

Associated Factors of Unhealthy Eating Patterns among Spanish University Students by Gender

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This study has examined bio-socio-demographic and psychopathological factors probably associated with unhealthy eating patterns among university students and to estimate a multifactorial model following the associated factors by gender. Adjusted odds ratios were calculated to describe associations on basis of Eating Disorder Inventory (EDI) stratified by gender in a representative sample of Spanish university students ($n = 2551$). The high EDI scorers for both sexes presented higher prevalence of dieting, body dissatisfaction, levels of psychopathology and lower self-esteem than the low EDI scorers. The results suggest that older students and higher self-esteem scores present lower scores in the EDI. In the female population, depression, paranoid dimension, dieting and body dissatisfaction were associated with population with unhealthy eating patterns. In the male sample, dieting, body dissatisfaction and interpersonal sensibility were also associated with unhealthy eating patterns. The results corroborate that abnormal eating patterns tend to affect specific vulnerable groups. We do not know the precise mechanisms through which these risk behaviors and attitudes, such as dieting or body dissatisfaction, may facilitate the later development of an eating disorder.

Keywords: unhealthy eating patterns, eating disorders, dieting, psychopathological symptoms, university students, gender.

Este estudio ha examinado los factores bio-socio-demográficos y psicopatológicos asociados a patrones alimentarios no saludables entre los universitarios y ha estimado un modelo multifactorial siguiendo los factores asociados según género. Los odds ratios ajustados mediante regresión logística fueron calculados para describir las asociaciones en base al Inventario de Trastornos del Comportamiento Alimentario (EDI) estratificado por género en una muestra representativa de universitarios españoles ($n = 2551$). El grupo que puntúa alto en el EDI presenta mayor prevalencia de conductas de dieta, insatisfacción corporal, mayores niveles de psicopatología y una menor autoestima en ambos sexos. Los resultados sugieren que estudiantes de mayor edad y puntuaciones elevadas en autoestima presentan bajas puntuaciones en el EDI. En las mujeres, la depresión, la dimensión paranoica, la dieta y la insatisfacción corporal fueron asociadas a la población con patrones alimentarios no saludables. En los varones, la dieta, la insatisfacción corporal y la sensibilidad interpersonal fueron asociadas con mayor riesgo de presentar patrones alimentarios no saludables. Los resultados corroboran que los hábitos alimentarios desestructurados tienden a afectar a grupos vulnerables específicos. Se desconoce los mecanismos precisos por el cual conductas y actitudes de riesgo, tales como la dieta o la insatisfacción corporal, puedan facilitar el desarrollo posterior de un trastorno alimentario.

Palabras clave: patrones alimentarios no saludable, trastornos del comportamiento alimentario, conductas de dieta, síntomas psicopatológicos, estudiantes universitarios, género.

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Accumulating evidence suggests that body image dissatisfaction, dieting and unhealthy weight loss practices are often present amongst female college students and have adverse consequences for both health and well-being (Cash, Ancis, & Strachan, 1997; Dobmeyer & Stein, 2003a; Engstrom & Norring, 2002; Fredenberg, Berglund, & Dieken, 1996; Futch, Wingard, & Felice, 1988; Lock, Reisel, & Steiner, 2001; Machado et al., 2004; Striegel-Moore & Cachelin, 2001; Yannakoulia et al., 2004; Lowry, Galuska, Fulton, Wechsler, & Kann, 2002; Nelson, Hughes, Katz, & Searight, 1999). In addition, disordered eating patterns also appear to be an increasingly common issue for college males, who display disturbed eating behaviors that do not meet clinical criteria for eating disorders (Carlat & Camargo, 1991; Woodside et al., 2001; Neumark-Sztainer et al., 2006; King, 1989; Lewinsohn, Striegel-Moore, & Seeley, 2000; Whitaker et al., 1990). Furthermore, the study by Favaro et al., (2003) stands out due to the use of a large representative sample of females from the general population between 18 and 25 years of age (including university students) which was assessed by clinical interviews. This study found a prevalence rate of 5.3% of full-syndrome cases and a lifetime prevalence of 11%. Only six women (14%) had been referred for psychological or psychiatric treatment.

