

Korean Society of
Nursing Science

Contents lists available at ScienceDirect

Asian Nursing Research

journal homepage: www.asian-nursingresearch.com

Research Article

Turkish Version of the Student Nurse Stress Index: Validity and Reliability

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ARTICLE INFO

Article history:

Received 4 October 2016

Received in revised form

16 March 2017

Accepted 23 May 2017

Keywords:

education
nursing
students

SUMMARY

Purpose: This study aimed to adapt the Student Nurse Stress Index (SNSI) for the Turkish nursing students and investigate its psychometric properties.**Methods:** Research was conducted with 152 volunteer female students who attended a university college in Ankara, Turkey. Test-retest reliability was investigated for the scale internal consistency (Cronbach α) and stability. Also, content validity and construct validity of the SNSI were assessed. In order to determine the construct validity of SNSI, Uygulamalı Çok Değişkenli İstatistiksel Yöntemler and confirmatory factor analysis was conducted.**Results:** The Turkish version of SNSI with 15 items comprised four factors (academic load, clinical concerns, personal problems, interface worries). The content validity index (CVI) score was .97. Factor loadings of Turkish version of SNSI varied between .532 and .868. The “personal problems” subscale explained 19.01% of the variance; “clinical concerns” explained 18.51%; “interface worries” explained 15.32%; “academic load” explained 14.14%. The total variance explained was 66.99%. CFA results (χ^2/SD , GFI, CFI, TLI, IFI, RMSEA and SRMR) were acceptable and in good agreement. The internal consistency coefficient of the SNSI was .86.**Conclusion:** Results showed that the SNSI had a satisfactory level of reliability and validity in nursing students in Turkey. Multicenter studies including nursing students from different nursing schools are recommended for the SNSI to be generalized.© 2017 Korean Society of Nursing Science, Published by Elsevier Korea LLC. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Stress is described as a person's mental, and/or physical limits being challenged in new and different situations, leading to nonspecific responses to the pressure on the organic system [1]. Stress is a dynamic interaction between the individual and the environment [2]. Selye defined stress as “a response given by the organism to stimuli” in 1952 [3]. Many students experience stress at high levels at the beginning of university education due to various changes required by the new environment, and this has been investigated by many researchers [3–5]. Nursing is an applied science. An applied science approach reveals the relationship

between theory and application, and comes to life with implementation of the theory. Student nurses are faced not only with academic stress but concerns of possibly hurting the patients as a result of the interventions they perform during the clinical internship period [6]. Deary et al. [7] reported that student nurses experienced stress in four areas: academic, clinical, personal and financial. Pulido-Martos et al. [6] evaluated the stressors for student nurses in three areas as academic stressors (such as fear of education, test and exam failure), clinical stressors (such as fear of making a mistake, negative reactions to suffering or dying patients, interactions with other staff) and personal/social stressors (such as economic problems, imbalance between homework and school). Hirsch et al. [8] reported lack of professional training, practical knowledge, free time and entertainment as factors that caused stress in student nurses. Responsibilities of being a university student and the course load can make student nurses experience

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intensive stress in some periods of time [8]. The content of the theoretical knowledge and the complexity of the methods regarding the education, study skills, the difficulty of homework and exams, evaluation methods, exam notes and maintaining or developing them, fear of failure, excessive workload, many daily activities and lack of time create stress for the students [1,6]. The students are especially known to experience stress at a high level during their first clinical experiences [9–11]. The students believe that they are responsible for the lives and health of other people. They therefore have fears of making mistakes, harming the patient, and facing negative reactions at the beginning of clinical practice [12]. The necessity of using new theoretical knowledge during clinical practice and compliance with the hospital environment leads to stress. Student nurses experience the most stress because of insufficient professional training and practical knowledge [13]. The student who feels uncomfortable and unprepared for professional practice experiences stress. Patient and patient relatives, the clinical instructor, healthcare professionals and clinical practices are also basic stress sources for students [14].

The stress that can occur due to the nature of nursing education is a psychological factor affecting the academic performance and welfare of the students [15]. In this regard, stress can lead to dissatisfaction with nursing education and leaving the profession in the long term. It is important to explore the stress conditions of the students and the causative factors, and help them develop stress management skills in order to improve their quality of life and prevent exhaustion [13]. Beck and Srivastava developed a stress inventory of 35 items evaluating the stress sources as reported by student nurses in 1991 [16]. The nurse students stress index (SNSI) of 22 items was developed by Jones and Johnston in 1999 due to certain structural problems of the previous scale [9].

