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Validation and Psychometric Assessment of the Student Nurse Stressor-14 Scale Among Undergraduate Nursing Interns

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Abstract

Assessment tools for evaluating stress experienced by undergraduate nursing interns during clinical training in China remain limited. Existing scales often fail to capture the specific stressors unique to clinical practice. This study aimed to explore the structure of the Chinese-adapted Student Nurse Stressor-14 Scale (SNS-14-CHI) and to assess its reliability and validity among Chinese undergraduate nursing interns. The original SNS-14 was adapted to the Chinese context and refined based on expert review. A total of 414 nursing interns from three cities in China completed the questionnaire. Reliability was assessed through internal consistency, split-half reliability, and test-retest stability. Construct validity was evaluated using both exploratory and confirmatory factor analyses. All 14 items were retained in the SNS-14-CHI. Exploratory factor analysis identified a two-factor structure, with some differences in item loadings compared to the original scale. Confirmatory factor analysis indicated a good fit of the model. The overall Cronbach's alpha was 0.934, with the two factors showing coefficients of 0.890 and 0.898. The content validity index reached 0.964, and the two-factor solution accounted for 60.45% of the total variance. Split-half reliability and test-retest stability were 0.869 and 0.762, respectively. The SNS-14-CHI is a reliable and valid instrument for assessing stressors among undergraduate nursing interns. Its application can guide nursing educators and administrators in identifying stress sources and designing interventions or educational programs to support nursing students during clinical practice.

Keywords: Undergraduate nursing interns, Clinical training, Stress assessment, Psychometric evaluation, Reliability, Validity

Introduction

Stress is commonly defined as a nonspecific reaction of individuals when confronted with challenging or adverse situations [1, 2]. Research indicates that environmental stressors can increase biological vulnerability and negatively affect health [3]. For nursing students, the clinical learning environment is a particularly significant source of stress [4], acting as both a trigger and an aggravating factor that can compromise well-being [5]. Stress is widely recognized as a psychosocial factor that may interfere with nursing students' academic performance and clinical competence [6-9]. Compared to students in other professional programs, nursing students often report higher levels of stress, typically ranging from moderate to high [7, 10]. Although nursing students do not bear the same level of responsibility as licensed nurses, they are frequently exposed to similar stressors. Unlike other disciplines, nursing students are tasked with some degree of responsibility for patient care, which can disrupt campus life and social engagement [11].

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Previous studies have categorized nursing student stressors into academic-related stressors (e.g., clinical training demands, patient care responsibilities, interactions with clinical staff, insufficient knowledge or skills, workload) and external stressors (e.g., financial pressures, personal or social challenges), most of which are encountered during clinical placements [12-14]. Nursing is an applied discipline that integrates theory with practice. In China and elsewhere, completing a practical phase involving direct patient care is mandatory for graduation and professional qualification [15, 16]. Clinical practice plays a pivotal role in developing nursing competencies, enhancing social and professional skills, and facilitating adaptation to nursing roles [17]. Exposure to real-world clinical situations enables students to better understand nursing expertise, appreciate the profession's realities, and strengthen both knowledge and practical skills [18].

Despite the benefits of clinical placements, the stress experienced during these periods should not be underestimated. High levels of stress can lead to clinical errors, endangering patient safety [19]. Additionally, clinical stress can cause physical and psychological symptoms, including headaches, anxiety, sleep disturbances, cognitive difficulties, and reduced learning capacity, potentially undermining students' commitment to the nursing profession [20]. Understanding the stressors and stress patterns of nursing interns is therefore essential for developing strategies to enhance coping skills and mitigate negative outcomes.

Currently, the primary instrument used in China to assess nursing student stress is the Nursing Student Stress Index Scale [21], which has demonstrated good reliability and validity. However, it is not specifically designed to evaluate stressors during clinical practice. In 2019, Irish researcher Patricia Sheridan developed the Student Nurse Stressor-15 Scale (SNS-15) to assess stressors in undergraduate geriatric nursing interns (ages 17–25). The SNS-15 focuses on stressors related to resources, knowledge, and workload [22]. Although this scale captures stressors unique to clinical placements, it has not yet been validated for use in other cultural contexts.

