



## Original Article

# Development and validation of a brief version of the traditional Chinese Stressors in Nursing Students scale among college nursing students in Taiwan

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### ABSTRACT

**Objective:** The 43-item Stressors in Nursing Students (SINS) scale has been evaluated among nursing students in several countries, including China, Hong Kong, Japan, Pakistan, and Spain. However, the original four-factor structure has not been consistently replicated in all of these populations. The aim of this study was to develop a brief version of the traditional Chinese SINS (TC-SINS) scale and to validate it in Taiwanese nursing students. **Materials and Methods:** Data obtained from a cross-sectional survey study of 814 nursing students in a nursing college and a university in Taiwan were randomly divided into two parts. The first part was used to conduct an exploratory factor analysis using principal axis factoring with oblique rotation. After the removal of cross-loading items, the resulting scale was validated with the data from the second part using confirmatory factor analysis. **Results:** A three-factor solution (social, clinical, and education) with 23 items accounting for 54.5% of variance was obtained in the exploratory factor analysis. The confirmatory factor analysis further reduced the number of items to 20. The goodness-of-fit indexes were good (Root Mean Square Error of Approximation = 0.075 and Comparative Fit Index = 0.90). **Conclusions:** The number of items in the TC-SINS could be reduced from 43 to 20, without sacrificing its psychometric properties. The brief version of TC-SINS might be able to reduce respondent burden.

**KEYWORDS:** *Factor analysis, Nursing student, Secondary analysis, Stress*

## INTRODUCTION

In recent years, there has been increasing attention on stress perception in nursing students. Many nursing students experience clinical, academic, and personal stress during the course of their training [1]. Stress could affect the psychological well-being of a nursing student, which in turn might affect their ability to provide quality patient care [2,3]. Therefore, there is a need for measuring perceived stress in nursing students.

The Stressors in Nursing Students (SINS) scale is a 43-item self-administered questionnaire that originally developed for use with nursing students in Scotland. Exploratory factor analysis indicated that four dimensions of stress were apparent, namely, academic, clinical, financial, and confidence [4]. The scale was subsequently translated into several languages and evaluated in different populations. The same four-factor structure was observed in a sample of Hong Kong nursing students [5]. A similar four-factor structure, albeit with a slightly different configuration of item loadings

on each of the factors, was also obtained in a simplified Chinese version of the SINS scale when applied to 1090 nursing students in China [6]. Recently, a Spanish version of the SINS scale was administered to 368 nursing students in Spain, and the confirmatory factor analysis revealed the same structure [7]. Nevertheless, the four-factor structure was not exactly replicated in all versions of the SINS. The distribution of items among factors was different when a Japanese version of the SINS scale was evaluated in 1298 female Japanese nursing students [8]. Similarly, when a translated version of the SINS scale was evaluated in 726 nursing studies in

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Pakistan, no clear factor structure emerged [9]. Given that the four-factor structure might not be universally applicable to nursing students of different cultural backgrounds, the aim of this study was to re-examine the factor structure of the scale and to develop a brief version of the SINS scale in traditional Chinese (TC). This study used the data that we collected for exploring the factors associated with perceived stress in Taiwanese nursing students [10]. In the original study, we used the total score of the TC-SINS as the outcome variable, but did not explore the factor structure of the scale.

## MATERIALS AND METHODS

### Design and participants

The study design, recruitment of study participants, translated procedure were described in our previous report [10]. Briefly, nursing students were recruited from a college in central Taiwan and a university in eastern Taiwan using convenience sampling. Only students who had already completed their first clinical practicum of basic nursing skills were eligible for inclusion. Eligible students were asked to complete a self-administered questionnaire, containing questions on basic characteristics and the TC-SINS. The SINS was translated to TC by one of the corresponding authors (HS) who is a bilingual native Chinese speaker. Back translation was performed by the first author (SP) who is a bilingual native Chinese speaker proficient in nursing education. Cross-checking of the SINS was conducted to confirm that the translation had preserved the meaning of the original items of the scale. The TC-SINS consisted of 43 items with a five-point Likert-type response scale that ranging from 1 (not stressful) to 5 (extremely stressful). The study protocol was approved by the human research ethics committee of the National Dong Hua University, Taiwan (No. 200802).

