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Validation of the Italian version of the Night Eating Questionnaire (I-NEQ)

Summary

Objective

Night Eating Syndrome (NES) has been included in the DSM-5 within the category of Other Specified Feeding and Eating Disorders and seems to be highly comorbid with other psychiatric disorders. NES has been frequently measured with the Night Eating Questionnaire (NEQ), but currently no Italian validation exists.

Methods

Overall 574 participants filled out the Italian version of the NEQ (I-NEQ) and the total score and subscales were correlated with measures of eating psychopathology, affective and sleep symptoms. In order to assess the I-NEQ structure, reliability, and test-retest reliability we respectively run confirmatory factor analysis (CFA), Cronbach's α , and intraclass correlation coefficient (ICC) test-retest.

Results

Second-order CFA confirmed the four-factor structure, even if item #9 did not load adequately with the Nocturnal Ingestions factor as in the original version. The alpha coefficients of the four factors ranged from .48 to .71, and the Cronbach's alpha for the total score was .65. The test-retest reliability was good [ICC (95% confidence interval) = .68 (.61-.74)] and sound correlations with other measures were found.

Conclusions

The I-NEQ has acceptable psychometric properties and test-retest reliability and thus seems an acceptable measure to investigate night eating behavior among Italian speakers.

Key words

Eating behavior • Night eating questionnaire • Validation • Night eating syndrome • Eating disorders

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Introduction

Night eating syndrome (NES) is currently recognized as an eating disorder (ED) and is classified within the category of other specified feeding or eating disorder (OSFED) in the Diagnostic and Statistical Manual, 5th Edition (DSM-5; APA, 2013).

The concept of NES, firstly described in 1955 as the combination of morning anorexia, evening hyperphagia and insomnia ¹, has been revised several times over the last few years, leading to a clear differentiation with sleep-related eating disorder (SRED) ². According to the suggested diagnostic criteria, NES is characterized by two core criteria as evening hyperphagia and/or nocturnal ingestions, the awareness of these behaviors and the presence of at least three of five descriptor symptoms (morning anorexia, post-dinner eating, insomnia, depression and the belief that one must eat in order to get to sleep) ³.

The relevance of NES has been highlighted across a number of psychological conditions and mental illnesses including anxiety disorders ⁴,

mood disorders⁵, and SRED⁶. The NES seems to play an important role in EDs. On the one hand there is a great overlap between NES and binge eating disorder (BED)⁷; on the other NES is associated with emotional eating and food cues⁸. Finally, the impact of NES in bariatric patients on their weight and weight-related comorbidities seems to be an important treatment target⁹. The Night Eating Questionnaire (NEQ) is the most commonly instrument for the screening of NES. It consists of 14 items describing 4 dimensions: morning anorexia, evening hyperphagia, mood/sleep, and nocturnal ingestions¹⁰.

The item 13 that assess awareness of eating is not included in the total score, but serves to differentiate NES from SRED⁶. It has already been translated and validated in several languages, such as German¹¹, Portuguese¹², Arabic¹³, Mandarin Chinese¹⁴ and Spanish¹⁵, showing a range of adequate to questionable psychometric properties. It is important to validate this instrument in different countries given that its validity may be influenced by the cultural and societal pressures and norms related to timing of eating. For example, lunch in Mediterranean countries is heartier and is consumed later when compared to northern Europe countries. Another example of cultural eating practices is related to religious practices (i.e. fasting during Ramadan in Muslim countries or avoiding meat during the Fridays of Lent by Catholics).

