



Original Article

Linguistic and psychometric validation of the Chinese version of the self-efficacy measures for sleep apnea questionnaire

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ABSTRACT

Objectives: The self-efficacy measure for sleep apnea (SEMSA) questionnaire was shown to be an effective tool to assess adherence-related cognitions on continuous positive airway pressure (CPAP) therapy in obstructive sleep apnea (OSA) subjects. SEMSA helps to solicit fundamental information for formulating strategies to promote CPAP adherence for better treatment outcomes. The objective of our study was to perform a linguistic and psychometric evaluation of a Chinese version of the SEMSA (SEMSA-C).

Methods: Data were obtained from 100 subjects in a randomized controlled trial (RCT) on CPAP education. Subjects were newly diagnosed of OSA and naïve to CPAP therapy.

Results: A 26-item SEMSA-C was obtained by a rigorous linguistic validation process. Internal consistency was high with Cronbach $\alpha > 0.88$. One-week test–retest intraclass correlation coefficient (ICC) ranged from 0.70 to 0.82. Principal component factor analysis identified three of the same hypothesized factors (perceived risks, outcome expectancies, and treatment self-efficacy) as in the original version. CPAP adherence was associated with outcome expectancies and treatment self-efficacy at 3-month assessment. Further, SEMSA-C demonstrated an improvement in self-efficacy after CPAP use.

Conclusions: SEMSA-C shows similar psychometric properties as the original English version. It is a reliable and responsive instrument to measure perceived risks, outcome expectancies, and treatment self-efficacy in Chinese subjects with OSA.

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1. Introduction

Obstructive sleep apnea (OSA) is a common disease characterized by recurrent episodic collapse of the upper airway during sleep. OSA with daytime sleepiness globally affects approximately 3–7% of adult men and 2–5% of adult women in various ethnic populations [1–4]. Continuous positive airway pressure (CPAP) is the standard treatment for OSA and has been demonstrated to be effective in relieving recurrent upper airway obstruction during sleep, as well as in improving cognitive, cardiovascular, and metabolic functions [5–8]. However, the issue of CPAP treatment adherence has been a primary concern. The rate of rejection or discontinuation of CPAP therapy may range from 5–50% during the first week and 12–25% by 3 years [9]. Suboptimal adherence to CPAP treatment limits its therapeutic effectiveness [9]. To enhance CPAP adherence, efforts have been made to improve

patients' ability to handle side effects and obstacles associated with CPAP use such as early CPAP education and follow-up [10]. Better understanding of patient's knowledge and perception towards OSA and CPAP treatment could help to develop tailor-made strategies to improve CPAP adherence.

Some common psychologic models that have been adopted to explain CPAP adherence, which include Bandura's social cognitive theory (SCT) [11,12], the transtheoretical model [13], Wallston's health locus of control [14], and the health belief model [15]. SCT has been the most widely used among these models [15–25]. SCT posits that individuals learn through observing others' behaviors, attitudes, and outcomes of those behaviors. It stipulates that human motivation and action is guided by forethought, and this theory has been employed to develop strategies to change health behaviors by following the three major cognitive elements, including risk perception, outcome expectancies, and treatment self-efficacy [26,27]. Risk perception is a subjective judgment based on the knowledge of health risks. It creates the precondition for a change, and it has been shown to be related to treatment compliance [28]. Poor awareness of illness especially in chronic diseases has been shown to be related to noncompliance to treatment [28]. Outcome

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expectancy is the individual's perception to likely consequences of a behavior, whereas self-efficacy refers to the belief in one's own ability to learn and perform behaviors toward a desired outcome. According to Bandura, individuals can perform certain behavior with achievement, only when their outcome expectancy and self-efficacy are high [28]. Self-efficacy, outcome expectancies, social support, and knowledge have been shown as significant predictors of CPAP adherence [16]. Positive relationships between CPAP adherence and outcome expectation or self-efficacy have been consistently demonstrated [18,21–23,29]. Contrary to expectation, a negative association between CPAP adherence and risk perception was found [21].

Based on the findings of the study from Stepnowsky et al. [16] in 2002, Weaver et al. [17] developed the self-efficacy measure for sleep apnea questionnaire (SEMSA) in 2003, a comprehensive instrument which not only expands the range of outcome expectancies and application of self-efficacy but also includes measures to decipher understanding of consequences of having untreated OSA. SEMSA consists of 26 items measuring three subscales: risk perception, outcome expectancies, and treatment self-efficacy [17]. SEMSA has been widely adopted and is deemed to be useful for evaluating patients' understanding of their disease, expectations of treatment, and beliefs in self-ability to manage the treatment [21,23,24].

