The relationship between Night Eating Syndrome, depression and chronotype in a non-clinical adolescent population

Night Eating Syndrome, depressione e cronotipo in un campione di adolescenti

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SUMMARY. Purpose. The aim of the current study was to assess the prevalence of Night Eating Syndrome (NES) in a population of non-clinical adolescents and to investigate the relationship between NES, depression and eveningness dimension. **Methods.** The data were collected from a sample of 301 subjects, 181 females and 120 males, aged between 15 and 19 (mean value 17.64, SD=1.3). All subjects were invited to answer demographic questions and to take a self-report battery composed by three questionnaires: the Night Eating Questionnaire (NEQ), the Morningness Eveningness Questionnaire (MEQ) and the Beck Depression Inventory (BDI). **Results.** The distribution of chronotypes in the sample was: morning type 9%, intermediate 68.4% and evening type 22.6%. 4% of the participants (12 subjects) reached the criteria for NES. The data indicate that MEQ and NEQ scores are significantly inversely correlated (r=-0.157; p<0.01); 58.3% of the participants who reached the criteria for NES received low scores on the MEQ. The BDI scores resulted significantly associated with the NEQ variable (r=0.275; p=0.001). **Conclusions.** This is the first study, as far as we are aware, which has investigated the relationship between chronotype, depression and NES in an adolescent non-clinical population. The findings of our study highlight the high prevalence of NES in the adolescent population and indicate a significant association between eveningness dimension, Depression and NES.

KEY WORDS: NES, Night eating, chronotype, eveningness.

RIASSUNTO. Introduzione. Lo scopo del presente studio è stato quello di valutare la prevalenza della Night Eating Syndrome (NES) in una popolazione non clinica di adolescenti e di indagare la relazione tra NES, depressione e cronotipo. **Metodi.** I dati sono stati raccolti all'interno di un campione di 301 soggetti, 181 femmine e 120 maschi, di età compresa tra i 15 e i 19 anni (valore medio 17,64, SD=1,3). Tutti i partecipanti hanno fornito informazioni demografiche e hanno effettuato una batteria di test self-report composta dai seguenti strumenti: il Night Eating Questionnaire (NEQ), il Morningness Eveningness Questionnaire (MEQ) e il Beck Depression Inventory (BDI). **Risultati.** All'interno del nostro campione, il 9% dei soggetti ha ottenuto alti punteggi al MEQ (che indicano un cronotipo mattutino), il 68,4% dei soggetti è, invece, risultato intermedio e il 22,6% aveva un cronotipo serotino. Il 4% dei partecipanti (12 soggetti) soddisfaceva i criteri per la diagnosi di NES. I dati indicano che i punteggi ottenuti al MEQ e al NEQ sono inversamente correlati in modo significativo (r=-,157; p<0,01); il 58,3% dei partecipanti che soddisfacevano i criteri per la diagnosi di NES aveva bassi punteggi al MEQ (che indicano un cronotipo serotino). Inoltre, i punteggi ottenuti al BDI sono risultati correlati con i punteggi NEQ (r=0,275; p=0,001). **Conclusioni.** Questo è il primo studio che ha indagato la relazione tra NES, cronotipo e depressione in una popolazione non clinica di adolescenti. I nostri risultati sottolineano l'alta prevalenza di NES tra gli adolescenti e indicano una correlazione tra NES, cronotipo serotino e depressione.

PAROLE CHIAVE. NES, cronotipo, serotino, alimentazione notturna.

INTRODUCTION

The Night Eating Syndrome (NES), included for the first time in the DSM-5 as a "Other Specified Feeding or Eating Disorder", was originally described by Stunkard[1] in a population of obese patients. The syndrome is characterized by morning anorexia, sleep maintenance insomnia[2], a delayed circadian rhythm of food intake[3] and/or nocturnal awakenings with ingestion of food[4,5]. Different studies suggested that patients with NES present depressed mood that worsens in the evening[4,6,7], low self-esteem[8,9], high levels of State and Trait Anxiety[10], elevated perceived stress[11-13] and impairment in the functioning. Recent researches[14,15] revealed that patients with NES present abnormalities in melatonin, cortisol, leptin, ghrelin, insulin and glucose rhythms and increased TSH levels.

Several researches provided a strong evidence that identify NES and Binge Eating Disorder (BED) as two distinct clinical entities[5], although findings indicate that BED and NES frequently co-occur[16-21].

NES was originally associated with elevated Body Mass Index (BMI)[1,22], but many researchers suggested that this association is clearer in the clinical samples than in the normal subjects[23-25]. Gallant[26] in a longitudinal study among obese parents observed that NES symptoms severity doesn't predict weight gain. Gluck et al.[27] finding suggested that, in an

obese sample, subjects with nocturnal ingestions of food gain more weight over 3.4 years than subjects without the night eating behavior (6.2 vs 1.7 kg). These studies suggested that night eating behavior may be implicated in the weight gain. A recent research[28] indicated that age may play an important role in the relationship between NES and BMI. The findings revealed that there is no association in young subjects; on the other hand a strong correlation has been found between NES and BMI in subjects aged 55-60 years. These results are consistent with the hypothesis that night eating behavior may precede weight gain[29]. Several researches also suggested an association between Emotional Eating (EE) and NES[25,30,31] and the results indicate that EE may play an important role as moderator in the relationship between NES and both BED and BMI[32].