To the best of the authors' knowledge, no Italian validation study of the NEQ exists. The original version and the validated translations of this instrument have demonstrated that, on one hand, it had good psychometric properties such as acceptable internal consistency ($\alpha = .70$ ¹⁰; $\alpha = .71$ ¹¹; $\alpha = .79$)¹⁵, a four-factor structure^{10 11 14 15} and a good test-retest reliability^{11 14 15}. On the other hand, it showed questionable psychometric properties such as a low Cronbach's α of the Morning Anorexia and Mood/Sleep subscales. Additionally, some items such as item #9 ("Other than only to use the bathroom, how often do you get up at least once in the middle of the night?"), loaded on the Mood/Sleep factor instead of Nocturnal Ingestions¹⁵, and item #5 ("How much of your daily food intake do you consume after suppertime?") in the original version loaded on both the Morning Anorexia and Evening Hyperphagia factors¹⁰. Thus, present research aims at validating and assessing the psychometric properties of I-NEQ (i.e. internal consistency, construct validity and test-retest reliability) in a sample of Italian speakers.

We hypothesized that I-NEQ would demonstrate adequate internal consistency ($\alpha \geq .70$), satisfactory retest reliability [intra-class correlation coefficient (ICC) $\geq .75$] and moderate to high positive correlations ($r \geq .30$) with other measures of eating psychopathology, affective, and sleeping symptoms.

Methods

Participants and procedures

Data were retrieved from February to April 2017. The students of the first and third year of the School of Medicine from the University Magna Graecia of Catanzaro (Italy) received information on the purpose and methods of this project by one researcher and the possibility to anonymously participate in this study was given them. Detailed information was offered also from the Facebook page of the Outpatient Unit for Clinical Research and Treatment of Eating Disorders of Catanzaro (Italy). Survey forms were directly accessed from a specific link. The online survey included an informed consent, a self-report form regarding socio-demographic variables, and the tests. Anonymity was assured through the use of a nickname (8 alphanumeric and symbols characters) that respondents had to write in either in the test and the retest to facilitate the data matching.

Since the link to fulfill the survey was posted on the social network, the number of subjects who initially entered the study remained unknown. Moreover participants who did not complete correctly all items were automatically dropped from the electronic database so we are unable to determine the initial sample and to estimate the number of drops out.

Overall 574 respondents (327 women and 247 men) completed the first survey form. Data regarding height and weight were self-reported. Mean age was 21.4 ± 2.3 years and mean Body Mass Index was 22.4 ± 4.1 kg/m².

Two weeks later the online retest was re-opened for the re-test procedure. All participants had one week to complete the second survey; overall 483 (84%) participants completed this retest after 17.6 ± 2.3 days. Only data of 444 responders were used for analysis because the codes of 39 did not match to those specified in the first survey.

Measures

Night Eating Questionnaire (NEQ). A double and independent forward- and back-translation procedure was carried for the translation into Italian of the NEQ by the authors and one bilingual Italian-English psychologist. After the achievement of a consensus among translators was reached, another Italian-English researcher, blind to the original NEQ, translated into English this preliminary version. Minimal discrepancies that did not invalidate the content of the items were found between the original and the back-translated version. Items were conceptually corresponding to the original test and easily comprehensible. Then the newly developed Italian NEQ was administered to 25 participants whose answers are not included in the present study in order to check the understanding of the items. All 25 considered

the I-NEQ comprehensible and easy to answer to. NEQ follows a Likert type scoring from 0 to 4. The questionnaire contains two stop criteria: when items #9 or #12 are answered "0" the remaining questions are also score "0" (Appendix 1).

Beck Depressive Inventory (BDI). The Italian version of BDI-II¹⁶, a 21 multiple-choice items test, was used to measure depressive symptomatology. It uses a Likert scale scoring (0-3). Minimum, mild, moderate and severe depression correspond respectively to scores between 0-9, 10-16, 17-29 and ≥ 30 . Cronbach's alpha in this study was .79.

Binge Eating Scale (BES). Binge eating was assessed by means of the Italian version of the BES¹⁷. Sixteen items describe the behavioral manifestations, feelings, and cognitions related to binge eating. Total BES scores < 17, 17-27 and > 27 indicate unlikely, possible and probable BED. The internal consistency was .90.