The SNS-15 includes items assessing practical challenges such as missed attendance, travel distance to clinical sites, weekly work schedules, and adequacy of facilities. In China, regulations require nursing students to complete at least eight months of clinical practice, and insufficient attendance may affect eligibility for professional registration. Traveling to placement sites can impose additional logistical and financial burdens, and some students may incur extra accommodation costs when public transportation schedules do not align with clinical hours. Shift work patterns and inadequate placement facilities can also contribute to stress and reduce motivation for pursuing a nursing career. Currently, no validated instrument in China effectively measures these specific clinical stressors. Therefore, this study aimed to translate and culturally adapt the SNS-15 for Chinese undergraduate nursing interns and evaluate its reliability and psychometric properties.

Aims and expected outcomes

Given the differences in cultural context between China and Ireland, as well as the distinct characteristics of the target populations, variations in scale content were anticipated. This study aimed to evaluate the psychometric properties of the Student Nurse Stressor Scale in a sample of Chinese undergraduate nursing interns. It was hypothesized that the Chinese-adapted version would demonstrate good reliability and validity in assessing stressors specific to clinical practice.

Instruments and Methods

Translation and cultural adaptation

Permission was obtained from the original SNS-15 scale authors prior to translation. The Brislin two-step translation and back-translation method was followed [23]. First, two graduate students independently translated the English version into Chinese, and the translations were reconciled into a single draft (Version A) after discussion with the research team. Next, two English language experts, who had not seen the original scale, back-translated Version A into English. Cross-cultural adaptation was conducted to ensure the items were culturally and contextually relevant: the original author was consulted for item meanings, and a psychologist and nursing expert reviewed the translations to resolve any discrepancies.

The original scale included 15 items across two dimensions. Item 8, which pertained to access to resources (e.g., wheelchairs, bed sheets, personal care items), was considered irrelevant for Chinese nursing interns who have limited interaction with patient caregivers regarding these items; it was therefore removed. This resulted in the 14-item Chinese version, SNS-14-CHI. A pre-test with ten nursing interns was conducted to assess clarity and comprehension of the scale items (final English version provided in supplementary materials).

Study design and participants

The study was carried out from December 2022 to March 2023 using convenience sampling. Undergraduate nursing interns from clinical placements in Shenyang, Dalian, and Jinzhou, Liaoning Province, were invited to participate. To meet factor analysis requirements, at least ten participants per scale item were recruited [24]. Eligibility criteria included: (1) being a full-time undergraduate nursing intern, (2) providing informed consent and volunteering to participate. Interns on medical leave were excluded. Researchers coordinated with internship

site supervisors to distribute the questionnaires, which were completed on-site. A total of 420 questionnaires were distributed; 6 were incomplete, leaving 414 valid responses (response rate: 98.6%). Participants' responses were anonymous, except for 30 who provided contact information for a two-week test-retest reliability assessment. Informed consent was obtained from all participants.

Instruments

1. **Demographic Questionnaire**: Collected basic information including age, gender, leadership experience, interest in nursing, hometown, and family income.
2. **Student Nurse Stressor-14 Scale (SNS-14-CHI)**: Adapted from the SNS-15 developed by Patricia Sheridan [22], this 14-item scale measures stress among nursing interns in two dimensions: knowledge and workload. Items are rated on a 5-point Likert scale (1 = highly stressed, 5 = not stressed); lower scores indicate higher stress levels.
3. **Perceived Stress Scale (PSS-14)**: A Chinese-adapted version [25] was used to assess general stress levels. The 14-item scale includes two dimensions: loss of control (reverse-scored items: 4, 5, 6, 7, 9, 10, 13) and tension (items 1, 2, 3, 8, 11, 12, 14), with higher scores reflecting greater perceived stress.

Data analysis

Data were analyzed using SPSS 26.0 and AMOS 24.0. Descriptive statistics were presented as mean ± standard deviation for continuous variables, and frequencies and percentages for categorical variables. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted to evaluate the construct validity of SNS-14-CHI, and reliability was assessed via internal consistency, split-half reliability, and test-retest stability.