The study carried out by Lowry et al., (2002) in an American high-school sample of 15,349 students found that, overall 62% of the females and 41% of the males combined exercise with a reduced-fat and low-calorie diet. This study also reported that 32% of the females and 17% of the males used unhealthy weight control methods such as fasting, vomiting or the use of laxatives. Likewise, studies that have reported similar practices, along with diagnosable disordered eating patterns, are also found among Spanish university students (Lameiras, Calado, Rodriguez, & Fernandez, 2002; Raich, Deus, Munoz, Perez, & Requena, 1991; Sepulveda, Carrobbles, & Gandarillas, 2008; Toro, Castro, Garcia, Perez, & Cuesta, 1989; Sepúlveda, Carrobbles, & Gandarillas, 2002). However, the accuracy of the prevalence of full-syndrome cases among college students could not be estimated due to the lack of clinical interviews in their assessments (Fairburn & Beglin, 1990).

A number of potential risk factors for eating disorders have been examined in cross-sectional and prospective studies; these include gender, ethnicity, early childhood eating and weight, body mass index (BMI), elevated weight and shape concerns, negative self-evaluation, sexual abuse as well as other adverse personal experiences and general psychiatric morbidity (Cervera et al., 2003; Dobmeyer & Stein, 2003b; Leon, Fulkerson, Perry, Keel, & Klump, 1999; Jacobi, Hayward, de, Kraemer, & Agras, 2004; Striegel-Moore et al., 2001; Ghaderi & Scott, 2001; Micali et al., 2007). The majority of the findings suggest

that perceived pressure to be thin, body dissatisfaction and dieting are major risk factors in the development of eating disorders in adolescents (Fairburn, Cooper, Doll, & Davies, 2005; Killen et al., 1996; Stice, 1998; Stice, Agras, & Hammer, 1999; The McKnight Investigators, 2003). Likewise, these findings are also supported in a meta-analytic review carried out by Stice (2002). Nevertheless, the precise mechanisms through which risk behaviors and attitudes, such as dieting or body dissatisfaction, may facilitate the later development of an eating disorder require further investigation (Stice, 1994; Striegel-Moore et al., 2001). On the other hand, recent retrospective studies suggest that dysfunctional individual and family eating patterns in childhood and early adolescence that may lead to the development of a subsequent ED (Krug et al., 2009; Micali et al., 2007).

According to a prospective study, Neumark-Sztainer et al., (2006) have found that adolescents who had used unhealthy weight-control behaviors were still at increased risk for binge eating and extreme weight-control behaviors, such as self-induced vomiting and the use of laxatives, up to 5 years later, compared with adolescents who had not used weight-control behaviors. Another study by Ghaderi and Scott (2001) reported significantly lower self-esteem and perceived social support as well as higher body concern at the onset of the study in groups that presented ED symptoms compared to a healthy group two years later. Furthermore, unhealthy eating practices are associated with other health-compromising behaviors, such as suicide attempts, smoking, alcohol abuse, and marijuana use (Neumark-Sztainer, Story, & French, 1996). Neurotic personality profile has also been significantly associated with the later development of anorexia nervosa (Bulik et al., 2006; Cervera et al., 2003).

Nevertheless, although there are important shortcomings and discrepancy in the literature regarding the methodology and instruments of assessing the potential risk of developing an eating disorder (Lameiras et al., 2002; Machado, Goncalves, Martins, & Soares, 2001; Machado et al., 2004; Morande, Celada, & Casas, 1999; Anstine & Grinenko, 2000; Garner, Olmsted, & Polivy, 1983; Garner & Garfinkel, 1979), these survey studies can provide valuable information of the different severity degree of disordered eating as well as data of the number of college students who report engaging in unhealthy eating patterns and attitudes. This extensive research on unhealthy eating patterns suggests that there are multiple and complex paths to the development of eating disorders.

The aims of our study were the following: (a) to examine bio-socio-demographic and psychopathological variables by gender comparing high and low EDI scorers (b) to identify socio-demographic, psychopathological, family and lifestyle characteristics associated with

unhealthy eating patterns in a college population by gender, and (c) to explore a multifactorial model by gender including factors associated with a population that presents unhealthy eating patterns.

Method

Subjects and procedure

A college-based cross-sectional study using questionnaires was carried out in the first and fourth academic years of different university schools at the Autonomous University of Madrid in the academic year of 2000/01. These academic years were chosen as they would allow to compare possible unhealthy eating behaviors and attitudes between the first and last academic years of a graduate course. Thirteen schools with the highest number of students enrolled for that academic year were selected from 21 schools on the campus (Psychology, Medicine, Law, Economics, Business, Chemistry Sciences, Biology Sciences, Computer Sciences, Teaching, History, English Studies, Hispanic Studies and Philosophy). The sample design was proportionally stratified according to academic year and school, assuming a 95% confidence interval. Of the total of 10,150 potential students enrolled in the first and fourth academic year, 4,682 students were targeted to reach the ideal sample size. Finally, 2,551 students participated in the epidemiology study corresponding to 54.5% of response rate (absenteeism and the teacher's non-presence during the data collection were the main reasons).