Eating Disorder Examination Questionnaire (EDE-Q). The EDE-Q¹⁸ evaluates symptoms related to eating disorders within the past four weeks. Twenty-two items account for the dimensions eating restraint, eating concern, weight concern, and shape concern. Another six items describe the frequency of altered eating behaviors. Cronbach's alpha in this study was between .91-.95.

Pittsburgh Sleep Quality Index (PSQI). We used the Italian version of the PSQI¹⁹ to evaluate: sleep quality, latency, duration, efficiency, disturbances, daytime dysfunction, and sleep medication use of participants. The PSQI global score allows the classification of good versus bad sleepers. Cronbach's alpha was .66.

Data analyses

Data, presented as means, standard deviations (SD), frequencies and percentages, were analyzed with the Statistical Package for the Social Sciences (SPSS 21.0). Amos 21.0 was used to carry out a Confirmatory Factor Analysis (CFA) to test the factor structure of I-NEQ. The Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Squared Residual (SRMR) and Relative chi-square (χ^2/df) were used to assess the goodness of fit of data. Regarding CFI and TLI, values of .90 and above were considered adequate, whereas values of .95 or above were considered very good; for RMSEA values of .08 and below were considered adequate and .05 or less very good; for SRMR a cutoff value close to .08 was considered adequate. Values of $\chi^2/df < 3.0$ are good and those < 2.0 are very good. The magnitudes of these indices were evaluated according to the recommendations of Hu and Bentler²⁰. In order to allow comparisons with previous studies, the I-NEQ internal consistency reliability was measured by Cronbach's alpha. Alpha values $\geq .70$ were considered

acceptable if dealing with subscales derived from a single questionnaire²¹.

Intraclass correlation coefficient (ICC) following a two-way random-effects model with absolute agreement was calculated along with the 95% confidence interval (CI) 22. The agreement level suggested by Cicchetti²³ was applied to interpret the results. Thus ICC < .40, .40-.59, .60-.74, and .75-1.00 was respectively considered as poor, fair, good and excellent level of clinical significance.

Construct validity was measured by correlations run with the corresponding scales and questionnaires; coefficients > .30 were considered advisable²⁴.

A p-value of < 0.05 was considered statistically significant.

Results

Night eating prevalence and associations with participants' characteristics

Using the cut-off score of 25¹⁰, 1.2% of the current sample screened positive for NES. The NEQ total score was unrelated to age ($r = -.015$, $p = .718$) and BMI ($r = .070$, $p = .092$). Women ($M = 9.24$, $SD = 5.2$) had a higher mean NEQ total score than men ($M = 8.32$, $SD = 4.3$, $t_{(572)} = 2.246$, $p < .05$) and even though this effect was small ($d = .19$), we performed the correlations controlling for gender.

Confirmatory factor analysis

The second-order model in which items were assigned to the four factors, and factors were considered to be part of a higher-order NES construct showed an adequate fit: CFI = .946, TLI = .928, RMSEA = .063, Relative chi-square (χ^2/df) = 2.798, and SRMR = .058, suggesting the appropriateness of the total score of the I-NEQ. Only item #9 ("Other than only to use the bathroom, how often do you get up at least once in the middle of the night?") had a small factor loading on Nocturnal Ingestions factor; the other item loadings were acceptable (Fig. 1).

Reliability and test-retest

Cronbach's alpha of the total scale was $\alpha = .65$ ranging between $\alpha = .48$ and $\alpha = .71$ for the subscales (Table I). The three week test-retest reliability of NEQ total score was good [ICC (95% confidence interval) = .68 (.61-.74)]. Cronbach's alpha coefficient increased when an item was deleted, in particular for items #1 (Morning Anorexia) and #7 (Mood/Sleep). As Table II shows, subscales were positively correlated with each other ($r_s = .282-.345$, $p_s < .001$) and with the total score ($r_s = .649-.734$, $p_s < .001$), except for Morning Anorexia which was unrelated to the other subscales ($r_s = -.023-.055$), and which also had the smallest correlation with the total score ($r = .322$, $p < .001$).