Validity analysis

To examine and confirm the underlying factor structure of the SNS-14-CHI, both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted. The total sample of 414 undergraduate nursing interns was randomly split into two equal groups, with 207 participants for EFA and 207 for CFA. Prior to factor extraction, the suitability of the data was assessed using the Kaiser-Meyer-Olkin (KMO) measure, with values greater than 0.6 considered acceptable, and Bartlett's test of sphericity, with statistical significance set at $P < 0.05$. Factor extraction was guided by visual inspection of the scree plot. CFA was performed using AMOS 24.0 to evaluate the goodness-of-fit of the factor model.

Item analysis

The discriminatory power of individual items was assessed using the extreme group method. Total SNS-14-CHI scores were ranked, with the top 27% classified as the high group and the bottom 27% as the low group. Independent samples t-tests were used to compare item score differences between these groups. Item-total correlations and Cronbach's alpha if item deleted were also calculated to determine whether each item should be retained.

Content validity

Six experts evaluated the content validity of the SNS-14-CHI through the Delphi method. Each item was rated on a 4-point scale: 1 = not relevant, 2 = weakly relevant, 3 = relevant, and 4 = highly relevant. The item-level content validity index (I-CVI) was calculated as the proportion of experts rating an item as 3 or 4, and the scale-level content validity index (S-CVI) was derived as the average of all I-CVI values.

Criterion validity

The Perceived Stress Scale (PSS-14) was used as the reference standard to preliminarily assess the criterion-related validity of the SNS-14-CHI.

Reliability analysis

Internal consistency was evaluated using the split-half method, calculating the correlation between two halves of the scale. Test-retest reliability was assessed after a two-week interval among 30 selected undergraduate nursing interns to examine the temporal stability of the scale.

Results

Descriptive statistics

The study included 414 undergraduate nursing interns, of whom 117 (28.3%) were male and 297 (71.7%) were female. Participants' ages ranged from 20 to 27 years, with a mean of 22.77 ± 1.69 years. In terms of birthplace, 226 (54.6%) were from rural areas and 188 (45.4%) from urban areas. Additional demographic characteristics are presented in **Table 1**.

Table 1. Sample characteristics

ariables	Total(N = 414) N(%)/(Mean ± SD)	EFA(N = 207) N(%)/(Mean ± SD)	CFA(N = 207) N(%)/(Mean ± SD)
Age in years	22.77 ± 1.685	22.75 ± 1.632	22.78 ± 1.739
Gender			
Male	117(28.3)	67(32.4)	50(24.2)
Female	297(71.7)	140(67.6)	157(75.8)
Homeplace			
Rural areas	226(54.6)	116(56.0)	110(53.1)
Urban areas	188(45.4)	91(44.0)	97(46.9)
Household income status			
≥ 30,000RMB/per month	27(6.5)	16(7.7)	11(5.3)
≥ 10,000RMB/per month	151(36.5)	73(35.3)	78(37.7)
> 5000RMB/per month	212(51.2)	105(50.7)	107(51.7)
≤ 5000RMB/per month	24(5.8)	13(6.3)	11(5.3)
Experience of student leaders			
Yes	201(48.6)	99(47.8)	102(49.3)
No	213(51.4)	108(52.2)	105(50.7)
Like the nursing major or not			
Yes	320(77.3)	156(75.4)	164(79.2)
No	94(22.7)	51(24.6)	43(20.8)

Item analysis

For the SNS-14-CHI, the discrimination index for individual items ranged from 12.832 to 22.467 ($p < 0.001$), all exceeding the threshold of 3.0, supporting the retention of all 14 items. Pearson correlation coefficients between each item and the total scale score ranged from 0.654 to 0.790 ($p < 0.001$), demonstrating strong item-total correlations. Furthermore, Cronbach's α values after deleting any single item ranged from 0.927 to 0.931, indicating that removing any item would not enhance the overall internal consistency of the scale. Therefore, all 14 items were retained **(Table 2)**.

