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Night Eating is Associated with Emotional and External Eating in College Students

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Abstract

The night eating syndrome (NES) consists of evening hyperphagia and/or nocturnal eating and has been associated with depressed mood, that worsens in the evening. However, it is not consistently related to elevated BMI. The present study was conducted to examine whether a relationship exists between NES and emotional, external, and restrained eating. BMI and sleep quality were also obtained. A sample of 246 students completed the Night Eating Diagnostic Questionnaire (NEDQ), Night Eating Syndrome History and Inventory (NESHI), Sleep Quality Index (SQI), and Dutch Eating Behavior Questionnaire (DEBQ), containing subscales for emotional, external, and restrained eating. They also provided demographic information, including height and weight. Participants were grouped by severity of NES features using the NEDQ and NESHI: normal, mild night eater, moderate night eater, and full night eater syndrome. MANOVA was used to compare DEBQ subscores for the groups; those in the full syndrome category had significantly higher emotional eating scores and external eating scores than those in the normal and mild categories. There was no difference in restrained eating between the normal and full syndrome groups. Those with moderate and full syndrome NES symptoms also reported significantly lower sleep quality. No significant relationship was found between NES and BMI. The results show that NES is associated with more eating in response to negative mood and in response to food cues.

Keywords

night eating syndrome; emotional eating; external eating; sleep quality

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Contributors Both A. Geliebter and L. Nolan were responsible for literature search and design of the experiment. A. Geliebter provided NESHI and NEDQ measures, and proofread the manuscript. L. Nolan supervised the collection of data, analyzed data, and wrote the manuscript. Both authors have read the final manuscript and approved its submission.

Conflict of Interest There are no conflicts of interest.

1. Introduction

The night eating syndrome (NES) was first described as consisting of morning anorexia, evening hyperphagia, and insomnia, and the onset was related to stressful events (Stunkard, Grace & Wolff, 1955). The feature of nocturnal awakening to eat was later added to the description (Birketvedt et al., 1999). NES has also been associated with depressed mood that worsens in the evening (Birketvedt et al., 1999). The defining symptoms appear to be evening hyperphagia and nocturnal ingestion (Allison, Latzer, Tzischinsky & Vinai, 2009). NES has been linked to elevated BMI (Aronoff, Geliebter & Zammit, 2001; Stunkard et al., 1955), but much more so in clinical populations than in epidemiological studies (Allison et al., 2008). No sex differences have been associated with NES (Striegel-Moore, Franko & Garcia, 2009). NES is not a formally recognized disorder; however, a case for inclusion of NES in the fifth edition of the DSM has been developing (see Stunkard et al., 2009).

NES is associated with several psychopathological features including, depressed mood (Gluck et al., 2001; Striegel-Moore et al., 2008; Striegel-Moore et al., 2010; Allison et al., 2009), low self-esteem (Gluck et al., 2001; Striegel-Moore et al., 2010), and functional impairment (Striegel-Moore et al., 2010). NES severity is positively associated with trait anxiety, cortisol levels, and perceived stress (Pawlow, O'Neil & Malcolm, 2003). Independent of BMI, NES is linked to pathological attitudes regarding eating, as well as to mood and sleep disturbance, anxiety disorders, and substance-related disorders (Lundgren, Allison, O'Reardon & Stunkard, 2008).

Only a few studies have been conducted examining the presence of NES in college students, a population in which stress and anxiety levels tend to be high (Brougham, Zail, Mendoza & Miller, 2009) and in which sleep disturbances are often more prevalent than in the general population; 88.5% of college students were found to have at least occasional sleep difficulties (Buboltz et al., 2009) as compared to approximately one-third of the general population who experienced at least one sleep problem (Roth et al., 2006) or met the criterion for broadly defined insomnia (Ohayon, 2009). Disordered eating is among the most common mental health problems in college students (18–19% in a large longitudinal study; Zivin, Eisenberg, Gollust & Golberstein, 2009). NES appears to be more prevalent in young adults (18–30 years old) than in older adults (Striegel-Moore, Franko, Thompson, Affenito & Kraemer, 2006). Thus, studying NES in college students is appropriate and informative. In a study of college students, higher Beck depression scores were associated with a number of NES features including the need to eat in order to fall back asleep, and cravings to eat when waking up at night (Thompson & DeBate, 2010). NES severity was associated with higher perceived stress in college students, which was mediated by maladaptive coping strategies (Wichianson, Bughi, Unger, Spruijt-Metz & Nguyen-Rodriguez, 2009).