Chronotypes are one of the main interpersonal differences in the temporal organization of biological and behavioral rhythms[33]; they can be defined as the individual preference for activity and sleep during the early morning (morningness) or the later afternoon (eveningness)[34-36]. Morning type and evening type subjects differ in sleep-wake cycle timing, in the feeling after the awakening and in the peak performance times.

Several researches also reported main differences in personality traits between chronotypes; the morning-type subjects resulted more conscientious, well-organized, compliant and disciplined, while evening-types appeared more anxious, hostile, depressed, impulsive and vulnerable[37-40].

Some researchers[41-46] found an association between mood and chronotypes, e.g. evening type and depression; these findings suggest that eveningness could be considered a vulnerability factor to depression.

Different researches showed findings that indicate an association between the evening chronotype and unhealthy dietary habits and obesity[47] and demonstrated that evening-type subjects have the tendency to skip breakfast more often compared to morning-types[48]. Several studies also revealed that subjects who prefer to wake up in the early morning tend to present more flexible diet control and greater ability to regulate their amount of food intake, compared to evening-types[49]. These findings suggest an association between the tendency to stay up late at night and the night eating[49]. The eveningness dimension was also associated with NES and BED in the clinical population[50].

Recent researches[51-53] revealed that Bright Light Therapy (BLT) is effective in the treatment of NES. Two case reports[51,52] revealed that BLT is effective in the treatment of NES. A recent pilot trial[53] showed promising results: in a sample of 15 adults the BLT improved night eating behavior, mood and sleep. These results were similar to the ones obtained with cognitive-behavioral therapy[54] and SSRI, such as sertraline[55]. The effectiveness of BLT in the treatment of NES underlines the need of further systematic investigation of the relationship between NES, mood and circadian rhythms.

The aim of the current study was to investigate the relationship between NES, depression and chronotype in a sample of non-clinical adolescents. We hypothesized an association between evening type, depression and NES; we assumed that evening type subjects would reach higher scores on the Beck Depression Inventory (BDI) and on the Night Eating Questionnaire (NEQ), as other studies observed in the clinical population[2].

METHODS

Participants

The data were collected from 301 students (F=181; M=120; aged 15-19) of two high schools in the district of Sassari (Italy). The subjects reported a mean height of 1.68, weight of 60.60 and BMI of 21.35.

Informed consent was obtained from the headmasters of all the schools, from the parents of the students who took part in the study, and from each student. The confidentiality of all the information provided was guaranteed.

Measures

All subjects were invited to answer demographic questions (sex, age, height, weight, education level) and to take a self-report battery composed by three questionnaires: the NEQ, the Morningness Eveningness Questionnaire (MEQ) and the Beck Depression Inventory (BDI). The BMI was calculated with the formula: weight (kg)/height (m)^2. The subjects were divided in three BMI categories: <18.5 (underweight); ≥18.5 to <24.9 (healthy); ≥25 to <29.9 (overweight).

The NEQ[23] is the most widely used instrument to assess the night eating behavior. The Italian version of the NEQ was used to screen the subjects for NES. The NEQ is composed by 15 items assessing mood, insomnia, morning anorexia, food cravings, food intake after suppertime, nocturnal awakenings with ingestion of food, awareness and feelings of control during the eating episodes. The presence of NES was evaluated using the method introduced by Runfola[24], focusing on the items that most closely match the DSM-5 criteria.

The MEQ[56] was used to assess the chronotype. The Italian version of the MEQ is composed by 19 items assessing individual differences in the timing of the sleep-wake cycle, activities and in the performance peak. The questions are characterized by four possible answers. The subjects, according to their total score, are divided in three different categories: morning type (scores 59-86), intermediate type (score 42-58) and evening type (score 16-41).

The BDI[57] is widely used to measure the severity of depressive symptoms. The scale is composed by 21 items, each one is characterized by four possible answers, that can be scored from 0 to 3. The score of 16 and above indicates the presence of moderate or severe depression.

Procedure

Descriptive statistics were used to examine the frequencies and percentages. Data are presented as mean±SD (standard deviation) for continuous variables and percent frequency for categorical variables. Student's t-test and Pearson's correlation (r) were used to analyze continuous dependent variables. Chi-square (χ^2) was used for categorical data. Two-tailed p values <0.05, were required for statistical significance.

All the statistical analyses were performed with IBM SPSS Statistics for Windows, Version 20.0. (IBM Corp, Armonk, NY, USA).