Concepts such as tolerance, understanding, respect for other cultures, being helpful, not harming and compassion are primary values in Turks due to the Turkish tradition and character and the Islamic value system. The inability to use interactive education methods such as simulation in a widespread manner can result in the students starting their clinical internships without having the opportunity to develop clinical skills. The students can therefore be hesitant about what is expected from them, and what they should do; they may also experience anxiety about harming the patients with the interventions they perform. Scientific and technological advances increase the expectation from nursing students to adapt and provide qualified care to a large number of patients in a short period of time. This influences how nursing students cope with the academic, personal, clinical and environmental stresses they experience during their education and there is no measurement tool like the SNSI that evaluates this situation as a whole in Turkey. In this study, we aimed to adapt the SNSI for the Turkish nursing students and investigate its psychometric properties.

Method

Research design

This study was planned and applied as a methodological study. The research questions were the following: (a) Is the Turkish version of the SNSI a valid and reliable measurement tool? (b) Are the psychometric characteristics of the SNSI an appropriate tool for measuring the stress perceived by nursing students in Turkey?

Samples

The data of this study was collected with face-to-face interviews from the nursing students who consented to participate in the study. A total of 152 students who continued their education at the

university during the 2015–2016 educational year and consented to participate in the study formed the study group. The nursing department in the university enrolled 421 students. But we could only reach 152 students who would like to participate in the study and completed all the data. Also, the SNSI consists of 22 items and our sampling size was approximately 152 with a ratio of 1 to 7. All of the participants were students. All were single and resided in the province.

Instrument

The SNSI consisted of 22 items clustered into four factors: academic load, clinical concerns, personal problems and interface worries. All items used a Likert scale ranging from 1 (*not stressful*) to 5 (*extremely stressful*). The four factors and their items are listed below:

“Academic load” includes items number 1, 2, 3, 8, 14, 18, and 20, and the score range is between 7 and 35; “clinical concerns” includes items number 13, 14, 16, 17, 18, 19, and 20 and the score range is between 7 and 35; “personal problems” includes items number 9, 10, 11, and 12, and the score range is between 4 and 20; “interface worries” includes items number 4, 5, 6, 7, 15, 21, and 22, and the score range is between 7 and 35 [9].

Procedure

We first obtained permission from Martyn C. Jones to evaluate the psychometric suitability of the SNSI to the Turkish culture. The English form of the index was translated into Turkish by bilingual investigators and two translation experts. The translated versions thought to explain each item best were chosen. The created Turkish form was reviewed and the compliance of each item with the Turkish culture and society was discussed, followed by appropriate corrections for content validity. The Davis technique was taken into account when evaluating the translation [17]. A preliminary administration was then conducted in a group of seven university students to make sure that the translation was easy to understand for face validity. It took about 15–20 minutes for the participants to complete the questionnaire. The SNSI was administered twice to the 143 students in the study group with an interval of 2 weeks in order to evaluate the test-retest reliability.

Data analysis

Content validity index (CVI) of the scale was assessed with the Davis technique. Test-retest reliability was investigated for the scale internal consistency (Cronbach α) and stability. The Pearson correlation coefficient was used for test-retest reliability, but the mean scores of the measurements conducted at different times were compared with *t* test in dependent groups. The structural validity of the scale was investigated with exploratory factor analysis and principal components analysis (varimax rotation). The suitability of the data for factor analysis was investigated with the Kaiser-Meyer-Olkin (KMO) coefficient and Bartlett's sphericity test. The structure of the dimensions according to the results of exploratory factor analysis was verified by confirmatory factor analysis (IBM SPSS Amos 21.0; IBM Corp, Armonk, NY, USA). Those with a factor loading value of .50 and over were selected. SPSS 23.0 and Amos 21.0 program (IBM Corp) was used for the analysis of the data.

Ethical considerations

The necessary permissions were obtained from the faculties of the students that formed the sample of this study and the Gulhane Military Medical Academy Ethics Committee (11th session, approval no. 372).

Results

Content validity

The content validity index of the SNSI was determined with the Davis technique based on the opinions of 6 experts (teaching staff from the fields of nursing fundamentals: psychiatric nursing, gynecology and obstetrics nursing, surgical nursing). Both the original scale and the scale translated into Turkish were sent to the experts for evaluation in terms of clarity within the content of the Davis technique. Accordingly, each item was scored from 1 to 4 (1 = *not relevant*, 2 = *somewhat relevant*, 3 = *quite relevant*, 4 = *highly relevant*). The experts were asked for their opinions regarding the items they believed were not appropriate during the scoring. The number of experts who marked the “quite relevant” or “highly relevant” options was then divided by the total number of experts. This procedure enabled determining the CVI [17]. Thus, the CVI of the scale items of our study varied between .83 and 1 and the scale's CVI score was .97.