Table 2 Item analysis for Chinese version of the Student Nurse Stressor-14 Scale

Item	Item score(SD)	Cronbach's Alpha if item deleted	t-test	Correlation coefficient between item and total score
1	3.66(1.12)	0.931	−12.832	0.654
2	3.02(1.15)	0.931	−16.690	0.679
3	3.30(1.10)	0.928	−19.271	0.761
4	3.30(1.12)	0.928	−19.684	0.761
5	3.28(1.12)	0.927	−19.287	0.790
6	3.15(1.15)	0.928	−18.725	0.769
7	2.91(1.22)	0.931	−17.627	0.692
9	3.57(1.12)	0.929	−17.353	0.740
10	3.81(1.10)	0.930	−13.615	0.688
11	3.57(1.13)	0.929	−16.607	0.737
12	3.24(1.13)	0.927	−20.210	0.774
13	3.65(1.18)	0.927	−22.467	0.784
14	3.27(1.25)	0.929	−20.757	0.749
15	3.67(1.16)	0.930	−15.416	0.687

Construct validity

Exploratory factor analysis (EFA) demonstrated that the dataset was suitable for factor extraction, with a Kaiser-Meyer-Olkin (KMO) value of 0.941 and a statistically significant Bartlett's test of sphericity ($\chi^2 = 1582.967$, $P < 0.001$), well above the recommended threshold of 0.6. Using principal component analysis, two factors with eigenvalues greater than 1.0 were extracted, explaining 60.445% of the total variance. Factor loadings for each item are presented in **Table 3**, with items 1, 14, and 15 loading differently compared to the original scale. The scree plot indicated a clear two-factor solution, with a noticeable inflection point after the second factor **(Figure 1)**.

Table 3. Factor loadings of exploratory factor analysis for the SNS-14-CHI

Items	Interpersonal Relationships and Resource	Knowledge and Workload
S11	0.780	
S10	0.779	
S9	0.769	

S13	0.613	
S14	0.609	
S1	0.574	
S15	0.528	
S12	0.527	
S2		0.822
S7		0.808
S6		0.742
S4		0.670
S5		0.628
S3		0.589

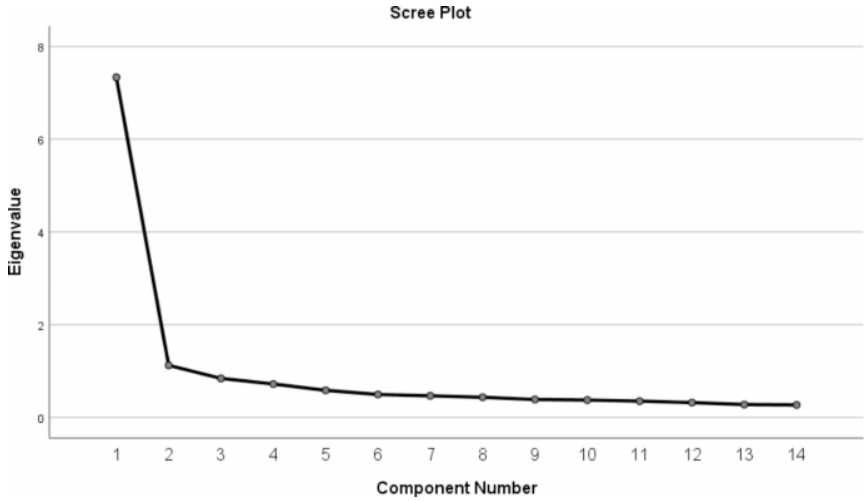

Figure 1. Screen plot of exploratory factor analysis of SNS-14-CHI

The two-factor model demonstrated an acceptable fit to the data. The model fit indices were as follows: χ^2/df (CMIN/DF) = 2.160, goodness-of-fit index (GFI) = 0.904, root mean square error of approximation (RMSEA) = 0.075, comparative fit index (CFI) = 0.955, normed fit index (NFI) = 0.920, Tucker-Lewis index (TLI) = 0.942, and incremental fit index (IFI) = 0.955. The final model fit statistics are summarized in **Table 4** and illustrated in **Figure 2**.

