Heart & Lung xxx (2017) 1–8

Contents lists available at ScienceDirect

Heart & Lung

journal homepage: www.heartandlung.org

Development of the Chinese-version of the exercise self-regulatory efficacy scale for patients with chronic obstructive pulmonary disease

Yu-Han Tsai, MSN, RN [a], Jyu-Lin Chen, PhD, RN, CNS, FAAN [b], Amy H.T. Davis, PhD, FNP [c], Wen-Jiuan Yen, PhD, RN [d], Yen-Ju Lin, PhD, RN [d], Li-Chi Chiang, PhD, RN [e], Yu-Ju Chen, PhD, RN [e,*]

[a] Department of Nursing, Tri-Service General Hospital, No.325, Sec.2, Chenggong Rd., Neihu District, Taipei 114, Taiwan
[b] School of Nursing, University of California San Francisco, 2 Koret Way, San Francisco, CA 94143, USA
[c] College of Health and Society, Hawaii Pacific University, 45-045 Kamehameha Hwy, Kaneohe, HI 96744, USA
[d] School of Nursing, Chung Shan Medical University, No. 110, Sec.1, Jianguo N. Rd, Taichung 402, Taiwan
[e] School of Nursing, National Defense Medical Center, No.161, Sec. 6, Minquan E. Rd., Neihu Dist., Taipei 114, Taiwan

ARTICLE INFO

Article history:
Received 23 May 2017
Received in revised form
25 October 2017
Accepted 27 October 2017
Available online xxx

Keywords:
Exercise self-regulatory efficacy
Cross-cultural adaptation
Psychometrics
Translation
Instrument

ABSTRACT

Background: A valid and reliable instrument for assessing exercise self-regulatory efficacy (Ex-SRE) is lacking in Taiwan.
Objective: To develop and validate a Chinese-version of the Ex-SRE scale (***Ex-SRES-Chinese***).
Methods: Published guidelines were followed for cross-cultural adaptation of ***Ex-SRES-Chinese***. Psychometric testing was conducted in 76 subjects with chronic obstructive pulmonary diseases (COPD).
Results: *Ex-SRES-Chinese* achieved clarity, culture appropriateness, and functional equivalence for measuring Ex-SRE. The scale-level content validity index of the ***Ex-SRES-Chinese*** was 0.99. The internal consistency reliability (Cronbach's α) was 0.925. Factor analysis identified a single factor with a high eigenvalue of 7.6 accounting for 47.5% of the total variance. The construct validity of ***Ex-SRES-Chinese*** was supported by higher Ex-SRE in subjects who exercise regularly in the past than those who did not ($p = 0.033$). In addition, Ex-SRE was positively associated with weekly exercise time ($r = 0.58$; $p < 0.0001$).
Conclusions: *Ex-SRES-Chinese* is a useful cross-culturally adapted instrument with good psychometric properties for measuring Ex-SRE in COPD patients in Taiwan.

Introduction

Chronic obstructive pulmonary disease (COPD) is a progressive and irreversible lung disease with significant negative impact on the patient's psychological and physiological health.[1,2] The World Health Organization (WHO) projects that COPD will be the third leading cause of death by the year 2030.[3] As the number of people with COPD continues to increase worldwide, concomitant increases in the associated morbidity, mortality, and overall medical costs are imminent.[4,5] COPD also poses a major healthcare concern in Taiwan. Currently, COPD is the seventh leading cause of death,[6] and the national prevalence of COPD in adults aged 40 years or older is 6.1% in Taiwan.[7] In addition, it is the second most common reason for physician visits.[8]

Prior evidence has shown that patients with COPD derive both psychological and physiological health benefits from adhering to regular exercise.[9,10] However, patients with COPD may face additional challenges in maintaining a regular exercise regime, such as shortness of breath with exertion, need for oxygen use, or frequent exacerbations.[11] According to Social Cognitive and Self-Efficacy Theories, as sentient beings, we humans have the capability to interact with our environment and regulate our thoughts and behavior (Self-Regulation).[12,13] The stronger our belief is in our abilities (Self-Efficacy), the more likely we will regulate and adjust

Abbreviations list: Ex-SRE, Exercise self-regulatory efficacy; Ex-SRES, Exercise self-regulatory efficacy scale; ***Ex-SRES-Chinese***, Chinese-version of the Ex-SRE scale; COPD, Chronic obstructive pulmonary disease; WHO, World Health Organization; CVI, Content validity index; I-CVI, Content validity of the individual item; S-CVI, Content validity of overall scale.

Funding: This work was supported by a Tri-Service General Hospital grant (TSGH-C101-160).

* *Corresponding author.*
E-mail address: judychen37@gmail.com (Y.-J. Chen).

0147-9563/$ – see front matter © 2017 Elsevier Inc. All rights reserved.
https://doi.org/10.1016/j.hrtlng.2017.10.007

our thoughts and behavior, in ways that will help us persist through challenges, overcome obstacles, and achieve desirable results (Self-Regulatory Efficacy).[12–14] Exercise self-regulatory efficacy (Ex-SRE) is an individuals' confidence in their ability to exercise regularly when faced with difficulties or impediments.[12–14] Ex-SRE has been reported to positively influence adherence to regular exercise in patients with COPD and other chronic diseases.[15–17] Therefore, assessing Ex-SRE may be important for understanding exercise adherence.[15–17] A scale to measure Ex-SRE, the Exercise Self-Regulatory Efficacy Scale (Ex-SRES) exists in English.[14] However, an instrument in Chinese to measure Ex-SRE in patients with COPD is lacking in Taiwan.