Structural validity

Exploratory factor analysis

KMO coefficient was used and the Bartlett's sphericity test was performed to conduct factor analysis of the measurement tool items when identifying structural validity. The value found for the KMO coefficient was accepted as perfect when close to 1 (perfect at .90, very good at .80, mediocre at .70 and .60, poor at .50) and unacceptable under .50 [18]. The chi-square value calculated for the Bartlett's sphericity test should be statistically significant [19]. When the factorization suitability of SNSI was evaluated in our study, the KMO coefficient was found to be .80 and the Bartlett's sphericity test χ^2 value was 1010.63 ($p < .001$). These results showed the normality of the scores and that the data were appropriate for factor analysis. Factor analysis started with 22 items as in the original form. Exploratory factor analysis was implemented to investigate the factor structure shown by SNSI. As a result of this analysis, we found that the SNSI consisted of 6 sub-dimensions with 22 items, and the total variance explained was 67.7%. In order to use the more powerful items, 3 items (items no. 6, 7, and 20) with a factor loading of less than .50 were removed. Three items (items no. 8, 21, 22) were removed because of the factoring alone. One item (item no. 13) was removed due to the strong loading on more than one factor. As a result of the exploratory factor analysis, 7 items of SNSI were removed. After the exploratory factor analysis, the 15-item scale (Turkish version of SNSI) had a four-factor structure, which was the same as the original form. We found that the first factor consisted of four items (items no. 9, 10, 11, 12), the second factor consisted of four items (items no. 16, 17, 18, 19), the third factor consisted of four items (items no. 4, 5, 14, 15) and the fourth factor consisted of three items (items no. 1, 2, 3). The factors were named “personal problems” (Factor 1), “clinical concerns” (Factor 2), “interface worries” (Factor 3) and “academic load” (Factor 4) similar to the original structure, by factor loadings of the Turkish version of SNSI varied between .53 and .87 (Table 1). The “Personal problems” subscale explained 19.0% of the variance, the “clinical concerns” subscale explained 18.5%, the “interface worries” subscale explained 15.32%, and the “academic load” subscale explained 14.1%. The total variance explained was 67.0% (Table 2).

Confirmatory factor analysis

Confirmatory factor analysis is a frequently used statistical process in adaptation studies of previously developed scales. The measurement model established to confirm the new construction

Table 1 Factor Loadings of Items of SNSI (N = 152).

Items	Personal problems	Clinical concerns	Interface worries	Academic load
Item 10 (Physical health of other family members)	.87			
Item 9 (Actual personal health problems)	.77			
Item 12 (Other personal problems)	.76			
Item 11 (Relationships with parents)	.76			
Item 17 (Client attitudes towards my profession)		.87		
Item 16 (Client attitudes towards me)		.85		
Item 18 (Atmosphere created by teaching staff)		.73		
Item 19 (Relations with staff in the clinical area)		.70		
Item 5 (Attitudes/expectations of other professionals towards nursing)			.83	
Item 15 (Lack of timely feedback about performance)			.69	
Item 4 (Peer competition)			.63	
Item 14 (Too much responsibility)			.53	
Item 1 (Amount of classwork material to be learned)				.79
Item 3 (Examination and/or grades)				.79
Item 2 (Difficulty of classwork material to be learned)				.71

Note. SNSI = Student Nurse Stress Index.

Table 2 SNSI Factor Loadings and Explained Variance Values (N = 152).

Factors	Initial eigenvalues			Total factor loadings (rotated)		
	Total	Variance explained %	Cumulative %	Total	Variance explained %	Cumulative %
Personal problems	5.26	35.1	35.1	2.85	19.0	19.0
Clinical concerns	1.94	12.9	48.0	2.78	18.5	37.5
Interface worries	1.80	12.0	60.0	2.30	15.3	52.9
Academic load	1.05	7.0	67.0	2.12	14.1	67.0

Note. SNSI = Student Nurse Stress Index.

consisting of 15 items was analyzed. First of all, the chi-square values were examined for possible changes in the model by looking at the modification index (MI values) tables. The modification, in which the highest MI value was shown, was carried out by linking where conceptually appropriate. As a result, the model was confirmed (Figure 1). In this study, confirmatory factor analysis was conducted on the basis of chi-square goodness (acceptable value ≤ 3), goodness of fit index (GFI, acceptable value $\geq .85$), comparative fit index (CFI, acceptable value $\geq .90$), Tucker-Lewis index (TLI, acceptable value $\geq .90$), incremental fit index (IFI, acceptable value $\geq .90$), root mean square error of approximation (RMSEA, acceptable value $\leq .08$) and standardized root mean square residual (SRMR, acceptable value $\leq .10$). When the fit index values were examined, we found that the results were acceptable and in good agreement (Table 3).