Table 4. Result of the confirmatory factor analysis of SNS-14-CHI(n = 207)

Items	χ2/df	GFI	RMSEA	CFI	NFI	TLI	IFI
Fitting standards	≤ 3.00	> 0.09	< 0.08	> 0.09	> 0.09	> 0.09	> 0.09
Fitting results	2.160	0.904	0.075	0.955	0.920	0.942	0.955

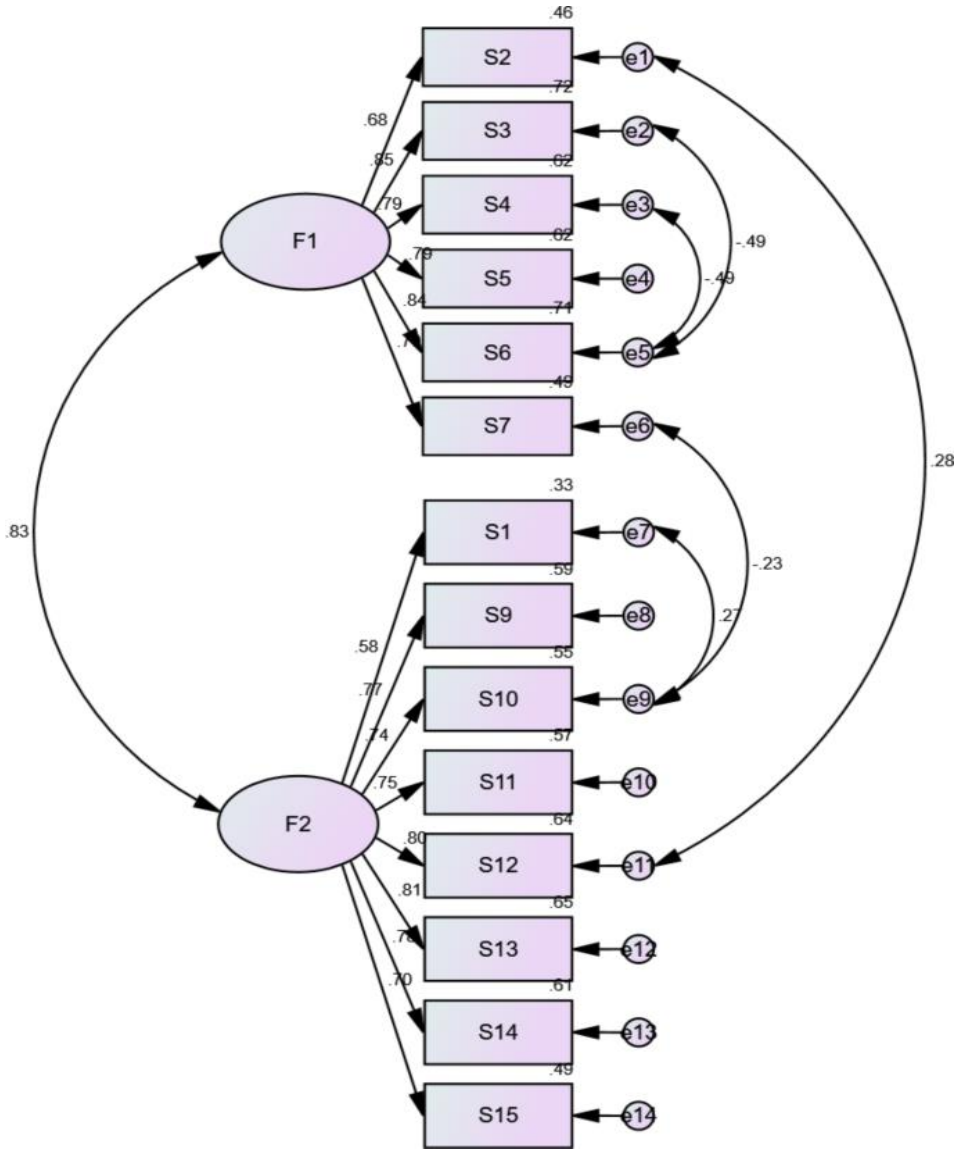

Figure 2. Standardized two-factor structural model of SNS-14-CHI (n = 207)

Content validity

Six experts were invited to rate the content validity of SNS-14-CHI, with an I-CVI of 0.833 to 1.000 and an S-CVI/Ave of 0.964 **(Table 5)**.