### Statistical analysis

Descriptive statistics were computed using frequency and percentage or mean and standard deviation, as appropriate. Principal axis factoring with oblique rotation was conducted following the method described by Ferguson and Cox [11]. The suitability of the data for exploratory factor analysis was evaluated using the Kaiser-Meyer-Olkin (KMO) measure of sample adequacy and Bartlett's test of sphericity. Using a minimum loading of items on components of 0.40, after each rotation, cross loading items were removed from the analysis and the remaining items were rotated again. This procedure was repeated until no further cross loadings were observed and a simple structure was obtained.

The validity of the items composing the latent variables obtained from the exploratory factor analysis was assessed using confirmatory factor analysis. Standardized factor loadings and modification indexes of error terms were examined to inform whether model revision would be required to reduce model misspecification. In addition, the Root Mean Square Error of Approximation (RMSEA), with acceptable values  $\leq 0.08$ , and the Comparative Fit Index (CFI), with acceptable values  $\geq 0.90$  were used to evaluate goodness-of-fit of the model. All data were analyzed using IBM SPSS Statistics for Windows, Version 25.0, except that confirmatory

data analysis was conducted using IBM SPSS Amos, Version 21.0 (Armonk, NY: IBM Corp.).

## RESULTS

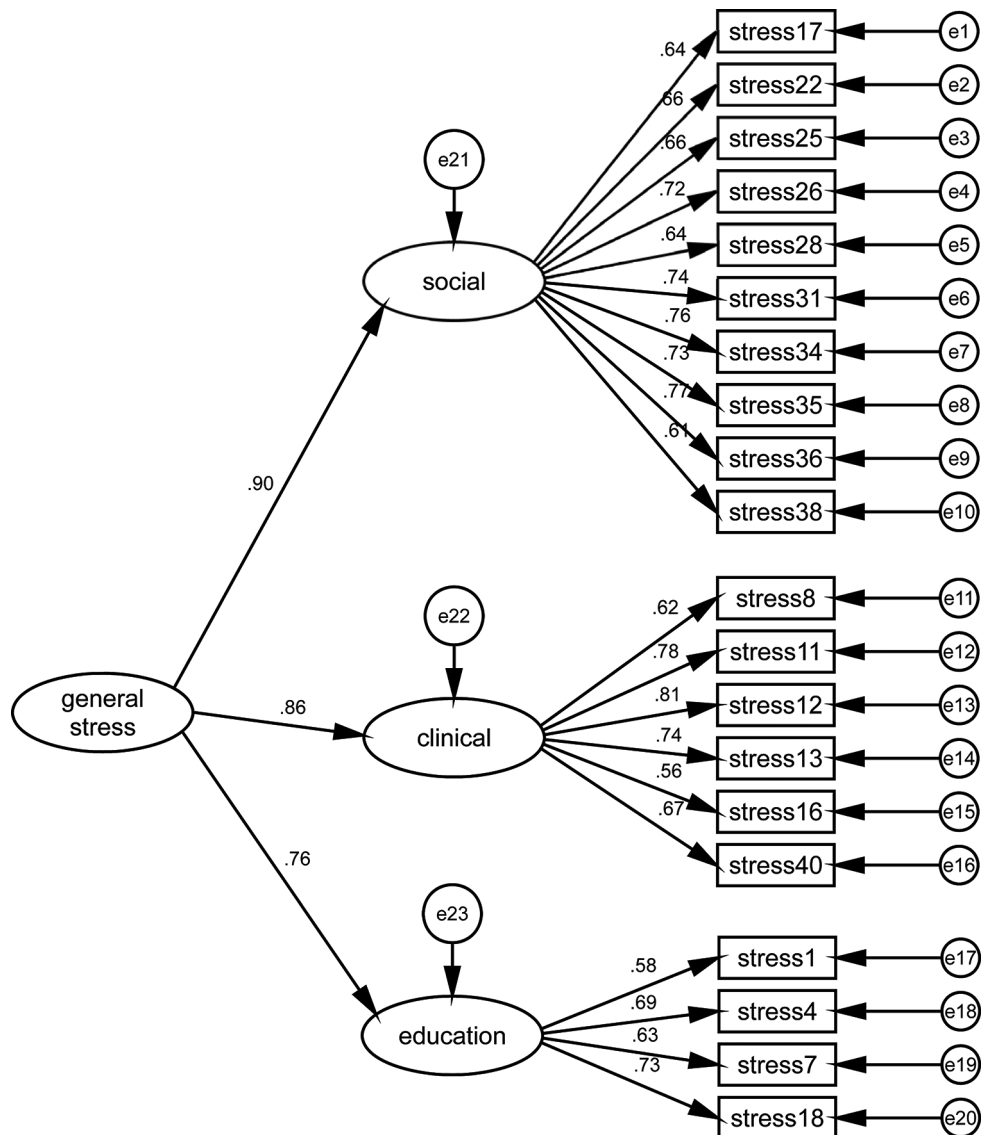
In this study, the dataset with 814 students were randomly divided into two parts, with 400 of them used in the exploratory factor analysis and the remaining 414 used in the subsequent confirmatory factor analysis. First, an exploratory factor analysis was performed and a four-factor solution with 43 items could explained 54.2% of the total variance. However, because of cross loadings in the items, 20 items were removed. The resulting three-factor solution consisted of 23 items, accounting for 54.5% of the total variance [Table 1]. The three factors were labelled as social, clinical, and education. The outcome of the KMO test was 0.94, indicating sufficient covariance in the scale items for the exploratory factor analysis. The Bartlett's test of sphericity was statistically significant ( $P < 0.001$ ), indicating that the correlation matrix was not identical.