Measures

All the participants completed the questionnaires battery in the following order of administration:

1. *Demographic Questionnaire*: This questionnaire collected demographic variables (age, weight and height self-reported, marital status, parental education, employment status, cohabitation, psychiatric and/or psychological history) and information on health habits (weight control compensatory strategies as dieting to lose weight, vomiting or use of laxatives, regularity of the menstrual cycle, time invested in exercise and/or sport, alcohol and/or cigarette consumption). Body mass index ($BMI = \text{weight (kg)} / \text{height (m)}^2$) was calculated based on self reported height and weight.
2. *Eating Behavior and Attitudes*: The Eating Disorder Inventory (EDI-2) (Garner, 1991) consists of 91 items rated on a six-point scale (from 1 (never) to 6 (always)) that are divided into 11 subscales. It was designed for the assessment of attitudinal and behavioral dimensions relevant to anorexia and bulimia nervosa. Scale scores are the sum of all items for each subscale. The first 64 original items are grouped into 8 scales. Additionally, 27 items were later added to form 3 more scales. This questionnaire has good internal consistency, between .84 and .92 for each scale. The version employed for this study was the Spanish version by Garner for clinical sample (Garner, 1998) which also has good psychometric properties. However, despite the fact that the global score of the EDI has not been regularly used due to the lack of a standardized cut-off score, we decided to use the cut-off point provided by a previous study by Gandarillas et al., (2003) based on the results from their recent study of a Spanish female adolescent sample, in which these authors validated the EDI questionnaire using a similar cut-off point (adding 8 original scales) to that used in our sample which illustrated high sensitivity and specificity (86% and 74.6%, respectively). Alpha coefficients were .92 for the total scale and oscillate between .63 and .88 by subscales. Higher scores indicate higher disordered eating attitudes and behaviors. For the current study, students who scored 40 or higher on the EDI total score, adding the original eight scales, were defined as a population with unhealthy eating patterns (high EDI scorers). Likewise, students who scored under 40 on the EDI were considered as low EDI scorers.
3. *Body Image*: The Body Shape Questionnaire (BSQ) (Cooper, Taylor, Cooper, & Fairburn, 1987) consists of a 34 item scale with scores between 1 (never) to 6 (always) for each item. It measures personal body dissatisfaction, fear of gaining weight and the desire to be thin. The Spanish version adapted by Raich et al.,(1994) was used which has an internal consistency of .97. A higher score indicates more body dissatisfaction.
4. *General Psychopathology*: The mental health of the sample was assessed using the Symptom Check List 90 Revised (SCL-90-R) (Derogatis, 1977), Spanish version by Gonzalez de Rivera and colleagues (González de Rivera & et al., 2002). It consists of 90 questions that gauge nine symptomatic dimensions of psychopathology. The Global Severity Index (GSI) indicates the level of psychological distress for each individual. The internal consistency is between .81 and .90. Higher scores indicate higher psychological distress.
5. *Self-Esteem*: Rosenberg's Self-Esteem Scale (RSE) (Rosenberg, 1979) was used to assess the level of self-esteem. The RSE consists of 10 statements regarding a person's general beliefs about oneself. Each item is measured on a four-point scale. The

RSE has high reliability ($\alpha = .93$) (Banos & Guillen, 2000). The Spanish version of the scale used for this study has good internal consistency with a coefficient alpha of .88 (Echeburúa, 1995). Lower scores indicate lower self-esteem.

Statistic analysis

Data was analysed with the program Statistical Package for Social Sciences V.10.0 (SPSS, 1999). The results were analysed using frequency distributions by gender, student's *t*-test for continuous variables and chi-squared tests and degrees of freedom for each categorical variable.