Stress and depression are also associated with emotional eating, which has been described as increased eating in response to negative affect (Lindeman & Stark, 2001), ego-threat (Wallis & Hetherington, 2004), or distress (van Strien & Ouwens, 2007). Emotional eating has been correlated with overeating, binge eating, bulimia nervosa, and obesity (see Lindeman & Stark, 2001 for review). Thus, the present study was conducted to determine whether emotional eating as assessed with the Dutch Eating Behavior Questionnaire (DEBQ), which contains emotional, external, restraint subscales, is associated with NES. Since the DEBQ measures of emotional eating and external eating are consistently positively correlated (van Strien, Frijters, Bergers, & Defares, 1986; Wardle, 1987), it was expected that external eating would also be associated with NES severity. Furthermore, since dietary restraint measured by the Eating Disorders Examination Interview (EDE) was associated with NES (Allison, Grilo, Masheb, & Stunkard, 2005), and restraint is often correlated with emotional eating as measured by the DEBQ (van Strien et al., 1986; Wardle, 1987), the relationship

between DEBQ restraint score and NES symptoms was examined. In addition, since sex differences have not been observed with NES (Striegel-Moore et al., 2009), none were expected in the present study. We also examined the relationship between severity of NES symptoms and BMI; none was expected since the sample studied was not from a clinical population. Finally, it was expected that sleep quality would be lower in those with greater NES severity since previous research showed that sleep quality in NES patients is poorer than in controls (Lundgren et al., 2008).

2. Method

2.1 Participants

Participants were university students ($N = 246$) with a mean age of 18.84 years ($SD = 1.43$) and of these 75.20% were women and 24.80% were men. Participants volunteered by enrolling in an online participant pool. The BMI of the sample ranged from 16.95 to 44.92 kg/m² ($M = 23.33$, $SD = 4.06$); 3.25% were underweight (BMI less than 18.50; $M = 17.91$, $SD = 0.44$), 71.95% were in the normal weight range (BMI from 18.50 to 24.99; $M = 21.71$, $SD = 1.64$), 18.70% were overweight (BMI from 25 to 29.99; $M = 26.95$, $SD = 1.53$), and 5.69% were obese (BMI greater than 30; $M = 34.88$, $SD = 4.53$). One participant did not provide height and weight information and was, therefore, excluded from analyses where BMI was a variable. The sample was comprised of individuals who identified themselves as White (83.33%), Black (3.66%), mixed race (2.85%), Asian (1.22%), other (1.22%), Native American or Pacific Islander (<1%) with 6.91% not replying to the question. In response to a separate question, 4.07% identified as Latino (60.00% of whom identified as White, 30.00% as mixed or other, 10.00% did not respond to the ethnicity question).

2.2 Measures

2.2.1 Night eating—Night eating was assessed by two questionnaires. 1) The Night Eating Diagnostic Questionnaire (NEDQ; Gluck et al., 2001) includes 22 questions about the schedule of eating and sleeping, whether the person perceives him or herself as being a night eater, the awareness of night eating, and whether there is distress over the eating behavior. Its psychometric properties have not yet been published. 2) The Night Eating Syndrome History and Inventory short form (NESH; see Allison et al., 2008) is an unpublished semi-structured interview which contains 13 questions (25 if all subquestions are included in the count) about the schedule and amount of food eaten in a 24-hour day, history of NES symptoms, sleep patterns, mood, and stressors. Here the NESH was administered as a questionnaire without interviewer scoring instructions since the questions are specific and not open ended. It contains all of the questions from the Night Eating Questionnaire (NEQ), a validated scale for assessing NES (with a reliability of .70) that is administered as a questionnaire (Allison et al., 2008).