Next, the 23 items obtained from the exploratory factor analysis were imported into IBM SPSS Amos for confirmatory factor analysis. The path diagram in Figure 1 shows that the model is a second-order model with a set of first-order factors associated to the observed variables and a second-order factor that captures shared variance among the first-order latent variables. Standardized factor loading estimates for all items were  $>0.50$ , which represent a high convergent validity, and therefore, no items were dropped. However, on examination of the modification indices, in particular, covariance of the error terms revealed strong correlations in three items (items 19, 33, and 37), and therefore, these items were dropped from the model.

The overall fit of the remaining 20-item model was assessed with two indexes. The value for RMSEA, an absolute fit index, was 0.075, which is below the 0.08 guideline indicating a good model fit. The value for CFI, an incremental fit index, was 0.90, which also reflects a good model fit. In addition, the average variance extracted was calculated to be 0.48, 0.49, and 0.44 for confidence stress, clinical stress, and education stress, respectively. These values were close to the 0.5 cut-off that signifies adequate convergence. Furthermore, construct reliability for the three constructs were found to be 0.903, 0.852, and 0.754, respectively, which suggested good reliability.

## DISCUSSION

This study evaluated the psychometric properties of the TC-SINS on 814 nursing students in Taiwan. The data were randomly split into two parts for exploratory factor analysis and confirmatory factor analysis. After the removal of cross loading items in the exploratory factor analysis and model checking in the confirmatory factor analysis, the numbers of items were reduced from 43 in the original scale to only 20. In addition, unlike previous studies conducted in Hong Kong [5], China [6], Spain [7], and United Kingdom [4], where a four-factor structure to the SINS has been evident, a three-factor structure was observed in the present study.



**Figure 1:** Path diagram for the final confirmatory factor analysis model with standardized factor loadings of the three-factor traditional Chinese version of the Stressors in Nursing Students structure. Ellipsoids represent latent variables, rectangles represent the traditional Chinese version of the Stressors in Nursing Students items and their item number, and circles represent error terms. Numbers on the arrows represent standardized factor loadings.

However, this is not the only study with a structure that the SINS scale has been shown to differ from that reported in the original study. A cross-sectional survey study in 726 nursing students from 11 schools of nursing in Pakistan reported that only a single dimension appeared to be present. The authors of the study suggested that nursing students in Pakistan did not appear to differentiate between various types of stressors [9]. Another study on 501 Japanese nursing students also found that their four-factor structure was not identical to that identified in previous studies. While two factors, namely, “clinical” and “education” were the same, two remaining factors were different. A “conflict and confidence” factor, which partly resembles the confidence factor and a new “free time” factor had emerged [8]. The authors of the study suggested that, for Japanese nursing students, having enough free time to enjoy life outside of their school work was important. Cultural variations appear to play a role in the perception of stress among nursing students.