Despite the high potential utility of the SEMSA, its original English version has not been translated and tested in other languages. It is important to translate and validate SEMSA for cross-cultural application in non-English speaking patient populations, to develop specific strategies for improving adherence to CPAP in patients of different cultural backgrounds. Our study aimed to perform linguistic validation and psychometric evaluation of a Chinese version of the SEMSA (SEMSA-C).

2. Methods

There were two stages of validation including (1) linguistic validation of the SEMSA-C by first translating the SEMSA into a traditional Chinese version using the dual panel methodology, followed by cognitive debriefing interviews with OSA subjects; and (2) assessment of scaling and psychometric properties of the SEMSA-C.

2.1. Linguistic validation of the SEMSA-C

A well-established 3-phase linguistic validation procedure was used after obtaining approval for translation from the author of the SEMSA [30] (Fig. 1). First, the original English version of the SEMSA was translated into traditional Chinese independently by two native Chinese, a professional translator (EM) and a polysomnographic technologist/nurse (AL). Both of them were bilingual in Chinese and English. A committee consisting of these two translators and another bilingual Chinese (DF), who had prior experience of linguistic and psychometric evaluation of patient reported outcomes, was then formed. Second, the committee critically reviewed the two Chinese versions, resolved all discrepancies, and obtained a consensus version (phase 1). This consensus Chinese version was then back-translated into English by another translator (KS), without knowing the original English version a priori. The same committee then assessed the back-translation for checking content equivalence with the original English version. Discrepancies among the first forward-translated version (Chinese), the back-translated version (English), and the original SEMSA were discussed and reconciled to form the first draft of the SEMSA-C (phase 2). Lastly, this version was evaluated by cognitive debriefing interviews with five native Chinese subjects who were newly diagnosed of OSA and CPAP naïve to assess acceptability, understand-

ability, relevance, and comprehensiveness of the SEMSA-C. Subjects were asked to comment on the questionnaire items, instructions, and response format. Revisions were made accordingly to ensure item clarity and relevance; thereafter, the final SEMSA-C was obtained for further psychometric evaluation (phase 3).

The final version comprised of three subscales: (1) risk perception (8 items), (2) outcome expectancies (9 items), and (3) treatment self-efficacy (9 items). Response to each item was given on a 1–4 Likert scale, ranging from very low to very high in risk perception subscale, and from not at all true to very true in outcome expectancies and treatment self-efficacy subscales. A higher score indicated a higher risk perception, higher outcome expectancies, and higher treatment self-efficacy.

2.2. Psychometric validation of the SEMSA-C

2.2.1. The study population

The data were obtained from a randomized controlled trial (RCT) which aimed to assess the efficacy of an educational program vs conventional information in improving CPAP adherence. Chinese subjects attending the Sleep Laboratory of Queen Mary Hospital, Hong Kong, from May 2010 to October 2011 who were aged ≥ 18 years, were diagnosed of OSA with AHI ≥ 5 , and were indicated for CPAP treatment and scheduled for an in-laboratory auto-CPAP titration for the first time were invited to participate in the OSA-CPAP educational study. Subjects were excluded if they had central sleep apnea, periodic leg movement disorders, coexisting chronic obstructive pulmonary disease, psychiatric illness on treatment, cognitive impairment, unstable health conditions (i.e., end stage renal failure on renal replacement therapy), or malignancy. Those who were currently pregnant, were on radiotherapy or chemotherapy, were dependent on daily care, or were illiterate also were excluded. A total of 212 subjects with OSA were referred for CPAP titration during the study period and 106 subjects fulfilled inclusion and exclusion criteria, but six of them refused to participate. One hundred subjects were enrolled into the OSA-CPAP educational study, and the SEMSA-C data of both groups (education group and control group) at baseline and at 3-month evaluation were used in our analysis.

The research protocol was approved by the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster with HKW IRB registration number: UW177 and was registered in Clinical trials of National Institutes of Health <http://www.clinicaltrials.gov> with the ClinicalTrials.gov Identifier number: NCT01173406. All subjects gave written informed consent prior to enrolling in the study.

2.2.2. Data collection

All subjects participating in the RCT were invited to self-complete the SEMSA-C at baseline assessment, after giving written informed consent and before randomization or CPAP titration were done. All subjects should have received information of OSA and CPAP treatment from attending doctors, but they should not have attended any OSA or CPAP educational class. Subjects were invited to answer the SEMSA-C again at the 3-month evaluation. Twenty-five randomly selected subjects also were asked to self-complete the SEMSA-C again at 1 week after baseline before they commenced at-home CPAP treatment and returned their completed questionnaires by mail.

2.3. Statistical analysis

The subscales of the SEMSA-C were scored as in the original English version. The mean of item responses was calculated for the three subscales. Using the baseline data, the performance of

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