Comparisons were made between groups separately for gender using two-way analyses of variance (ANOVAs) with gender (females vs. males) and type of group (high EDI scorers vs. low EDI scorers) as independent variables. The effect size was calculated using eta squared. The dependent variables were age (as continuous variable), cohabitation (parents/siblings, friends or alone) marital status (married/divorced or separate or widowed), parental education (primary/secondary or degree), employment (yes/no), body-mass index (as continuous variable), dieting to lose weight (yes/no), weight control compensatory strategies (yes/no), hours per week dedicated to exercise (as continuous variable), psychiatric/psychological history (yes/no), alcohol and/or cigarettes consumption (yes/no), body dissatisfaction scores, self-esteem score and nine dimensions of the SCL-90-R scores (scales as continuous variables).

A univariate and multivariate logistic regression analysis was used to investigate adjusted associations between socio-demographic and psychopathological variables while providing the proportion of the sample with unhealthy eating patterns by gender. The odds ratios (OR) and confidence intervals were given. The OR is a measure of the strength of association between socio-demographic and psychopathological variables and disordered eating. An odds ratio greater than 1 occurs when the risk of unhealthy eating patterns is more common among the high EDI scorers group than among the group considered as low EDI scorers. The opposite holds when the odds ratio is less than 1 (Tabachnick & Fidell, 2001). Belonging to a high or low EDI scorer group was the dependent variable (1 = high, 0 = low). After identifying the socio-demographic and psychopathological variables that were significantly associated to the high EDI scorer group, a multivariate logistic regression model was calculated by gender and Bonferroni correction to adjust overall model probability values. All *p* values were two-tailed and statistical significance was set at $p < .05$ (Bonferroni correction when was appropriated).

Results

Data from 2551 students was collected in 13 schools; 2386 students returned valid questionnaires (93.5%), of which 31.4% ($n = 743$) were male and 67.9% ($n = 1620$) were female. The prevalence rate for unhealthy eating patterns associated with ED was 14.8% for males and 20.8% for females (Sepulveda et al., 2008) and the association was calculated based on these rates. The mean age of the first academic year was 19 ($SD = 1.6$) and the mean age of the students in the fourth academic year was 21.8 ($SD = 1.6$). Females were the majority in each group. For the whole sample, 85.6% of the students lived with both parents; 86% of the parents were married, 9% were divorced or separated and 4.6% were widowed. Based on self-reported height and weight, the mean BMI for men was 22.9 ($SD = 2.6$) and 20.6 for women ($SD = 2.4$). Likewise, for the sample, 1.3% ($n = 9$) of the males and 6% ($n = 83$) of the females reported a BMI of 17.5 or less. One percent of the total sample ($n = 27$) reported that they were receiving or had received treatment for an eating disorder.

Socio-bio-demographic variables associated with unhealthy eating patterns by gender

Gender differences of the percentages of socio-bio-demographic variables amongst the unhealthy eating patterns population are shown in Table 1. The mean age of the total students was 20 years ($SD = 2.1$). There were significant differences in the BMI between high EDI scorers and low EDI scorers by gender, however, there was no significant interaction effect between type of group and gender, ($F = 1.5, p > .22, \eta^2 = .1$). There were no differences in cohabitation, marital status, parents' education and employment between type of group by gender (see Table 1, $p > .05$). Likewise, there were no differences between type of group for hours per week dedicated to physical exercise/sport (e.g., gym, aerobic, swimming) or for cigarette consumption by gender. However, alcohol consumption associated significantly higher for the female participants with unhealthy eating patterns ($\chi^2 = 4.7, df = 1, p = .03$). Both male and female high EDI scorers presented higher frequencies when reporting having requested psychological or psychiatric assessments. These differences were statistically significant for males ($\chi^2 = 7.6, df = 1, p > .01$) and females ($\chi^2 = 32.2, df = 1, p > .05$).

Psychopathological variables associated with unhealthy eating patterns by gender

As can be observed in Table 2, the body dissatisfaction scores (BSQ) presented a statistically significant main effect for gender, ($F = 285.3, p > .01; \eta^2 = .12$) and for type of group, ($F = 619.2, p > .01; \eta^2 = .22$), as well as a

Table 1
Means and standard deviations and percentages of the socio-bio-demographic variables between type of group by gender