The Ex-SRES is a 16-item questionnaire asking subjects to report the degree to which they are confident they could continue to exercise regularly (3 times a week for 20 min) when faced with various impediments. It was originally developed in the United States based on a Caucasian sample with mild to moderate COPD.[14] Ex-SRES has demonstrated a one-factor structure with a high eigenvalue of 6.79 and excellent internal consistency reliability (Cronbach's α of 0.917).[14] In addition, in COPD participants, the higher Ex-SRES scores were significantly associated with more exercise behavior and better health status ($r = 0.41$, $p < 0.0001$; $r = 0.37$, $p < 0.0001$, respectively).[14]

Apart from the obvious language differences between the United States (English), and Taiwan (Chinese), there are discernible cultural differences between the west and the east that may affect people's self-concepts and cognitive styles.[18,19] Importantly, there is increasing evidence that there are cultural differences regarding how information is processed in understanding the cognitive and communicative processes underlying the response to a survey.[20] Therefore, an instrument sourced from another language and culture requires careful adaptation for it to be linguistically clear and conceptually relevant to the new culture.[21,22] By following established processes, such as Beaton and Guillemin's guidelines for translation and adaptation of self-report measures for cross-cultural research, the prospect of maintaining the content validity of an instrument at a conceptual level across cultures is heightened.[22,23]

However, a rigorous and comprehensive linguistic translation process alone is not sufficient to confirm construct reliability and validity. Therefore, after translation of an instrument has been completed, it is important that the psychometric properties of the instrument are tested in the target population.[23–25] Thus, the aim of this study was to initiate the translation and cross-cultural adaptation of the Ex-SRES (Table 1-1) to ***Ex-SRES-Chinese*** (Table 1-2) and perform a preliminary evaluation of its psychometric properties in patients with COPD in Taiwan.

Methods

Development of ***Ex-SRES-Chinese*** involved three phases: I) tool translation, II) tool evaluation, and III) psychometric evaluation. During phase I and II, Ex-SRES was converted into ***Ex-SRES-Chinese*** following the guidelines for cross-cultural adaptation.[21,23,25] Subsequently, an expert committee, which included bilingual health professionals with Ph.D. level training in the methodology, reviewed all of the reports generated through the various steps to ensure that the reports provided an accurate reflection of each step. In phase III, reliability and validity of the ***Ex-SRES-Chinese*** were preliminarily evaluated using a sample of Taiwanese subjects with COPD at a medical center in Northern Taiwan. This study was approved by the Institutional Review Board of the Tri-Service General Hospital in Taipei, Taiwan (*TSGHIRB100-05-230*).

Phase I: tool translation

The tool translation phase encompassed two primary steps. First, the original English version of the Ex-SRES was translated into Chinese. Then, it was translated back into English.

Translation of Ex-SRES to Chinese

To capture the nuances of the Chinese language, two bilingual nurses with diverse backgrounds, whose native language was Chinese, independently translated the original English version (Ex-SRES) into Chinese (***Ex-SRES-Chinese***). Initially, two versions of ***Ex-SRES-Chinese*** were generated, one from each of the nursing experts (one was well versed with study concepts and one was not).[23] Additionally, two translators were invited to join the expert committee to help resolve any discrepancies between the two initial versions of ***Ex-SRES-Chinese*** and to generate a single consensus version of ***Ex-SRES-Chinese*** for subsequent back translation into English.

The expert committee arrived at a single consensus version of ***Ex-SRES-Chinese*** after discussion of two items (item *two* and *sixteen*) that were discrepant between the two nurses who performed the initial translation of Ex-SRES to Chinese.

Item *two* queried the subject's confidence in exercising regularly if the subject experienced "aches and pains" while exercising. Since in Chinese, the phrase "aches and pains" does not exist, one translator directly translated the phrase using two different Chinese words that meant pain, essentially "pain and pain", which was awkward. The other translator changed the phrase to a common Chinese expression of "pain and discomfort", which had a slightly different connotation in Chinese from "aches and pains". Item *sixteen* queried about the subject's confidence in exercising regularly when the subject "did not feel like it (exercising)". Since in Chinese, the word "feel" is not used in this manner, one translator translated it into "when I dislike exercising". The other translator translated it into "when I do not think that I want to exercise". After discussion, the committee adopted "pain or discomfort" for item *two*, and "when I do not think that I want to exercise for item *sixteen*.

The layout of the original Ex-SRES also generated committee discussion. The layout of Ex-SRES presented the *question stem* "I believe that I could continue to exercise 3 times a week for 20 min" only once at the top of the questionnaire, and then presented each condition in a subsequent list of items. However, this short-handed layout does not flow well in written Chinese and may seem unintelligible to the subject. Therefore, the committee decided to incorporate the stem of the question into each condition elicited by the items in ***Ex-SRES-Chinese***.

*Translation of **Ex-SRES-Chinese** back into English*

To highlight conceptual inconsistencies or errors, the ***Ex-SRES-Chinese*** was back-translated into English. The ***Ex-SRES-Chinese*** was sent to two other bilingual individuals for independent back-translation. These individuals' native tongue was English. They had neither a background in medicine nor familiarity with the study concepts. They were also blinded to the original English version of the Ex-SRES.[23]

The new expert committee, to which the forward and back translators were added, was assembled to consolidate the Chinese and English versions of the Ex-SRES. Following the guideline developed in Beaton's article,[23] the committee made decisions by discussing each item until consensus was achieved as to how to optimally represent semantic, idiomatic, experiential, and conceptual equivalence of the ***Ex-SRES-Chinese*** with the original