To have full fledged NES by the latest provisional diagnosis (Allison et al., 2010), a person must meet 6 criteria (see Table 1 for a description of NES criteria). The NEDQ and NESH were used to place participants into four categories (normal, mild, moderate, and full syndrome) by severity of NES (see Table 1 for description of categories).

2.2.2 Eating Styles—Emotional, restrained and external eating were assessed with the Dutch Eating Behavior Questionnaire (DEBQ). The DEBQ contains three subscales: emotional eating (DEBQ-E), restrained eating (DEBQ-R), and external eating (DEBQ-X). The DEBQ-E contains 13 items, 4 of which describe eating in response to diffuse emotions, and 9 of which describe eating in response to clearly labeled emotions (van Strien et al., 1986). The DEBQ-R (cognitive restraint of eating) and DEBQ-X (eating in the presence of external cues) scales each have 10 items. All 33 questions are rated on a 5-point Likert-type

scale with “never” and “very often” as the anchors. The DEBQ is reliable in both obese and nonobese men and women; Cronbach's $\alpha = .95, .94$, and $.80$ for restraint, emotional eating, and external eating respectively (van Strien et al., 1986).

2.2.3 Sleep quality—Sleep quality was assessed with the Sleep Quality Index (SQI; Urponen, Partinen, Vuori, & Hasan, 1991), a validated brief questionnaire containing 8 items to indicate the frequency of various sleep disturbances per week for the past 3 months. Higher scores on this measure indicate poorer quality of sleep. The SQI has acceptable reliability of $.71$ in a US sample (Buboltz et al., 2009) and $.74$ in a European sample (Urponen et al., 1991). Furthermore, a significant relationship between quality of sleep and subjective health has been reported (Urponen et al., 1991).

2.2.4 Participant Characteristics—Information regarding the height, weight, sex, age, and ethnicity was collected by use of a questionnaire. Reported height and weight were used to compute BMI. Although direct measures of height and weight are preferable, self-reports of height and weight have been shown to be valid proxy measures with a correlation of $.97$ with measured values in young adults with discrepancies more common in older individuals and in the overweight and obese (Kuczmarski, Kuczmarski, & Najjar, 2001).

2.3 Procedure

Participants were tested individually or in small groups of up to 10 in a quiet room that afforded privacy, and each one sat alone at a small table. The participants were informed that the purpose of the study was to survey eating and sleeping habits. Prior to the test session, participants provided written informed consent. They completed the NEDQ, NESHI, DEBQ, and SQI followed by a demographics questionnaire including height, weight, age, and ethnicity. After completing all the questionnaires, the participants were debriefed more fully regarding the purpose of the study. Procedures and consent forms were approved by the Wagner College Human Experimentation Review Board.

2.4 Statistical Analyses

Analyses were performed with ANOVA, MANOVA, or Chi-square using SPSS (15.0) with two tailed $\alpha = .05$, required for significance.

3. Results

Participants were grouped into four categories by severity of NES using the NEDQ and NESHI: normal ($n = 166$), mild night eater ($n = 37$), moderate night eater ($n = 29$), and full syndrome ($n = 14$). Thus, 5.69% of participants in the sample met the criteria for NES. A chi-square test revealed that there were no sex differences among the categories, $\chi^2(3, N = 246) = 5.27, p = .153$. A MANOVA was performed to determine whether there were differences in emotional, external, and restraint eating scores at different NES levels (see Figure 1). The analysis indicated significantly different emotional eating scores among the NES groups, $F(3, 40) = 4.49, p = .004$. The Tukey HSD test revealed that those in the full syndrome NES category had significantly higher emotional eating scores than those in the moderate ($p = .027$), mild ($p = .025$), and normal categories ($p = .002$). Similarly there were significantly different external eating scores among the NES groups, $F(3, 240) = 7.85, p < .001$; the Tukey HSD test revealed that there were higher external eating scores in the full syndrome NES category than those in the moderate ($p = .008$), mild ($p < .001$), and normal ($p < .001$) categories. Furthermore, moderate night eaters had significantly higher external eating scores than normal eaters ($p = .023$). For both emotional and external eating the pattern reflected higher mean scores as night eating severity increased. There were also differences in restrained eating among the NES groups, $F(3, 240) = 4.80, p = .003$. The