Scales	High EDI scorers		Low EDI scorers		χ^2 ; <i>df</i> ; <i>p</i> -value
	Males <i>N</i> = 99	Females <i>N</i> = 350	Males <i>N</i> = 620	Females <i>N</i> = 1238	
*Body mass index (BMI)	23.5 (2.9)	21.5 (2.7)	22.8 (2.5)	20.4 (2.3)	Gender = 194.3; .001 Group = 29.1; .001 Gender x Group = 1.5; .22
Cohabitation (Parents vs. †siblings/alone)	15%	14.6%	13%	15%	$\chi^2 = .25$, <i>df</i> = 1, <i>p</i> = .6 ^a $\chi^2 = .05$, <i>df</i> = 1, <i>p</i> = .8
Parent's Marital Status (Married vs. †divorced/separated)	8.5%	15.3%	12.4%	14%	$\chi^2 = 1.1$, <i>df</i> = 1, <i>p</i> = .3 ^a $\chi^2 = 4$, <i>df</i> = 1, <i>p</i> = .5
Father's education (†Primary vs. Secondary/Degree)	31.5%	35.4%	29%	31.3%	$\chi^2 = .46$, <i>df</i> = 2, <i>p</i> = .8 ^a $\chi^2 = 2.2$, <i>df</i> = 2, <i>p</i> = .3
Mother's education (†Primary vs. Secondary/Degree)	57.4%	57%	64.4%	62%	$\chi^2 = 1.8$, <i>df</i> = 1, <i>p</i> = .2 ^a $\chi^2 = 2.2$, <i>df</i> = 1, <i>p</i> = .13
Employment Status (†yes/no)	20.6%	27.3%	24%	22.7%	$\chi^2 = .5$, <i>df</i> = 1, <i>p</i> = .5 ^a $\chi^2 = 3.2$, <i>df</i> = 1, <i>p</i> = .07
Dieting to lose weight (†yes/no)	22.4%	38%	7%	13%	$\chi^2 = 24.1$, <i>df</i> = 1, <i>p</i> = .001^a $\chi^2 = 108.1$, <i>df</i> = 1, <i>p</i> = .001
*Average of hours invested in exercise/sport	4.0 (4.5)	2.1 (4.7)	3.9 (4.5)	1.7 (3.1)	Gender = 74; .001 Group = .8; .3 Gender x Group = 15; .7
Alcohol consumption (†yes/no)	23.5%	9%	21%	5.7%	$\chi^2 = .27$, <i>df</i> = 1, <i>p</i> = .6 ^a $\chi^2 = 4.7$, <i>df</i> = 1, <i>p</i> = .03
Cigarette consumption (†yes/no)	28.6%	35.6%	21%	33.7%	$\chi^2 = 2.8$, <i>df</i> = 1, <i>p</i> = .09 ^a $\chi^2 = .45$, <i>df</i> = 1, <i>p</i> = .5
Psychiatric/psychol services (†yes/no)	18.4%	21.6%	9%	10%	$\chi^2 = 7.6$, <i>df</i> = 1, <i>p</i> = .006^a $\chi^2 = 32.2$, <i>df</i> = 1, <i>p</i> = .001

Note. Values are expressed as percentages (means and standard deviations in parentheses).

^a differences between high and low EDI scorers on males using chi-square analysis for categorical variables

* two-way ANOVA analysis has been performed for continuous variables, F and p values are given

† risk category as reference

χ^2 = chi-squared value; *df* = degrees of freedom. NS (not significant) > .05; Bold format means that *p* < .05

significant interaction effect between gender and type of group, ($F = 33.5$, $p > .01$; $\eta^2 = .01$). However, the effect size was small for this comparison.

Both male and female, self-esteem scores proved to be a significant main effect for gender, ($F = 5.3$, $p > .05$, $\eta^2 = .01$) and for type of group, ($F = 336.9$, $p > .01$; $\eta^2 = .14$). However, there was no significant interaction between gender and type of group, ($F = 3.5$, $p = .06$; $\eta^2 = .01$).

When a two-way ANOVA was used to explore the impact of gender and type of group on levels of psychopathology distress (GSI; mean score of the nine scales), significant differences were found for interaction between gender and type of group for anxiety, hostility, paranoid ideation and psychoticism dimensions as shown Table 2 ($p < .05$). In addition, the level of psychological distress (GSI) only type of group proved to be a significant main effect, ($F = 393.2$, $p > .01$, $\eta^2 = .17$). However, the effect size was small for this comparison.

Factors associated with populations with unhealthy eating patterns

Table 3 presents the OR and the confidence intervals (95% CI) of the physical, family, social and lifestyle variables related to the high EDI scorers. A univariate logistic regression was performed by variable, controlling for gender. Students with high EDI scorers displayed statistically higher values. Results for female high EDI scorers showed higher statistical OR regarding age, size, weight and BMI compared with the rest of the females. However, the age of the participant did not appear to be associated with male high EDI scorers. Age is an associated factor for women, given that older women have a 1.1 times lower likelihood of risk of engaging in unhealthy eating patterns than younger women.

