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Validation of the Night Eating Diagnostic Questionnaire (NEDQ) and its relationship with depression, sleep quality, "food addiction", and body mass index

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ABSTRACT

Night eating syndrome (NES) is commonly assessed using the Night Eating Questionnaire (NEQ), a validated scale of symptom severity, which does not assess all diagnostic criteria. The Night Eating Diagnostic Questionnaire (NEDQ) assesses all diagnostic criteria, but has not been fully validated. The study purpose was to establish convergent validity for the NEDQ with the NEQ. It was also expected that higher NEDQ scores would be associated with elevated depression, poorer sleep quality, "food addiction," and BMI as in other studies of NES. Students (n = 254) and community members (n = 468) were administered the NEQ, NEDQ, Pittsburgh Sleep Quality Index, Zung Self-report Depression Scale (SDS), and the Yale Food Addiction Scale (YFAS). Convergent validity between the NEDQ and the NEQ was demonstrated; the scores were significantly positively correlated. There was good agreement between the NEDQ and the NEQ in diagnosis of NES; 56% of those diagnosed by the NEDQ met the threshold score on the NEQ, while the other 44% did not. Only 5 participants out of 33 who met the NEQ threshold score for NES did not meet the NEDQ diagnostic criteria. MANOVA revealed that higher NEDQ was associated with higher SDS and YFAS scores and poorer sleep quality. Full-syndrome NES by the NEDQ was associated with higher BMI in the community group unlike the student group. Scores on all the other questionnaires were higher in the community group. The discrepancies between NEDQ and NEQ diagnosis may be due to differences in construction of the questionnaires and specifically due to the NEDQ being designed for diagnosis. The NEQ provides a convenient global score for NES severity, whereas the NEDQ, which shows convergent validity with the NEQ, provides clinically useful diagnostic categories.

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). NES has been associated with depression (Allison et al., 2009; Birketvedt et al., 1999; Gluck, Geliebter, & Satov, 2001; Nolan & Geliebter, 2016; Striegel-Moore et al., 2008, 2010), low self-esteem (Gluck et al., 2001; Striegel-Moore et al., 2010), and functional impairment (Striegel-Moore et al., 2010). Independently of BMI, NES is linked to disordered eating, as well as to mood and sleep disturbance, anxiety disorders, and substance-related disorders (Lundgren, Allison, O'Reardon, & Stunkard, 2008; Nolan & Geliebter, 2012, 2016; Runfola, Allison, Hardy, Lock, & Peebles, 2014). Recent studies have linked NES to elevation in emotional eating and eating in the presence of food (Nolan & Geliebter, 2012) and higher scores on a measure of "food addiction" (Nolan & Geliebter, 2016).

NES has been associated with elevated BMI (Aronoff, Geliebter, & Zammit, 2001; Stunkard et al., 1955), but a recent longitudinal study of parents (whose children were enrolled in a study of obesity development) suggested no clear relationship between NES and weight gain in the course of two years (Gallant et al., 2015). Evidence thus far suggests that the relationship between BMI and NES is clearer in clinical samples than in epidemiological studies (Allison et al., 2008). Although little is known about the food choice of those with NES, those who consume food very late into the night frequently select foods relatively high in carbohydrates (Gallant, Lundgren, & Drapeau, 2014).

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NES is frequently assessed using the Night Eating Questionnaire (NEQ) which is scored to produce a single global score of symptom severity (Allison et al., 2008). NEQ assesses symptoms over an unspecified duration and is meant to screen for NES symptoms broadly independent of a NES diagnosis (Lundgren, Allison, Vinai, & Gluck, 2012). The NEQ has been used in a number of studies of NES, although in some other studies, NES has been assessed using questions from a number of different questionnaires to obtain a collected measure of symptoms. Although the usefulness of the NEQ as a measure of symptom severity has been shown, there are some limitations to the use of the NEQ in NES diagnosis. For example, no item assesses the absolute frequency of nocturnal ingestions per week, so that diagnostic criterion cannot be completely assessed (Lundgren et al., 2012). In addition, due to the manner in which the question regarding evening hyperphagia on the NEQ is scored, persons who solely endorse evening hyperphagia (proposed criteria: 25% of daily energy consumption after the evening meal and/or nocturnal ingestions at least twice per week) often do not score above the proposed "wide net" cutoff score, and thus would not be identified successfully if only the cutoff scores were used (Lundgren et al., 2012). Finally, the commonly used 14-item NEQ does not assess the amount of personal distress experienced in relation to night eating symptoms nor the degree of impairment that might be attributed to those symptoms although the addition of such questions has been proposed (Allison et al., 2008).