It should be noted that although the people in Taiwan, Hong Kong, and China share the Han Chinese heritage and similar collectivistic cultures, there are distinct variations in health care and education system, which may influence their perceptions of stress and their coping style. In addition, the sources of study participants and timing of data collection were dissimilar between the studies in Taiwan, Hong Kong [5], and China [6]. The present study recruited students from one university and one college, and the questionnaires were administered to the students after they had completed their first clinical practicum of basic nursing skills. The students in the Hong Kong study were recruited from a university and the data were obtained between the beginning and the end of their 1<sup>st</sup>-year program. Finally, the students in the China study were from a university hospital college nursing school and the data were collected either when they returned to school for examination or during their clinical practicum. Variations in the stage of vocational training and the duration

**Table 1: Factor loadings of a brief version of the traditional Chinese version of the Stressors in Nursing Students scale**

Item number and item wording	Factor loadings		
	Social	Clinical	Education
36. Conflicts with college staff	0.790		
35. Having no time for entertainment	0.783		
28. Not having enough money for entertainments	0.773		
25. Not having enough time for friends and family	0.750		
37. Surviving on a low income	0.669		
38. Personal health problems	0.574		
22. The lack of free time	0.557		
26. The college response to students needs	0.547		
31. Not having anyone to talk to about the course	0.508		
34. Not being sure what is expected on placements	0.401		
19. The atmosphere created by teaching staff	0.391		
17. Conflicts with peers	0.375		
12. Caring for the emotional needs of patients		0.855	
11. Relations with staff in the clinical area		0.763	
8. Patients' attitudes towards me		0.707	
13. The attitudes and expectations of other professionals (doctors, administrators, social workers, etc.) towards nursing		0.619	
40. Speaking to patients' relatives		0.432	
16. Fear of poor job prospects		0.414	
4. The difficulty of the classwork material to be learned			0.716
1. The amount of classwork material to be learned			0.675
18. Having too much to learn			0.575
7. Examinations and placement gradings			0.517
33. Fear of failing in the course			0.498

of recall period at the time of data collection might explain the divergence between this study and others.

The reasons speculated by Watson *et al.* [9] might also be applicable in the present study. For instance, “going out” and “having a good time,” which can put a financial strain on the low-income students in the West, are important parts of students' lives. However, these activities are generally not being viewed as important among Taiwanese nursing students. In addition, the mean age of nursing students in the United Kingdom is generally older than those in Taiwan because many of them are pursuing nursing as a second career. Perception of stress is likely to be different at various stages of life. Therefore, similarly to study on Pakistani nursing students [9], specific dimensions of stressors that nursing students experience could be masked by a general experience of stress in Taiwanese nursing students.

In terms of the factor labelling, two of our factors, clinical and education, were identical to those identified in previous studies. However, we labelled our third factor as “social” rather than “confidence” because it contains, in addition to those covering confidence, items on conflicts and financial issues. While it is possible to consider conflicts items as a reflection of confidence, as suggested by Watson *et al.* [8], it appears to be far-reaching to link financial and time issues with confidence. Therefore, the label “social” was used in this study for the factor with 10 items, which covered items on conflicts, financial, friendship, and free time.

Our study has a few limitations. First, convenience sampling of students from two educational institutions could limit the generalizability of the findings. Second, the data were

randomly divided into two parts for cross-validation. Ideally, new independent samples should be collected for confirmatory factor analysis. Nevertheless, our sample size was sufficiently large to be divided into two parts for exploratory factor analysis and confirmatory factor analysis [12].

## CONCLUSIONS

Findings from this study indicated that the number of items in the TC-SINS could be reduced from 43 to 20, without sacrificing its psychometric properties. A three-factor structure, namely, social, clinical, and education was obtained from the brief version of the TC-SINS. This new brief version of the TC-SINS can be employed in future studies to potentially reduce respondent burden.

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## Conflicts of interest

There are no conflicts of interest.

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