pattern for restrained eating was less clear: the moderate category had lower restraint scores than those in the normal ($p = .020$) and full NES categories ($p = .041$). There was no significant difference between the normal and full NES categories.

86.60% of participants reported at least occasional sleep problems. A one-way ANOVA revealed that the moderate and full syndrome categories had significantly poorer sleep quality than the normal and mild categories, $F(3, 241) = 13.60$, $p < .001$. Tukey HSD tests indicated that there were no differences between normal and mild categories nor between moderate and full syndrome categories (see Figure 2). Another one-way ANOVA revealed that there were no significant differences in BMI differences across NES categories, $F(3, 241) = 1.04$, $p = .374$, and for both women, $F(3, 180) = 1.28$, $p = .284$, and men, $F(3, 57) = 0.44$, $p = .725$.

4. Discussion

The results in a sample of college students showed that NES severity was associated with higher emotional eating and external eating scores. Those with greater NES severity were also more likely to have poorer sleep quality as has been reported by Lundgren et al. (2008). In the present study, the percentage of participants exhibiting NES (see Striegel-Moore et al., 2009 for review) and those experiencing sleep disturbances (Buboltz et al., 2009) were similar to that reported in other studies with non-clinical samples.

It is likely that stress is a common trigger for both NES and emotional eating. Students who experience high levels of stress (and engage in less adaptive coping strategies) are more likely to engage in night eating (Wichianson et al., 2009). Furthermore, those with NES may have an overactive hypothalamic-pituitary-adrenal axis (Birketvedt, Sundsfjord & Florholmen, 2002) and higher cortisol levels (Birketvedt et al., 1999). In their review of the literature on NES, Stunkard et al. (2009) reported high comorbidity of NES and anxiety disorders, and trait anxiety has been associated with NES (Pawlow et al., 2003). Likewise, stress also can increase food consumption in emotional eaters (Macht, 2008). Thus, while stress levels were not measured in the present study, it is possible that stress and anxiety could contribute to the incidence of both emotional eating and NES in students.

It is possible that stressed individuals who experience low mood prior to bed time are more likely to wake up in the night, and among these, those with a propensity to emotional eating may be more likely to eat in order to reduce feelings of negative affect. For those who are likely to engage in eating in the presence food (external eating), the presence of food-related cues when up late in the evening and during nocturnal awakenings may also contribute to night eating. Although external and emotional overeating often co-occur, they appear to represent independent constructs (van Strien, Schippers & Cox, 1995). External cues present in the environment associated by learning with food or eating (Blumenthal & Gold, 2010) can prompt eating, regardless of physiological hunger. Eating in the presence of these cues without hunger may contribute to overeating and obesity (Schachter & Rodin, 1974). It has been shown that external eaters may also increase food consumption in the presence of stressors (Conner, Fitter & Fletcher, 1999) and display attentional bias toward snack foods (Newman, O'Connor, & Conner, 2008). The results of the present study suggest that strategies used to treat NES may benefit from managing mood and impulse control in the presence of food-related cues.