RESULTS

The sample was composed by 301 subjects, 181 females and 120 males, aged between 15 and 19 (mean value 17.64, SD=1.3); the participants presented mean height of 1.68

(SD=0.89), weight of 60.60 (SD=11.9) and BMI of 21.35 (SD=3.35) (Table 1).

The distribution of chronotypes in the sample was: morning type 9%, intermediate 68.4% and evening type 22.6%. 4% of the participants (12 subjects) reached the criteria for NES.

The data indicate that MEQ and NEQ scores are significantly inversely correlated (r=-0.157; p=0.006). 58.3% of the participants who reached the criteria for NES, received low scores on the MEQ; the results highlight a significant association between evening type and NES.

The BDI scores resulted significantly associated with the NEQ variable (r=0.275; p=0.001) (Table 2).

DISCUSSION

The current study was the first one, as far as we are aware, that investigated the relationship between morningness/eveningness dimension, depression and NES in an adolescent non-clinical population. The main findings of this research indicate a significant association between eveningness dimension, depression and NES and night eating behavior resulted more often associated with an evening chronotype, compared to morning chronotype.

The prevalence of NES in our population of high school students was 4%, similar to the one observed in previous researches. Runfola et al.[24] assessed the presence of NES in a population of university students, using a self-report measure, and found an incidence of 4%. Nolan and Geliebter[25] assessed the presence of NES in college students with a survey and a semi-structured interview, the incidence found was 5.7%. Both studies used the same diagnostic criteria.

In our sample, according to prior studies[24], the NEQ cutoff of 25 points failed to identify subjects who met the criteria for NES. Consistently with Runfola's findings subjects with evening hyperphagia, in the absence of nocturnal ingestions, do not score above 25 on the NEQ. Thus, in our findings, the incidence using the NEQ cutoff of 25 was 3.4%.

The literature is not concordant about the correlation between evening-type and NES. Different researches suggested that subjects with NES present a significant circadian delay exclusively in their food intake; in fact the delay doesn't affect the global functioning[3,14,15]. On the other hand other studies suggested an association between NES and circadian rhythm disruption[11,14], specifically subjects with NES reported to consider themselves to function better in the late hours of the day. Consistently with this hypothesis our findings indicated an association between NES and eveningness dimension and suggest that eveningness dimension could be considered a risk factor for NES. Further researches and lon-

Table 1. Demographic and psychometric characteristics of the participants.

Characteristic	With NES[e]	No NES	Total	p-value
N (%)	12 (4)	289 (96)	301	
Age (mean±SD)	17.25±1.54	17.65±1.29	17.64±1.3	
Gender *n* (%)	12	289	301	
Male	6 (50)	114 (39.4)	120 (39.9)	
Female	6 (50)	175 (60.6)	180 (39.9)	
Body mass index (BMI; kg/m^2)	24.29±4.2	21.22±3.27	21.35±3.36	
BMI category				
Underweight (BMI\18.5 kg/m^2)	1 (8.3)	60 (20.6)	61 (20.1)	
Healthy (BMI C18.5-24.9 kg/m^2)	7 (58.3)	195 (67.9)	202 (67.6)	
Overweight (BMI C25-29.9 kg/m^2)	4 (33.3)	34 (11.5)	38 (12.04)	
BDI total (mean±SD)	10.58±6.03	9.08±8.08	9.14±8	
MEQ total (mean±SD)	42.92±11.1	47.56±8.39	47.30±8.54	0.02[a]
Morningness type	2 (16.7)	25 (8.7)	27 (9)	0.03[b]
Intermediate type	3 (25)	203 (70.2)	206 (68.4)	
Evenigness type	7 (58.3)	61 (21.1)	68 (22.6)	

[a] Student's independent t test
[b] Chi-squared test

Table 2. Correlation between study variables and NEQ total score analysed by Pearson correlations.

	Bivariate	
Variables	Correlation coefficient (r)	p-value
Body mass index	0.055	0.342
BDI total	0.275	0.001
MEQ total	-0.157	0.006

gitudinal studies are needed to determine the relationship between eveningness and NES.

Prior researches indicated that patients with NES reach higher scores on depression rating scales[2,6,8,58,59]; different studies reported the presence of night eating behavior in depressed patients[60-62] and pointed out high lifetime prevalence of depression in subjects with NES[11,63,64]. Consistently with the literature data our findings suggest that increased symptoms of night eating behavior are significantly associated with increased depressive symptoms. The association between eveningness dimension, depressed mood and NES has some major clinical implications and explains the effectiveness of Bright Light Therapy (BLT) in the treatment of NES[51-53]. Therefore further researches are needed to investigate the relationship between eveningness dimension, depression and NES in the clinical population.

The current study has some limitations. The subjects who met the criteria for NES and depression were not clinically evaluated. The sample was composed primarily by high school students and the sample size was not large enough to be representative of the general Italian adolescent population; further researches and longitudinal studies are needed to investigate the relationship between age, eveningness and NES.

Conflict of interests: no conflict of interest exists for all the participating authors.

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