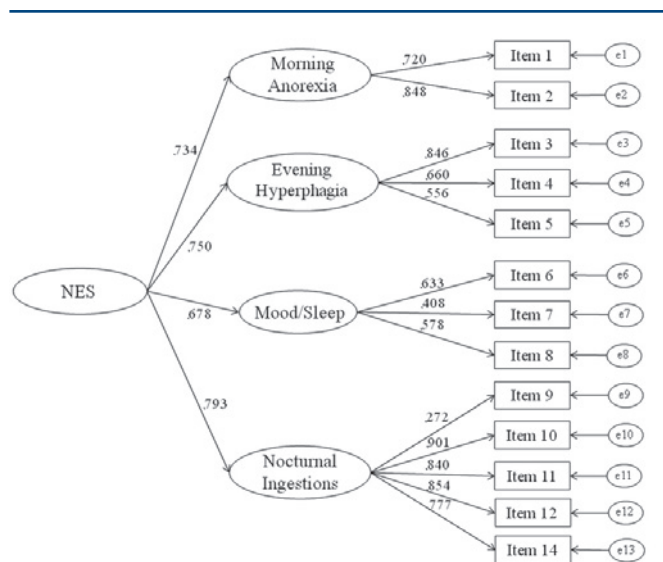


FIGURE 1. CFA second-order model and its standardized factor loadings.

Construct validity

NEQ total score was moderately and positively correlated with the EDE-Q total score ($r = .317, p < .001$) and its subscales: Eating Concern ($r = .406, p < .001$), Weight Concern ($r = .301, p < .001$), and Shape Concern ($r = .297, p < .001$), while a weak correlation with the Restraint subscale ($r = .188, p < .001$) was evident. The NEQ also showed positive correlations with the BDI ($r = .478; p < .001$), PSQI ($r = .514, p < .001$) and BES ($r = .474, p < .001$) scores.

Discussion

The purpose of this study was to validate the Italian version of the NEQ (I-NEQ) based on the original questionnaire¹⁰ in order to have a reliable and easy-to-administer tool to measure night eating. In fact, this behavior is of interest across a wide variety of disorders and conditions⁷⁻⁹, and previous validations in other countries showed that cultural differences can impact this topic¹¹⁻¹³. Present results suggest that the I-NEQ is a tool with acceptable psychometric properties and test-retest reliability and that it is psychometrically very similar to the original NEQ and its validations (i.e. German, Spanish, Arabic). Besides, its structure is fully comparable to the original version with a four-factorial model as demonstrated by the CFA.

However, item 9 (“Other than only to use the bathroom, how often do you get up at least once in the middle of the night?”) produced a small factor loading on the Nocturnal Ingestions factor. Interestingly this item loaded on the Mood/Sleep factor in the Spanish version¹⁵. This could be due to the small number of nocturnal eaters in our sample, so to get up during the night in this sample could be more related to insomnia than to nocturnal eating or depression. Further testing of the performance of this item using a clinical sample of persons with NES would be helpful.

Interestingly, the Morning Anorexia factor showed the weakest correlation with the total I-NEQ score and was unrelated to the other subscales. These results seem to confirm that Morning Anorexia is a descriptor of NES instead of a core feature³. In fact, a previous study found

TABLE I. Psychometric properties of the Italian Night Eating Questionnaire (I-NEQ).

Item	α -item	Correlation (r) with total score		Nocturnal ingestions	Evening hyperphagia	Mood/sleep	Morning anorexia
1	.687	.230*	Cronbach's α	.70	.71	.48	.56
2	.640	.342*	Mean \pm (SD)	.70 \pm (1.6)	2.21 \pm (2.1)	3.44 \pm (2.6)	2.49 \pm (1.5)
3	.594	.621*					
4	.601	.607*					
5	.624	.464*					
6	.609	.542*					
7	.677	.544*					
8	.612	.530*					
9	.625	.451*					
10	.630	.527*					
11	.632	.455*					
12	.628	.520*					
14	.625	.479*					

Mean NEQ total score = 8.84 \pm 4.8; *: $p < .001$; α -item: Cronbach's α if item is deleted; SD: Standard Deviation.

