2	0.196
Carbohydrate (g)	202.7 ± 112.3	205.5 ± 62.7	0.765
Fat (g)	70.3 ± 16.5	63.9 ± 17.5	0.268
Trans fats (g)	2.2 ± 4.0	2.2 ± 3.0	0.910
SFA (g)	22.8 ± 7.8	24.2 ± 10.2	0.926
MUFA (g)	29.4 ± 12.1	23.0 ± 5.9	0.117
PUFA (g)	9.1 ± 3.3	8.5 ± 3.9	0.418
Fiber (g)	19.8 ± 41.8	14.3 ± 8.0	0.233
Na (mg)	2260.3 ± 1126.5	2819.0 ± 1032.6	0.115

BMI Body Mass Index, *EADES* Eating and Appraisal Due to Emotion and Stress [8]; *EI* energy intake, *mYFAS* Modified Yale Food Addiction Scale [31], *MUFA* mono-unsaturated fatty acids, *NS* not significant, *PUFA* poly-unsaturated fatty acids, *SFA* saturated fatty acids

*Significant differences

[a]Energy-adjusted nutrient intakes

[b]Mann–Whitney *U* test

vegetables and orthorexic women exhibited increased BMI and waist circumference compared to the non-orthorexic ones. The association between increased ON indicators and BMI has previously been reported by Bundros and colleagues [23] among college students.

Compared to the general public [38], nutrition and dietetics students tend to exhibit an increased prevalence of orthorexia. In comparison to other studies on Nutrition and Health Sciences students (Table 1), the sample herein demonstrated an increased prevalence. It has been suggested that frequent exposure to food and nutrition information could contribute to the development of EDs or OFSED [12], explaining the increased prevalence among Dietetics students and professional. In addition, increased energy restrictive tendencies have been previously reported among nutrition students [16, 39], with the trend being reduced among those closer to graduation. According to Barthels and associates [40], increased dietary change score is associated with increased prevalence of orthorexia, and thus, it is highly likely that the knowledge attained during their studies altered the diet of Dietetics students in a degree similar to orthorexia. It should be noted, however, that although the BOT has also been applied in several studies, as observed in Table 1, we could not determine its diagnostic accuracy. However, given that our sample consisted of students familiarized with the other tools used for ON diagnosis, including the ORTHO tests [25], we opted for the use of the BOT.

A small percentage of Dietetics students (4.5%) demonstrated food addiction, which was associated with elevated emotion-and-stress-related eating. In a recent U.S. survey, 10.3% of college students were identified as "food dependent" according to the YFAS [41], without any differences observed between Nutrition and other majors. In addition, the co-occurrence of food addiction and EDs has been well established in the literature [41], and the need for the inclusion of food addiction into the disordered eating spectrum has been suggested [42]. In our sample, food-addicted students exhibited significantly more emotion-and-stress-related eating. In addition, emotion-and-stress-related eating was negatively associated with BMI. Furthermore, appraisal of ability and resources to cope with emotions and stress was associated with both the energy intake and BMI of students. Finally, age was positively correlated to appraisal of outside stressors/influences, indicating that, as expected, older students were capable of coping with outside stressors.

According to Hughes and Desbrow [43], 1/3 of dietetics students were motivated to select the field triggered by personal experiences. Whatever the driving force behind major

selection, we cannot assess the exact extend to which these OFSEDs are continued during professional practice. As Houston and associates have noted [44], in the USA, according to the professional code of ethics, dietitians should withdraw from professional practice when an emotional/mental disability affects his/her practice in a manner that could possibly harm clients [45]. This is why, screening is required for the identification of disordered eating behaviors during the course of studies, in order for a more proactive approach to be implemented [46]. After all, according to a recent study among British Dietetic Association members, improving the public profile and perception of the profession consists of a priority among dietitians [47]. However, to this date, despite the unanimous suggestions and the available data delineating the problem, we lack data concerning counseling interventions aiming at students with increased stress-related eating behaviors and OFSED. This problem is augmented outside the U.S., where screening has only been performed occasionally, in very few countries, whereas in Greece, lack of screening is evident in all faculties and departments, despite the recorded prevalence during adolescence [48]. Proactive screening on university admission and annual screening thereafter could identify the high-risk students who could benefit from attending team therapeutic sessions with open discussions about EDs and food struggles.

According to the KR-20, the BOT and the mYFAS tests demonstrated moderate reliability [49], whereas the EADES questionnaire exhibited an increased reliability in the total and subscale measures, with the exception of the Appraisal of Outside Stressors/Influences subscale, which revealed a moderate consistency [50]. In the study herein, the reliability coefficient for the BOT test was in agreement with a previous study on college students [23]. We opted to refer to the reliability coefficient as the KR-20, as this denomination is more appropriate when running a reliability analysis on dichotomous scales. It should be noted that the statistical software used herein calculates an alpha coefficient which is called KR-20 for dichotomous and Cronbach for ordinal scales [32]. Furthermore, the KR-20 coefficient of the mYFAS scale was found to be moderate, lower to that reported in a cohort of 353 undergraduate students and among 2061 participants from the Nurses' Health Study II [31]. Finally, Cronbach's coefficient for the total EADES scale was high, akin to the EADES development and validation analysis [8], as well as to a recent study on Mexican university students with analogous age distribution [51].

Limitations of the present study include its cross-sectional nature and the relatively small but homogenous sample, recruited from one Department of Nutrition and Dietetics only. In addition, the number of male participants was small, although indicative of the typical student population among these departments compared to other studies [27, 52]. Our sample was not stratified, thus, despite the similarities to akin research from other countries, caution should be taken when extrapolating the findings herein. An additional limitation lies in the use of the BOT. Although the BOT has been repeatedly used is similar research as detailed in Table 1, it has recently been suggested as a tool of limited clinical utility [53]. In addition, confirmatory factor analyses of the ORTHO tests revealed the need for new and valid measures of ON [54].

Advantages of the research herein stem from the innovative design combining dietary intake data with the assessment of orthorexia and food addiction. This was the first study to assess the prevalence of OFSEDs among Nutrition and Dietetics students in Greece, and among the very few conducted worldwide. In the future, a prospective study, using a follow-up sample from dietetics professionals would shed more light to the exact prevalence of OFSEDs after graduation and delineate the extend of the problem.

Conclusions

This study provides a better understanding of the level of disordered eating among nutrition and dietetics students. In addition, despite the available scientific data and the proposed interventions, the present study shows that the problem still exists. With disordered eating being an inherent struggle with food, from student to professional [12], frequent screening and education of nutrition and dietetics students for disordered eating appears urgent.

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Compliance with ethical standards

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

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.

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

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