



## “Food addiction” is associated with night eating severity



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### ARTICLE INFO

#### Article history:

Received 17 August 2015

Received in revised form

25 November 2015

Accepted 21 December 2015

Available online 24 December 2015

#### Keywords:

Night eating syndrome

Food addiction

Body mass index

Depression

Sleep quality

### ABSTRACT

Night eating syndrome (NES) and “food addiction” (FA) are associated with elevated body mass index (BMI) and disturbed eating behavior. The present study was conducted to examine whether NES is associated with FA, and whether BMI, depression and sleep quality contribute to any relationship between NES and FA. Two groups were studied: a sample of 254 university students and a sample of 244 older adults. All completed the Yale Food Addiction Scale (YFAS), the Night Eating Questionnaire (NEQ), the Zung Self-report Depression Scale, and the Pittsburgh Sleep Quality Index, and BMI was computed from height and weight. In both samples, higher global NEQ scores were significantly correlated with more FA symptoms, elevated depression, and poorer sleep quality, and these correlations were significantly higher in the older adult sample than in the younger student sample. Higher BMI was significantly correlated with NEQ score only in the older adult sample. The hypothesis that the prediction of NEQ by YFAS was moderated by BMI and group membership (moderated moderation) was tested; while the prediction of NEQ by YFAS was not moderated by BMI, elevated YFAS predicted higher NEQ in the adult sample than it did in the student sample. In addition, multiple regression revealed that “continued use of food despite adverse effects” was the sole FA symptom predictive of NES symptoms in students while in older adults food tolerance was the only predictor of NES. Thus, NES appears to be associated with FA, more strongly in an older community sample; higher food tolerance in NES may contribute to a desire to eat late in the evening and/or when awakening at night.

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Night eating syndrome (NES) is characterized by morning loss of appetite, evening hyperphagia, insomnia (Allison, Latzer, Tzischinsky, & Vinai, 2009; Stunkard, Grace, & Wolff, 1955), and nocturnal awakening to eat (Birketvedt et al., 1999). Furthermore, NES is associated with depressed mood in the evening (Birketvedt et al., 1999). Proposed diagnostic criteria for NES based on these observations have been published (Allison et al., 2010). In addition, NES is associated with elevated emotional eating, higher external eating, and poor sleep quality (Nolan & Geliebter, 2012). Recent research suggests that emotional eating may moderate the relationship between NES and BMI (Meule, Allison & Platte, 2014). Although there is good evidence that NES and binge eating disorder (BED) are distinct entities (Allison, Grilo, Masheb, & Stunkard, 2005), up to 25% of those diagnosed with NES may also meet the criteria for BED (Allison et al., 2010). NES has been linked to elevated BMI (Aronoff, Geliebter, & Zammit, 2001; Stunkard et al.,

1955), but much more so in clinical populations than in community and student samples (Allison et al., 2008; Nolan & Geliebter, 2012; Runfola, Allison, Hardy, Lock, & Peebles, 2014).

Food addiction (FA) is a controversial construct which has been proposed as a contributor to increasing obesity prevalence. Supporters of FA suggest that some highly palatable, energy-dense foods (or specific compounds in food such as salt or refined sugar) have the ability to generate addiction-like behaviors in those who consume them (Gearhardt, Corbin, & Brownell, 2009). Critics have suggested that “eating addiction” may be a more accurate term suggesting there is little evidence for an addicting substance in food, instead suggesting that overeating may be a form of habitual food “abuse” (Hebebrand et al., 2014). FA as measured by the Yale Food Addiction Scale (YFAS) is correlated with disordered eating variables associated with binge eating behavior (Davis et al., 2011; Gearhardt et al., 2012; Gearhardt, Boswell, & White, 2014) and with elevated BMI even in the absence of BED (Gearhardt et al., 2014; Meule, 2011; Pedram et al., 2013). Like NES, FA has also been associated with depressed mood. For example, self-identified

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chocolate “addicts” (which may or may not be related to the construct measured by the YFAS) tend to have higher scores on depression (Hetherington & MacDiarmid, 1993; Tuomisto et al., 1999). Furthermore, FA has been associated with depression in obese participants (Davis et al., 2011; Gearhardt et al., 2012; Meule, Heckel, Jurowich, Vögele, & Kübler, 2014).

NES and FA are associated with increased body weight and depressed mood. The present study was conducted to examine whether NES is associated with FA, and whether depression and sleep quality contribute to any relationship between NES and FA. Furthermore, BMI was examined as a potential moderator of this relationship. NES is common in the young (Striegel-Moore, Franko, Thompson, Affenito, & Kraemer, 2006), but its relationship with body weight may be more apparent in older adults (Marshall, Allison, O’Reardon, Birketvedt, & Stunkard, 2004). Therefore, samples of university students and the general adult population were tested in order to determine whether the relationships among FA, NES, and BMI would depend upon the age group of the population evaluated. It was also expected that depression and poor sleep quality, would be positively correlated with symptoms of NES. Finally, it was expected that BMI would be more strongly correlated with NES symptoms in the adult community sample than in the university student sample.