The relationship between NES and restrained eating was not clear cut. The DEBQ-R score for those in the moderate category was lower than that for those in the full syndrome NES and normal categories. Thus, it remains unclear whether dietary restraint contributes to night eating. Some have reported higher restraint scores as measured by the EDE but not by the

Three-Factor Eating Questionnaire (TFEQ), in individuals diagnosed with NES compared to non-NES controls (Allison et al., 2005), but not when compared to those with other eating disorders (Allison et al., 2005; Allison, Lundgren, O'Reardon, Moore, & Stunkard, 2007; Lundgren et al., 2011). In the obese, no difference in restraint (TFEQ) was found between those with and without NES (Adami, Campostano, Marinari, Ravera & Scopinaro, 2002). In the present study, the full syndrome NES group did not differ significantly in restraint score (as measured by the DEBQ) from the normal groups. This is consistent with the finding of no difference between NES and non-NES on the TFEQ since both the TFEQ and DEBQ restraint scores focus on intent to restrict food consumption while the EDE may specifically reflect dieting to lose weight (Safer, Agras, Lowe & Bryson, 2004). It is possible that those with NES in the present sample do not intend to restrict caloric intake more than those without NES, consistent with the lack of a difference in BMI between the two groups. Further research is needed to understand whether dietary restraint plays a role in NES.

Night eating has been associated with higher BMI, more so in clinical populations than in epidemiological studies (Allison et al., 2008). We found no differences in BMI among NES groups for men or women. The lack of relationship between BMI and NES in this sample may be due to the relatively young age of the participants. In a study of obese and non-obese night eating individuals, the mean age of those in the non-obese group was lower (Marshall, Allison, O'Reardon, Birketvedt & Stunkard, 2004) suggesting that NES preceded the onset of obesity (Marshall et al., 2004; Spaggiari et al., 1994). Thus, it is possible that those with NES in the present sample will gain weight in the future.

There are several limitations in the present study. The study was cross-sectional and the sample primarily consisted of young White college students of which 75% were women making it difficult to generalize to other groups. However, the percentage of participants exhibiting full night eating syndrome was similar to what has been reported in other studies (see Striegel-Moore et al., 2009). Moreover, this study was conducted in college students who are in an age range in which NES may develop and already be relatively prevalent (Striegel-Moore et al., 2006). Additional limitations include the relatively small numbers of participants with BMI over 30 and the reliance on self report measures of height and weight. Thus, while our finding that BMI was not related to NES severity is consistent with those of other studies of non clinical samples (Striegel-Moore et al., 2009), they should be interpreted cautiously.

The present study is the first to our knowledge that has examined the relationship between emotional and external eating and NES severity. The results indicate that those who have greater NES severity are likely to exhibit more emotional and external eating. The findings suggest that the evening and nocturnal eating in NES may be influenced by the presence of negative mood and food-related cues.

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Highlights

- Night Eating Syndrome (NES) consists of evening hyperphagia and/or nocturnal eating.
- We tested whether there is an association between severity of NES and eating styles.
- NES symptom severity was associated with eating in presence of food cues.
- It was also associated with higher eating while distressed.
- NES was not associated with BMI and was associated with low sleep quality.

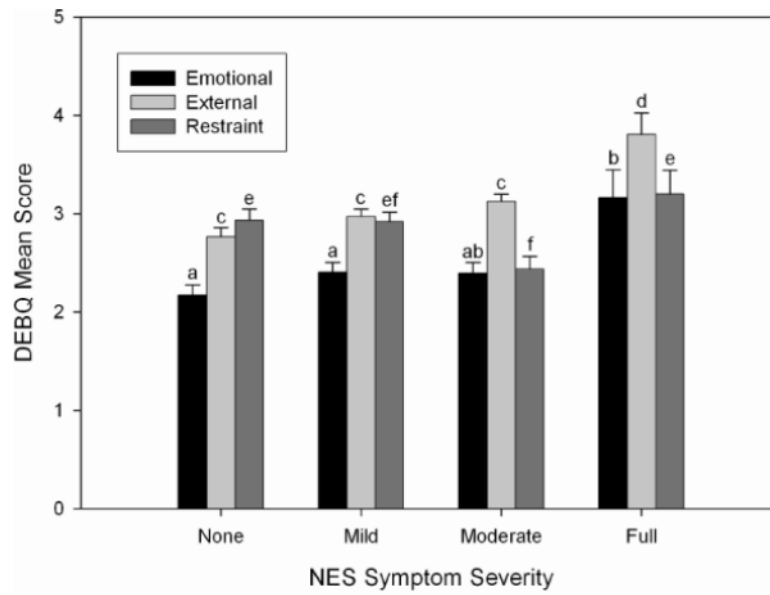


Figure 1.