Alternatively, the Night Eating Diagnostic Questionnaire (NEDQ) can be used to establish a diagnosis of NES using the proposed DSM criteria (see Allison et al., 2010), rather than an assessment of symptom severity (Lundgren et al., 2012). While it does not provide a global score of symptom severity, a hierarchical scoring method has been developed to assess mild, moderate, and full-syndrome night eaters (Lundgren et al., 2012). The NEDQ has not been formally validated. However, like the NEQ, the NEDQ has been associated with elevated depression in obese adults (Gluck et al., 2001) and with higher emotional and external eating and poorer sleep quality in university students (Nolan & Geliebter, 2012).

Thus, the purpose of the present study was to establish convergent validity for the NEDQ by examining its relationship with the NEQ. It was predicted that a higher NEDQ score would be associated with a higher NEQ score. In addition, the relationship between NEDQ and measures that have been associated with the NEQ (namely depression, sleep quality, "food addiction," and BMI) was examined. It was expected that, like the NEQ, the NEDQ would be associated with higher depression, poorer sleep quality, and elevated BMI (particularly in older persons). While the controversial "food addiction" construct has only recently been linked to NES and has not yet been related to specific NES diagnostic criteria, it is associated with characteristics implicated in NES such as depression, impulsivity, and emotional eating, among others (Davis et al., 2011; Price, Higgs, & Lee, 2015). Thus, we predicted that elevated "food addiction" scores would be associated with higher NES symptomology as measured by the NEDQ as it was with the NEQ.

1. Method

1.1. Participants

Participants included students (n = 254) and older community members (n = 468; see Table 1 for group characteristics). In the student group, 263 participated in a laboratory setting, but the data from 9 were removed due to incomplete questionnaires, leaving 254 participants. Students volunteered to participate via an online research study database as one way to satisfy the research requirement for an introductory psychology course. The relationship between NES severity based on the NEQ and measures of depression, sleep quality, "food addiction," and BMI in this group has been published previously (see Nolan & Geliebter, 2016). None of the student participants reported being a shift worker, an exclusion for the assessment of NES.

In the community group, 468 complete records were obtained from adults who participated using an online survey tool (Qualtrics, Provo, UT) and who were recruited in two ways. In one way, 133 volunteered to take part without compensation (105 provided complete records). To elicit their participation, a description of the study (and a link to it) was sent via email to the staff and selected alumni outside of New York City of Wagner College. Recipients were encouraged to forward the link to acquaintances who were adults and not undergraduate students. In the second way, participants were enlisted by use of the Qualtrics sample creation service and were paid $1.60 to complete the study. The only requirement for participation was age >25 years old. 453 people began the study and complete records (i.e., completed all night eating questionnaires) were obtained from 399 participants. After removal of self-reported shift workers (n = 34) and BMI outliers (n = 2), the records of 363 participants were added to the community group. Pay offers for participation in online studies can attract automated response programs or "bots" (Prince, Litovsky, & Friedman-Wheeler, 2012). To counter this, Qualtrics employs several quality control procedures to ensure that the participants are actual people. In addition, records were screened by the researchers for inappropriate responses to open-ended questions and unusually short duration times, which can be indications of false participants (Prince et al., 2012). No evidence of "bot" respondents was detected. Because no statistically significant differences were found between the characteristics of these two online groups, they were merged. Data from 244 of the participants in the community group were used in a previous published study to examine the relationship between NEQ and the measures of depression, sleep quality, "food addiction," and BMI (Nolan & Geliebter, 2016).

1.2. Measures

1.2.1. Night Eating Diagnostic Questionnaire

The NEDQ (Gluck et al., 2001) includes 22 questions about the schedule of eating and sleeping, whether the person perceives him/herself as being a night eater, incidence of night eating, the awareness of night eating, and whether there is distress over the eating behavior. Many of the questions are dichotomized with yes or no answers (and some of these also having ratings of severity) or are open-ended (e.g. questions about percent of food consumed after evening meal). The NEDQ is designed to assess each of the 6 criteria for diagnosis of NES based on the latest proposed diagnosis (Allison et al., 2010) and does not result in a single numerical score. Additionally, the NEDQ can be used to place participants into four categories (normal, mild, moderate, and full syndrome) based on number of symptoms of NES that are present (Lundgren et al., 2012); this scoring method was used in all analyses. The most recent form of the NEDQ is found in Appendix A.

1.2.2. Night eating questionnaire

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 has been proposed as a lenient threshold for NES and