High EDI scorer women presented a higher prevalence of engaging in exercise and sports and dieting compared with low EDI scorer women. Overall, males presented a higher prevalence of physical exercise, alcohol consumption and smoking than their female counterparts. Regarding psychological factors or the use of psychiatric services, men in the high EDI scorer group were 2.2 times more likely to engage in unhealthy eating patterns while women in this group were 2.4 times more likely to engage in these eating risk behaviors.

High scores on the psychopathological dimensions, body dissatisfaction and self-esteem measures were significantly associated with unhealthy eating patterns in college students. Male students who scored high on the GSI were 11.9 times more likely to engage in unhealthy eating patterns, illustrating the seriousness of the pathology in relation to the rest of the sample. High female EDI scorers were 9.4 times higher on this index than their low EDI scorer female counterparts.

Model of associated factors for populations with unhealthy eating patterns by gender

Separate multivariate logistic regressions for female and male students were conducted to identify the biological, socio and psychological characteristics that were associated with an increased risk of unhealthy eating patterns. Table 4 describes the OR and confidence intervals (95% CI) of the variables that predict an increased risk of unhealthy eating patterns, in a model with a Bonferroni-adjusted $p = .01$. Among male students, dieting was 4.3 times more frequent amongst high EDI scorers than low EDI scorers. Self-esteem and age are associated with healthy eating patterns within the male high EDI scorers. Self-esteem on its own reduced the risk of engaging in eating risk behaviors by 10%.

Among female students, age and self-esteem were associated with less risk of engaging in unhealthy eating patterns; a higher level of self-esteem and an older age were associated with a reduced risk of developing eating risk behaviors, in addition to other variables such as dieting and body dissatisfaction. Two scales from the SCL-90-R, depression and paranoid ideation appeared in the model, however they were not significant statistically after adjusting by Bonferroni correction ($p = .01$).

Discussion

The first aim of this study was to determine the impact of gender and populations with unhealthy eating patterns in bio-socio-demographic and psychopathological aspects among college students using a cut-off point by questionnaire. The high EDI scorers for both sexes presented higher dieting rate, body dissatisfaction, levels of psychopathology and lower self-esteem than the low EDI scorers. These findings are in line with Ghaderi and Scott (2001) in which both low self-esteem and high body shape concern were found to be risk factors for a later development of ED among young adult women. Likewise, in our study similar behaviors and attitudes, including high levels of psychopathology and high dieting rates, were also observed among the high male EDI scorers which are comparable to those shown in similar studies (Carlat et al., 1991). This suggests that male college students may be affected by similar intervening factors as females, however, they rarely progress towards more severe psychopathology. This pattern of results suggests that the use of a cut-off point on the EDI can reliably differentiate unhealthy eating patterns within a sample, as well as encapsulate eating risk behaviors and negative attitudes amongst groups.

Regarding these disordered eating behaviors and attitudes that were present in both sexes, it is important to differentiate between *moderate* and *severe* dieting behaviors and identify which behaviors may implicate

Table 2

Means and standard deviations of the SCL-90-R scales, BSQ and Self-Esteem scores between groups by gender. Interaction effects by type of group and gender