TABLE II. Correlations among the subscales of the Italian Night Eating Questionnaire (I-NEQ).

	I-NEQ Total score	Morning anorexia	Evening hyperphagia	Mood/sleep	Nocturnal ingestions
I-NEQ Total score	-				
Morning anorexia	.322**	-			
Evening hyperphagia	.706**	.026	-		
Mood/sleep	.734**	-.023	.282**	-	
Nocturnal ingestions	.649**	.055	.345**	.302**	-

** $p < .001$

that the morning anorexia items were not significant contributors of the night eating construct²⁵.

Similar to previous versions in other languages^{10 11 13}, even if two of the four subscales showed low internal consistency, the internal consistency of the I-NEQ total score was acceptable. In fact our results for the subscales Morning Anorexia and Mood/Sleep are similar to those reported both in the original¹⁰ and in the German¹¹ versions, so according to Meule et al.¹¹ future studies should only use the I-NEQ total score.

The test-retest reliability of the I-NEQ total score was good, and it was very similar to the previous validation studies^{11 15}, even if these used the Pearson correlation to quantify the test-retest reliability. The test-retest reliability represents the proportion of variance in one measurement accounted for by another; ICC ranges from 0 to 1 while Pearson r ranges from -1 to 1 and it must be squared to estimate the proportion of variance. In this way, it is possible to see that the German validation¹¹ accounted for 59% of variance and the Spanish validation¹⁵ found 73% of the variance accounted for, which are quite similar to the 68% found in our study.

We observed no relation between NES and BMI but, important, we just examined a sample of young adult students. This finding is consistent with studies of university^{8 27} and young adult samples²⁸, but contradictory to some studies of adult populations^{29 30}. The lack of relationship between NES and BMI in our study could be due to the relatively young age of the participants as, according to Meule, Allison, Brähler and de Zwaan²⁶, age moderates the relationship between NES and BMI. Our findings could be further supported by the results of Marshall, Allison, O'Reardon, Birketvedt and Stunkard³¹ who showed that weight gain occurs with the persistence of NES and, therefore, an elevated BMI is not likely to be related to NES at a young age.

About convergent validity, the total I-NEQ score was positively correlated with eating pathology (i.e. EDE-Q subscales and total score) and binge eating (i.e. BES), replicating previous studies^{8 10 32}. Interestingly, a small, positive correlation with the dietary restraint scale of the EDE-Q was observed, and this is consistent with

the assumption that restraint is not a core feature but a descriptor of NES as suggested in the description of the diagnostic criteria³ as well as in studies using a population-based sample¹¹. Moreover, the positive relationship observed between the total I-NEQ score with the PSQI^{10 14} and the BDI is consistent with previous studies^{14 15 33}.

Interestingly, the I-NEQ showed a higher strong association with sleep disturbance, binge-eating and depression than the EDE-Q subscales. Our results seem to confirm the core conceptual features of the NES, defined as a synthesis of sleep, affective and eating disorders. Therefore in the future, it might be useful to investigate the NES in a population that manifests these clinical features.

This study has some limits. The first is that data were gathered by self-report (e.g., anthropometric measures as height and weight) and accordingly they could be biased. The second limit regards the Internet-based data collection because the procedure could result in a self-selected sample of participants³⁴. Yet, a recent research has proved that either the Internet or the paper-and-pencil Chinese versions of NEQ had strong reliability and validity¹⁴. The last limit is that our sample predominantly comprised young normal weight medical students. Literature reveals that the prevalence of NES is higher in obese populations than in the general population³⁵ but recent studies have investigated this disease in young adult non-obese populations²⁷ revealing that NES also occurs in this type of sample. In this line of thinking, if we refer to the definition of NES as a combination of eating, mood and sleep disorder, and also to the theory that this syndrome appears to be an adaptation to stress¹, a sample of young medical students, like ours, could be representative because they may be at higher risk to develop poor quality and quantity of sleep, eating and affective disorders³⁶. However, forthcoming studies involving both wider representative samples of general population and clinical samples would be appropriate to replicate and extend current results. In conclusion, this study first proved that the I-NEQ is comparable to the

