

Comparative validity of the Internet and paper-and-pencil versions of the Night Eating Questionnaire

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Abstract

Objective: This study examined the psychometric properties of the Internet and paper-and-pencil versions of the Mandarin Chinese version of the Night Eating Questionnaire (C-NEQ) and compared these measures' validity.

Method: The C-NEQ was evaluated through two different media: 626 participants completed the C-NEQ on the Internet and 160 participants completed the paper-form C-NEQ at the psychiatric outpatient clinics. A subgroup completed both versions of the C-NEQ ($n = 50$). The Night Eating Syndrome History and Inventory was used to identify individuals with night eating syndrome (NES).

Results: The paper-and-pencil and Internet versions of the C-NEQ both showed good internal consistency, reliability, and concurrent validity. Reliability between the Internet and the paper-and-pencil versions of the C-NEQ was excellent ($ICC = .96$). Diagnostic analysis of the C-NEQ's performance using the Receiver Operation Curve method showed excellent results in both versions; the area under the curve did not differ significantly between the versions. Regarding detecting NES, the Internet version had a higher optimal cutoff point than the paper-and-pencil version (23 and 22, respectively).

Conclusions: The Internet and paper-and-pencil versions of the C-NEQ both showed strong reliability and validity; however the two versions appear to differ marginally regarding usage in NES detection.

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1. Introduction

Night eating syndrome (NES), first described in 1955, is an eating disorder characterized by evening hyperphagia, insomnia, and morning anorexia [1]. Over the years, various criteria for NES have been employed and revised. In 2008, diagnostic criteria were created following expert consensus in order to establish useful operational criteria for research

and clinical practice [2]. NES often co-occurs with other eating disorders, anxiety and mood disorders, and alcohol/substance use disorders [3], and differs from sleep-related eating disorder by the presence of full awareness [2]. Recently, NES has gained increased recognition for its role in obesity. NES is prevalent among obese people; however, it also occurs among people with normal weight. NES was estimated to exist in 1.5% of the general population [4]. Some studies have shown that it is more common in specific patient groups, including 12.3 to 22.4% of psychiatric outpatients [5,6], 25% of inpatients with eating disorders [7], and 30.6% of lifetime substance use disorder [5].

The Night Eating Questionnaire (NEQ) is the most widely used NES screening instrument. The latest version consists of 14 items assessing morning anorexia (2 items), initial insomnia (1 item), mood (2 items), percentage of food consumed after dinner (1 item), nocturnal awakenings and

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ingestions (3 items), food cravings and feelings of control over late evening and nocturnal eating (4 items), and awareness during eating episodes (1 item) [8]. Thirteen items (excluding the item examining awareness during eating episodes) are summed as the NEQ total score. The NEQ has been translated into numerous languages. Most translations show satisfactory internal consistency (Cronbach's $\alpha = .70-.87$) [8–11]. A four-factor structure including (1) nocturnal ingestions, (2) evening hyperphagia, (3) morning anorexia, and (4) mood/sleep has been identified in the original English version [8] and two other versions [9,10]. In the Arabic version, the mood and insomnia items belong to different factors, yielding a five-factor structure [12]. In the Hebrew version, the item examining awareness is included in the total score and constitutes an independent factor [11].

The NEQ was originally designed to measure NES symptom severity; however, various cutoff scores (ranging from 20 [5] to 30 [13]) have been used to identify NES in diverse populations (e.g., university students [10,12], the general public [14], attendees visiting psychiatric outpatient clinics [5] or nutritional clinics [11,13], obese patients seeking bariatric surgery [8], and Internet users [8]). Two studies have tested the NEQ's diagnostic validity using semi-structured interviews (i.e., the Night Eating Syndrome History and Inventory; NESHI) [8,15]. The NESHI was developed to examine NES symptom severity and to establish the diagnosis of NES based on proposed diagnostic criteria [2]. No study has examined the NES's criterion validity using the NESHI and the Receiver Operation Curve (ROC) method.

Internet-based data collection and intervention are increasingly popular methods of conducting psychological research. Internet surveys have important advantages (e.g., continuous availability, reduced cost, greater convenience, reduced missing values, reduced social desirability effect [16]). A range of factors may prevent individuals with eating disorders from obtaining medical help (e.g., fear of social stigma, low motivation, lack of accessibility and knowledge among patients and healthcare providers [17]). Internet-based interventions are well placed to resolve these issues through anonymity, greater accessibility, and ease of information dissemination. Some studies examining NES using Internet-based methods have been published [8,10,18]; however, scales' psychometric properties may vary between paper-and-pencil and Internet-based administration [19] and this possibility has not been tested regarding the NEQ.

In this context, this study aimed to examine the reliability and validity of the Internet and paper-and-pencil versions of the Mandarin Chinese NEQ (C-NEQ) and identify the optimal cutoff score for the diagnosis of NES using the NESHI. Additionally, we compared the validity of the Internet and paper-and-pencil versions of the C-NEQ.

2. Methods

2.1. Participants and procedures

The C-NEQ was evaluated in an Internet and an on-site sample. The Internet sample was composed of volunteers

recruited through an Internet program hosted on a server operated by PsychPark in February 2014–November 2015. PsychPark is a popular mental health website in Taiwan and maintains contact with >30,000 members and 200 mental health care specialists. Information provided by PsychPark members has shown excellent reliability [20]. Eligible participants were PsychPark members aged ≥ 18 years. All participants received an e-mail invitation to participate and provided a written indication of informed consent to participate. Information describing the study was added to the PsychPark website to promote recruitment. Real-time data analysis was used to ensure no missing data. Participants completed the Internet-based C-NEQ, Eating Disorder Examination-Questionnaire (EDE-Q) [21], Morningness/Eveningness Scale (MES) [22], and Brief Symptom Rating Scale (BSRS-5) [23]. Demographic information was also collected (i.e., age, gender, educational level, weight, height, employment status, and shift work style). Participants who were willing to be interviewed provided their telephone number immediately after completing the Internet-based questionnaire. Research assistants arranged telephone or face-to-face interviews; these used the eating disorder module of the Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Patient edition (SCID-P) [24] and NESHI [15] for diagnosis of eating disorder and NES, respectively. Interviews were conducted within four weeks of the participant's completion of the online questionnaire. The rater was blind to the participants' C-NEQ scores in the interviews. Participants who were willing to visit clinics to complete face-to-face interviews would be asked to complete other paper-format assessments.

All on-site participants were recruited via Internet advertisement or from among individuals seeking treatment for eating, weight, or emotional problems at psychiatric outpatient clinics; these participants consisted part of a larger pool of patients (108 eating disorders and 14 affective disorders), and controls ($n = 32$) who were recruited for an impulsivity study [25]. One senior resident (first author Tu) and one trained research assistant (nutrition bachelor's degree) administered all participants the eating disorder module of the SCID-P [24] and NESHI [15]. Participants completed a seven-day diary of food intake and the paper-format questionnaire. Inter-rater reliability was .77–.1 between the research interviewer and correspondence author regarding eating disorders and NES diagnosis. A subgroup of on-site participants ($n = 32$) re-completed the C-NEQ within two weeks to examine test–retest reliability. Participants' height, weight, and BMI were recorded. A randomly selected subsample from the on-site group ($n = 34$) completed the C-NEQ and other questionnaires on the Internet within two weeks.

A total of 663 participants (completion rate: 95.9%) and 171 participants completed the Internet C-NEQ and on-site assessments, respectively (Fig. 1). We removed the shift workers in both groups ($n = 37$ and $n = 10$, respectively) for further analyses. Finally, 62 and 50 participants who completed the internet C-NEQ received telephone and

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