Table 5. Item-level CVI for the SNS-14-CHI

Items	Expert1	Expert2	Expert3	Expert4	Expert5	Expert6	I-CVI
1	4	2	4	4	4	4	0.833
2	4	4	4	3	4	4	1
3	4	3	4	4	4	3	1
4	4	4	4	3	3	4	1
5	4	4	3	4	4	4	1
6	4	4	4	4	4	4	1
7	3	4	4	3	4	4	1
9	4	3	4	3	3	3	1
10	4	4	3	3	4	4	1
11	4	4	4	4	3	4	1
12	4	3	4	3	4	4	1
13	3	4	2	3	3	3	0.833
14	4	4	4	2	3	4	0.833
15	4	4	3	3	4	4	1

Criterion validity

To assess criterion validity, correlation analysis was conducted between the SNS-14-CHI and a widely used stress scale, the PSS-14. Results indicated a significant negative correlation ($r = -0.369$, $p < 0.001$), suggesting that the SNS-14-CHI is a valid tool for evaluating stress levels among Chinese undergraduate nursing interns.

Reliability

The SNS-14-CHI demonstrated excellent internal consistency, with a total Cronbach's alpha of 0.934. The two factors showed Cronbach's alpha values of 0.890 and 0.898, respectively. The split-half reliability of the scale was 0.869. Furthermore, retest reliability assessed over a two-week interval in a randomly selected subset of 30 interns was 0.762 **(Table 6)**.

Table 6. Reliability analysis for Chinese version of the Student Nurse Stressor-14 Scale

The scale and its dimension	Cronbach's Alpha	split-half reliability	Test-retest reliability
SNS−14-CHI	0.934	0.869	0.762
Knowledge and Workload	0.890		
Interpersonal Relationships and Resource	0.898		

Differences in characteristics of stress among undergraduate nursing interns

The results of the variance analysis are presented in **Table 7**. The findings indicated that household income and students' interest in their nursing major were significant factors influencing the total scores on the SNS-14-CHI.

Table 7. Comparison of SNS-CHI-14 scores for stress with different characteristics

	M	SD	t/F	P-value	Pairwise differences
Gender			1.232	0.219	
Male	48.51	12.536			
Female	46.93	11.432			
Homeplace			−1.123	0.262	
Rural areas	46.79	11.465			
Urban areas	48.09	12.099			
Household income status			12.407	0.000	(1)>(2)>(3),(4)
≥ 30,000RMB/per month	55.59	10.649			
≥ 10,000RMB/per month	50.01	11.680			
> 5000RMB/per month	45.12	11.406			
≤ 5000RMB/per month	41.58	8.097			
Experience of student leader			1.919	0.056	
Yes(1)	48.52	11.664			
No(2)	46.31	11.778			
Like the nursing major or not			3.945	0.000	(1)>(2)
Yes(1)	48.59	11.133			
No(2)	43.24	12.911			

Discussion

In this study, the SNS-14 scale was first adapted to the Chinese context using the Brislin double-translation model combined with expert review, resulting in the revised SNS-14-CHI. Our findings confirmed that the SNS-14-CHI demonstrates strong reliability and validity, making it a suitable tool for assessing stress among undergraduate nursing interns.