Scales	High EDI scorers		Low EDI scorers		Two-way ANOVA analysis <i>F</i> ; <i>p</i> -value
	Males <i>N</i> = 99	Females <i>N</i> = 350	Males <i>N</i> = 620	Females <i>N</i> = 1238	
Body Dissatisfaction(BSQ)	78.9 (29)	105.8 (31)	48.8 (13.6)	64 (19)	Gender = 285.3; .001 Group = 619.2; .001 Gender x Group = 33.5; .001
Self-Esteem Scale	26.6 (2.5)	27.9 (5.3)	33.1 (4.8)	33.2 (4.3)	Gender = 5.3; .02 Group = 336.9; .001 Gender x Group = 3.5; .06
Somatization	.95 (.7)	1 (.7)	.50 (.46)	.58 (.47)	Gender = 5.3; .02 Group = 167.9; .001 Gender x Group = 1; .93
Obsessive-Compulsive	1.7 (.8)	1.6 (.75)	.97 (.60)	.98 (.60)	Gender = 3.5; .06 Group = 264.1; .001 Gender x Group = 3.5; .06
Interpersonal Sensitivity	1.5 (.7)	1.4 (.8)	.66 (.54)	.69 (.52)	Gender = 2.8; .09 Group = 441.7; .001 Gender x Group = 4.9; .02
Depression	1.5 (.8)	1.5 (.8)	.70 (.56)	.75 (.54)	Gender = .3; .90 Group = 364.1; .001 Gender x Group = 1.8; .20
Anxiety	1.3 (.8)	1.1 (.7)	.53 (.49)	.57 (.47)	Gender = 3.6; .05 Group = 323.9; .001 Gender x Group = 9.3; .002
Phobic Anxiety	.65 (.7)	.6 (.64)	.25 (.38)	.24 (.37)	Gender = 1.9; .15 Group = 165.2; .001 Gender x Group = .8; .36
Hostility	1.3 (.8)	1 (.8)	.62 (.59)	.51 (.51)	Gender = 23.8; .02 Group = 212.6; .001 Gender x Group = 4.7; .03
Paranoid ideation	1.5 (.8)	1.2 (.8)	.73 (.62)	.61 (.54)	Gender = 3.3; .001 Group = 31929; .001 Gender x Group = 6.6; .01
Psychoticism	1.1 (.8)	0.7 (.6)	0.40 (.43)	0.29 (.34)	Gender = 73.3; .001 Group = 380.9; .001 Gender x Group = 24.1; .001
GSI (Global Severity Index)	1.2 (.6)	1.2 (.6)	0.58 (.40)	0.59 (.39)	Gender = 1.6; 0.21 Group = 393.2; .001 Gender x Group = 3.5; .06

Note. Values are expressed as means and standard deviations are presented in parentheses
NS (not significant) > .05; Bold format means that $p < .05$

a progression towards a full ED diagnosis. According to Neumark-Sztainer et al., (2006), associations between dieting and the later onset of binge eating, extreme weight-control behaviors and eating disorders suggest that dieting may be the first step in a progression towards more severe disordered eating behaviors. Interestingly, a recent retrospective case-control study by Micali et al., (2007) showed that childhood eating problems could have an effect on the later development of bulimia nervosa but not of anorexia nervosa. These results are in line with Krug et al., (2009) who reported of a negative association between healthy eating and subsequent ED whereas several factors (i.e. control and rules about food) related to negative eating behaviors during childhood and early adolescence was positively associated to the probability of developing a later ED. Hence a retrospective component may be helpful to better understand associations between previous and current unhealthy eating patterns and subsequent ED symptoms.

The second aim was to determine which factors were most strongly associated with an increased risk of engaging in unhealthy eating patterns and explore gender differences in these relationships. The results suggest that age and self-esteem are associated with a reduction in the risk of unhealthy eating behaviors for both female and male college students. Similar findings have been found in previous studies (Cervera et al., 2003; Croll, Neumark-Sztainer, Story, & Ireland, 2002) in which body dissatisfaction and dieting were considered major risk factors in the development of an eating disorder. In our study, these factors were unusually high in males; in which, and consistent with other studies involving adolescents (Killen et al., 1996; Patton, Selzer, Coffey, Carlin, & Wolfe, 1999; Fairburn et al., 2005), the probability of engaging in unhealthy eating patterns was four times more likely in males than in females when the high EDI scorers reported using dieting behaviors.

The last aim was to estimate a model of associated factors by gender. In the female population, dieting and body dissatisfaction were more frequently present in high EDI scorers. In the male sample, dieting, body dissatisfaction and interpersonal sensibility were also associated with an increased risk of engaging in unhealthy eating patterns. This model is also similar to male clinical populations in which men are more sensitive to social criticism than men from general populations, and are therefore possibly more sensitive to social standards of thinness.

Several studies of community-based samples have reported that disordered eating is associated with depression, anxiety, compulsive-obsessive symptoms or/and illicit drug use (Lock et al., 2001; Rooney, McClelland, Crisp, & Sedgwick, 1995). Research by Neumark-Sztainer et al., (1997) found higher rates of substance abuse and suicide attempts in adolescents who

used unhealthy weight-loss methods. It therefore appears that low self-esteem, high anxiety and unhealthy eating attitudes may cluster to develop an adolescent group vulnerable to the development of a mental illness (Fisher et al., 1995).