original NEQ and other foreign validations. Secondly it demonstrated that the I-NEQ is an acceptable measure to evaluate night eating symptomatology in Italian speakers. The total score is psychometrically sound, even if item 9 (the frequency of nocturnal awakenings for reasons other than having to go to the bathroom)

did not adequately load with the Nocturnal Ingestions factor.

Conflict of interest

None

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APPENDIX. ITALIAN NIGHT EATING QUESTIONNAIRE (I-NEQ)

1) Di solito quanto si sente affamato/a al mattino?				
0	1	2	3	4
Per nulla	Pochissimo	Un po'	Abbastanza	Molto
2) Generalmente, quando mangia per la prima volta nella giornata?				
0	1	2	3	4
Prima delle 9	Tra 9:01 e 12	Tra 12:01 e 15	Tra le 15:01 alle 18	Dopo le 18:00
3) Sente il bisogno incontrollabile o l'impulso di mangiare qualcosa dopo cena, ma prima di andare a dormire?				
0	1	2	3	4
Per nulla	Poco	Abbastanza	Molto	Moltissimo
4) Quanto riesce a controllarsi nel mangiare tra la cena e l'ora di andare a dormire?				
0	1	2	3	4
Per nulla	Poco	Abbastanza	Molto	Completamente
5) Quanto del cibo che mangia quotidianamente consuma dopo cena?				
0	1	2	3	4
0% (nulla)	1-25% (entro un quarto)	26-50% (circa metà)	51-75% (più della metà)	76-100% (quasi tutto)
6) Attualmente, quanto si sente depresso o veramente a terra?				
0	1	2	3	4
Per nulla	Poco	Abbastanza	Molto	Moltissimo
7) Quanto si senti giù, il suo umore è più basso al: (se non cambia durante la giornata metta una X sul pallino o altrimenti prosegua).				
0	1	2	3	4
Al mattino presto	Tarda mattinata	Pomeriggio	Sera presto	Sera tardi / notte
8) Quanto spesso ha problemi a prendere sonno?				
0	1	2	3	4
Mai	Qualche volta	Circa la metà delle volte	Di solito	Sempre
9) Quante volte le capita di alzarsi almeno una volta nella notte per motivi differenti dall'andare in bagno?				
0	1	2	3	4
Mai	Meno di 1/7 gg.	Circa una volta a settimana	Più di 1/7 gg.	Sempre

Se ha risposto 0 alla domanda 9 il questionario termina qui

10) Sente il bisogno impellente o l'impulso di mangiare qualcosa quando si sveglia la notte?				
0	1	2	3	4
Per nulla	Poco	Abbastanza	Molto	Moltissimo
11) Quando si sveglia la notte, ha bisogno di mangiare qualcosa per potersi riaddormentare?				
0	1	2	3	4
Per nulla	Poco	Abbastanza	Molto	Moltissimo

segue

12) Quando si sveglia nel cuore della notte, quante volte le capita di mangiare ?				
0	1	2	3	4
Mai	Qualche volta	Circa la metà delle volte	Spesso	Sempre

Se ha risposto 0 alla domanda 12 il questionario termina qui

13) Quando mangia nel cuore della notte, quanto è consapevole di stare mangiando ?				
0	1	2	3	4
Per nulla	Poco	Abbastanza	Molto	Completamente

14) Quanto controllo ha sul mangiare quando si alza la notte?				
0	1	2	3	4
Per nulla	Poco	Abbastanza	Molto	Completamente