The mean (and *SEM*) for Dutch Eating Behavior Questionnaire (DEBQ) subscales of emotional eating, external eating, and dietary restraint for each NES group. Statistically significant differences within each DEBQ subscore are indicated by different letters (Tukey's HSD, $p < .05$).

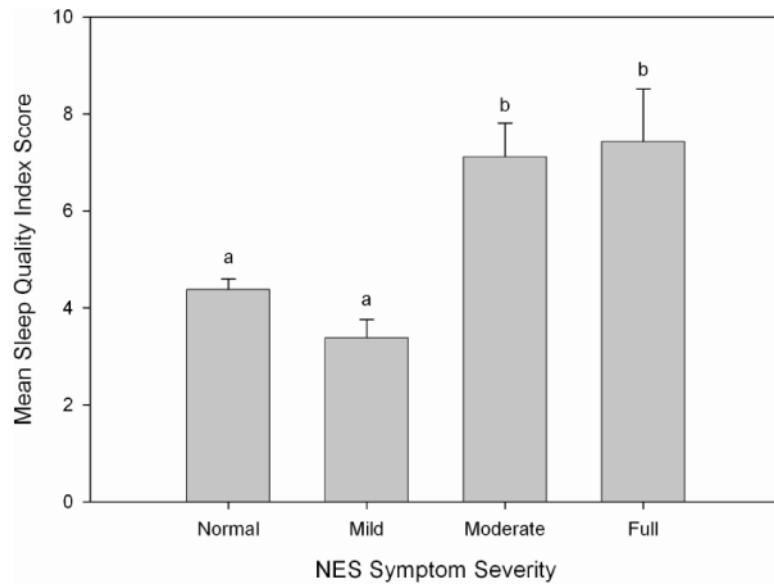


Figure 2.

The mean (and *SEM*) for Sleep Quality Index (SQI) for each NES group. Different letters indicate statistically significant differences among NES groups (Tukey's HSD, $p < .05$).

Table 1

Criteria used for diagnostic categories of NES based on provisional criteria[/] using the NEDQ and NESHI

| | |
|---|---|
| Criterion 1: One or both of the following for 3 or more months | |
| a) | consume 25% or more of food after the evening meal |
| b) | two or more nocturnal eating episodes per week |
| Criterion 2: | |
| awareness of evening and nocturnal eating episodes | |
| Criterion 3: At least three of the following | |
| a) | lack of interest in eating in morning and/or skip breakfast four or more times per week |
| b) | strong urge to eat between dinner and sleep onset and/or during the night |
| c) | sleep maintenance or onset insomnia four or more times per week |
| d) | personal belief that one must eat in order to initiate or return to sleep |
| e) | mood depressed or lowered mood in evening |
| Criterion 4: | |
| significant distress and/or impairment in functioning | |
| Criterion 5: | |
| maintenance of disordered eating for a minimum of three months | |
| Criterion 6: | |
| disordered behavior is not secondary to another medical or psychiatric disorder | |

NES Severity

| | |
|---------------|---|
| None | Does not meet any criteria category below. |
| Mild | More than 2 of 5 qualifiers from criterion 3 and none from 1. |
| Moderate | More than 2 of 5 qualifiers from criterion 3 plus 1 from criterion 1. |
| Full Syndrome | More than 3 of 5 qualifiers from criterion 3 plus two from criterion 1 plus criteria 4 and 5. |

[/] Allison et al., 2010