There are strengths and limitations to be noted in this study. Amongst its strengths, this study benefited from a large sample size among university students; and the definition of a population with unhealthy eating behaviors has allowed us to analyse potential associations present within a Spanish university setting. These findings may help identify students engaging in unhealthy eating patterns and understand what factors interact in increasing the risk for disordered eating. Nevertheless, several limitations must also be noted. These include the cross-sectional nature of the study, which made it impossible to infer causality between variables. Likewise, another limitation is the nature of self-reported data collection. However, this is also the most common method of screening used for disordered eating behaviors and as such, is a very sensitive area and open to debate (Fairburn et al., 1990). Our decision to use self-report questionnaires as opposed to interviews was made based on the more conducive nature of the former in a university setting as well as it being less labour-intensive. Lastly, perhaps other variables, such as personality traits, could also be associated to disordered eating behaviors; however, these have not been included in the study.

In addition to clarifying the mechanism of action of the variables included in our model of disordered eating by gender, a more nuanced model would need to be developed and tested within university populations through prospective studies. Furthermore, the current study's findings may provide a direction for a multidimensional focus for the prevention of unhealthy eating patterns amongst students. University students may be more likely to implement physically active lifestyles and healthy eating behaviors (Franko et al., 2005; Sepulveda, Carrobes, Gandarillas, Poveda, & Pastor, 2007; Neumark-Sztainer, Wall, Story, & Perry, 2003). However, it is also uncertain whether the risk can be reduced by prevention efforts, and therefore the need for this type of surveillance is also contested.

The results corroborate the fact that unhealthy behaviors such as abnormal eating habits tend to affect specific vulnerable group. The precise mechanisms through which unhealthy eating behaviors and attitudes, such as dieting or body dissatisfaction, facilitate the development of an eating disorder require further investigation. Further research is necessary to explore the possible clinical implications of disordered eating amongst university populations as well as promoting a greater awareness of the unhealthy eating habits on campuses that can simultaneously address the different variables implicated in the present model.

Table 3
Factors associated with population with unhealthy eating patterns

Variables	Males (N = 99)			Females (N = 350)		
	OR	95%CI	p	OR	95% CI	p
PHYSICAL						
Age	1.01	.92-1.12	.74	.9	.83-.95	.001
Height	.045	.001-2.5	.131	.003	0-.03	.001
Weight	1.03	1.003-1.05	.033	1.06	1.04-1.08	.001
BMI	1.097	1.013-1.2	.023	1.18	1.12-1.2	.001
FAMILIAL/SOCIAL						
Marital status	.68	.22-2.3	.542	1.4	.86-2.4	.162
Father's highest level of education	.87	.49-1.5	.652	1.07	.78-1.4	.654
Mother's highest level of education	1.2	.73-2.1	.425	1.19	.88-1.6	.250
LIFE STYLES						
Physical exercise	1.06	.67-1.7	.779	1.03	.8-1.3	.78
Drinking	1.3	.37-4.9	.644	.42	.08-2.2	.31
Smoking	1.5	.93-2.4	.091	1.08	.84-1.3	.50
Dieting	3.8	2.1-6.7	.001	4.1	3.1-5.4	.001
Psychologist/ Psychiatric Services	2.2	1.2-4	.007	2.4	1.7-3.3	.001
PSYCHOLOGICAL ASPECTS						
Body Dissatisfaction	1.06	1.04-1.07	.001	1.07	1.06-1.08	.001
Self-Esteem	.82	.78-.85	.001	.80	.77-.8	.001
Global Severity Index	11.9	7-20.2	.001	9.4	6.8-12.8	.001

Note. Significant differences relative to the reference group ($p < .05$).

BMI = body-mass index

CI = confidence interval; OR = odds ratio adjusted for other variables in the model.

Table 4
Multivariate models of factors associated to population with unhealthy eating patterns by gender

Model	Males			Females			
	OR	95%CI	p	OR	95%CI	p	
Age	0.79	0.59-0.91	0.013	Age	0.83	0.75-0.9	0.001
Dieting	4.3	1.05-8.6	0.008	Dieting	1.82	1.1-3.1	0.015
Interpersonal Sensitivity	3.97	1.7-7.5	0.001	Paranoid ideation	1.58	1.2-3.1	0.026
Body Dissatisfaction	1.04	1.02-1.06	0.001	Body Dissatisfaction	1.06	1.5-1.07	0.001
Self-Esteem	0.81	0.76-0.91	0.001	Depression	1.55	1.3-2.97	0.051
				Self-Esteem	0.89	0.85-0.95	0.001

CI = confidence interval; OR = odds ratio adjusted for other variables in the model.

Bonferroni adjusted $p = .01$

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