The content validity analysis showed I-CVI values ranging from 0.83 to 1.00 and an S-CVI/Ave of 0.964, exceeding the commonly accepted thresholds of 0.78 and 0.90, respectively [26]. This indicates that the SNS-14-CHI has excellent content validity. The scale retained a two-factor structure with 14 items, compared to the original 15-item structure. After expert consultation, item 8 was removed. The original scale's dimensions were knowledge and workload (items 1–7, 14, 15) and resources (items 8–13). Exploratory factor analysis (EFA) in this study revealed that factor 1 included six items (2–7) and was named "Knowledge and Workload," while factor 2 contained eight items (1, 9–15) and was renamed "Interpersonal Relationships and Resources" based on literature and expert input.

EFA explained 60.445% of the total variance, and all items had factor loadings ≥0.60, which is considered acceptable [27]. Some item attributions differed from the original scale (items 1, 14, 15), reflecting contextual differences between China and Ireland. The importance of interpersonal relationships is supported by Peplau's theory, emphasizing nurse-patient interactions [28], and Bandura's social learning theory, highlighting the role of socialization in learning [29]. In China, mentors are predominantly university faculty who provide not only academic guidance but also professional, career, and psychological support, whereas in Ireland, mentors are

typically clinical registered nurses. Positive faculty-student interactions have been shown to improve clinical adaptation and professional confidence [30-32].
Factor 2 also reflects practical considerations such as transportation and accommodation. Longer distances from the clinical site increase absenteeism, and financial burdens related to placement logistics are a significant source of stress for students [16, 33]. Therefore, factor 2 was renamed to encompass both interpersonal relationships and resources, reflecting the combination of social and logistical influences on nursing interns. Differences in scale structure may be attributed to variations in medical environments, cultural backgrounds, and educational systems between countries.
Confirmatory factor analysis (CFA) demonstrated good model fit, with CMIN/DF < 3, GFI, TLI, CFI, NFI, and IFI > 0.9, and RMSEA < 0.08 [34], confirming the structural validity of the SNS-14-CHI. Overall, the SNS-14-CHI is a psychometrically sound instrument for evaluating stress in Chinese undergraduate nursing interns.

Reliability and criterion validity
A significant negative correlation was observed between the SNS-14-CHI and PSS-14 scores ($r = -0.369$, $p < 0.001$). This aligns with previous findings indicating that the clinical learning environment is closely associated with students' perceived stress levels [4]. Higher SNS-14-CHI scores reflect lower perceived stress, while higher PSS-14 scores indicate higher stress, explaining the negative correlation. The SNS-14-CHI demonstrated strong internal consistency, with Cronbach's alpha values exceeding 0.8 for both the overall scale and its subscales. Additionally, retest reliability was greater than 0.7, and split-half reliability exceeded 0.8 among Chinese undergraduate nursing interns [35]. These results indicate that the SNS-14-CHI is stable and reliable, making it a valid tool for assessing stress in this population.

Differences in stress based on socioeconomic and career preference factors
Analysis revealed significant differences in stress levels based on family income ($p < 0.05$), with interns from lower-income households reporting higher stress. Family economic status likely affects the availability of financial support, which can buffer stress; higher-income families may provide more resources to alleviate pressure [14,36].
Stress levels also differed according to participants' preference for the nursing profession. Those who favored a nursing career reported lower stress levels than those who did not, consistent with prior research [37, 38]. Students with a stronger professional preference typically have a higher sense of professional identity [39], which can enhance motivation, adaptability to clinical settings, and reduce stress during internships [40]. These findings indicate that both financial support and professional interest are important factors influencing nursing interns' stress.

Limitations

This study has several limitations. First, although the sample size met the recommended criteria, the participants were concentrated in Liaoning Province, with a higher proportion of female students, which may limit the generalizability of the findings to the broader population of Chinese nursing interns. Future research should include multicenter and larger-scale surveys to further validate the SNS-14-CHI. Second, the data were self-reported, which introduces the potential for response bias. While the confirmatory factor analysis supported model fit, the discriminant and convergent validity of the scale's factors should be further examined in subsequent studies.

Conclusion

This study is the first to evaluate the cross-cultural validity of the SNS-14-CHI, demonstrating that it has good psychometric properties in a sample of Chinese undergraduate nursing interns. Overall, the SNS-14-CHI was shown to be a reliable and valid instrument for assessing stress in this population.

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