## 1. Method

### 1.1. Participants

Data were collected from two samples: one of university students and another of older adults in the community (see Table 1 for sample characteristics). Those who engaged in shift work were excluded from participation. In the student sample, 263 participated in a laboratory setting, but the data from 9 were removed due to incomplete questionnaires. Thus, the analyses were conducted on responses from the remaining 254 participants. Students volunteered via an online participant pool database as one way to satisfy an introductory psychology course research experience requirement.

In the community sample, 244 complete records were obtained from adults who participated using an online survey tool (Qualtrics, Provo, UT). These participants were recruited in two ways. In one way, 133 volunteered their time without compensation (108 completed it; 3 were removed for missing data leaving 105). To elicit their participation, an email describing the study, which contained a link to the online study, was sent to the staff of Wagner College. Recipients were encouraged to also pass the link to interested parties who were adults and not university students. The link

was also sent to several Wagner College alumni outside of New York City with the same instructions. In the second way, participants were recruited through Qualtrics sample creation service and paid \$1.60 to complete the study. The only requirement for participation was age >25 years old. 159 began the study and 145 completed it; 4 were removed due to missing data and 2 were removed for giving the same answer to all questions, leaving 139. Qualtrics employs several quality control procedures to ensure that the participants are actual people since paid participation in studies can attract automated response programs or “bots” (Prince, Litovsky, & Friedman-Wheeler, 2012). In addition, records were screened for inappropriate responses to open-ended questions and unusually short duration times, both indications of fake participants (Prince et al., 2012). No evidence of “bot” respondents was detected. Because no differences were found between the characteristics of these two online groups of participants, they were merged into one sample. Although care was taken to screen out traditional-aged university students, it is possible some were present among the unpaid online volunteers although only 5 of them were between 19 and 22 years old.

### 1.2. Measures

#### 1.2.1. Night eating

Night eating symptoms were assessed using the Night Eating Questionnaire (NEQ). The NEQ is a validated scale for assessing NES that is administered as a self-report questionnaire containing 14 questions about symptoms rated on a 5-point Likert-type scale, which are then summed to obtain a NEQ Global Score (Allison et al., 2008). A total score >25 provides a lenient threshold for NES and >30 a more stringent one (Allison et al., 2008). An analysis of the factor structure of the NEQ revealed 4 subscales: nocturnal ingestion, evening hyperphagia, mood/sleep disturbance, and morning anorexia (Allison et al. 2008). Cronbach’s alpha for the scale was 0.70 (Allison et al., 2008) and in the current study it was 0.76. The continuous NEQ global score was used in correlational and regression analyses.

#### 1.2.2. Food addiction

“Food addiction” was assessed by the Yale Food Addiction Scale (YFAS) which is designed to evaluate indications of “addiction” toward foods according to the DSM-IV criteria for substance dependence (Gearhardt et al., 2009). The YFAS has been validated against questionnaires that measure related constructs, and has a Kuder-Richardson’s alpha of 0.86. In the present study, Kuder-Richardson’s alpha was 0.83. The YFAS is scored by counting the number of diagnostic criteria that are met (0–7). A person is

**Table 1**  
Characteristics of the student and community samples (YFAS = Yale Food Addiction Scale, SDS = Zung Self-report Depression Scale, PSQI = Pittsburgh Sleep Quality Inventory, NEQ = Night Eating Questionnaire).

	Student	Community	Test (df)	p
N	254	244		
Sex (%)	63.1F/34.9M	59.0F/41.0M		
Age (Mean ± SEM)	18.7 ± 0.1	44.5 ± 0.9	t(245.9) = -28.6	<0.001
BMI (Mean ± SEM)	24.5 ± 0.3	27.1 ± 0.4	t(425.6) = -5.7	<0.001
Obese (%)	9.8	26.6		
Overweight (%)	26.0	33.2		
Normal (%)	60.2	37.7		
Underweight (%)	3.9	2.5	X <sup>2</sup> (3) = 35.3	<0.001
SDS Score (Mean ± SEM)	37.8 ± 0.6	38.5 ± 0.7	t(479.2) = -0.85	0.395
Met Depression Criterion (%)	10.2	14.3		
PSQI Score (Mean ± SEM)	6.5 ± 0.2	6.4 ± 0.2	t(457.9) = 0.29	0.770
YFAS Score (Mean ± SEM)	1.9 ± 0.1	1.9 ± 0.1	t(463.1) = -0.18	0.855
Met FA Criterion (%)	4.7	12.7	X <sup>2</sup> (3) = 10.0	<0.001
NEQ Global (Mean ± SEM)	13.6 ± 0.3	14.3 ± 0.5	t(411.3) = -1.21	0.227

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