Reliability analyses

Internal consistency

The internal consistency of scale items was evaluated with the Cronbach α coefficient. The internal consistency coefficient of SNSI was .86. The internal consistency coefficient of the “personal

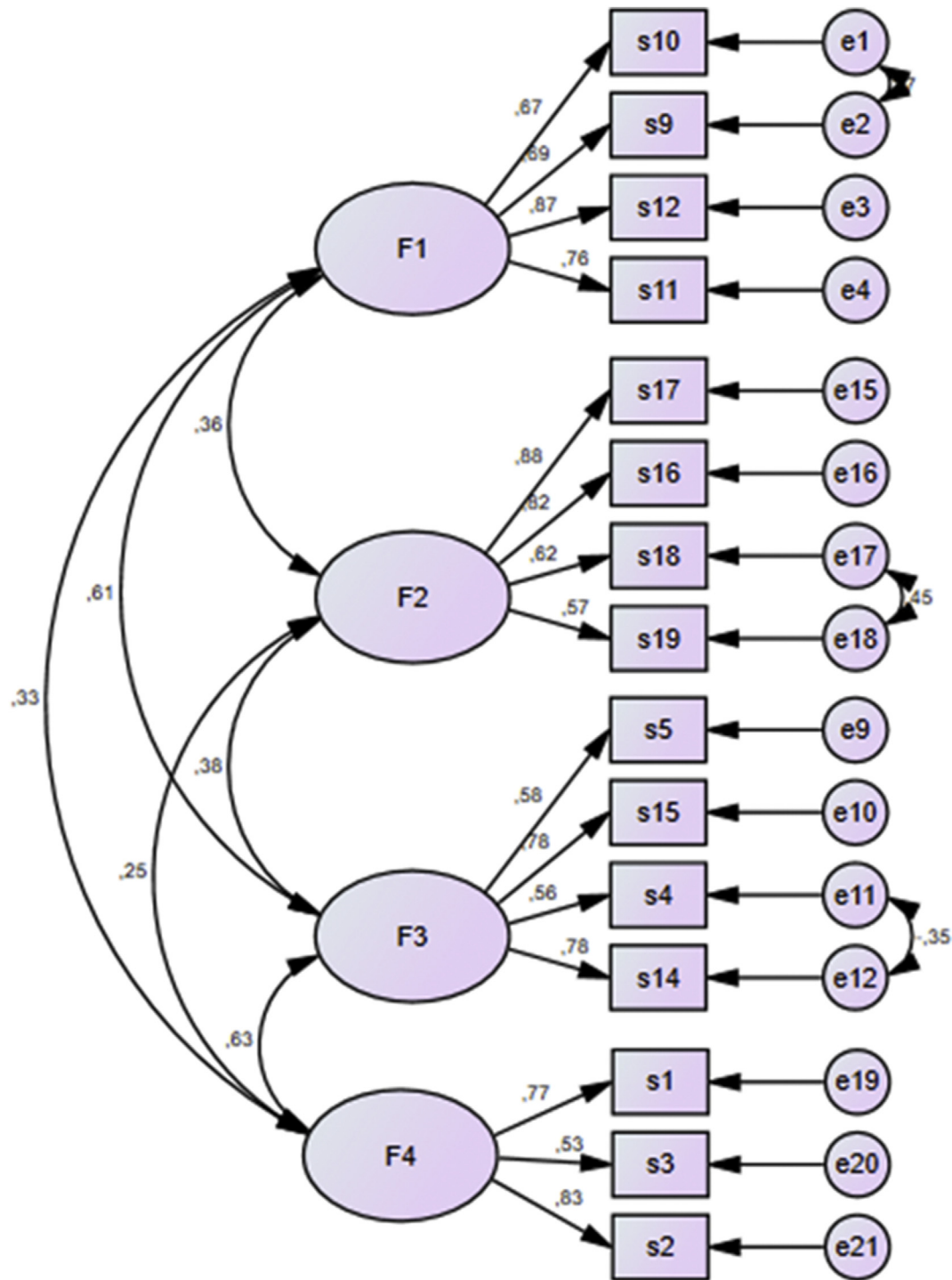


Figure 1. Confirmatory factor analysis of SNSI. Note. SNSI = Student Nurse Stress Index.

problems”, “clinical concerns”, “interface worries” and “academic load” subscales were .85, .83, .73 and .74 respectively (Table 4).

Test-retest consistency

The mean scale scores were compared with the “*t* test in dependent groups” in order to evaluate the stability of SNSI over time and no statistically significant difference was found ($p > .05$). The Pearson correlation coefficient was used for test-retest reliability while the mean scores of the measurements conducted at different times were compared with the *t* test in dependent groups.

A mildly significant relationship was found between the test-retest scores with the Pearson correlation test when evaluating the stability of SNSI over time ($r = .63, p = .001$).

Discussion

The surface validity of the SNSI has been examined in order to evaluate its clarity in the Turkish language. Also, the content validity index of the SNSI was determined. The content validity of the SNSI scale items varied between .83 and 1; the scale content

Table 3 Confirmatory Factor Analysis of SNSI ($N = 152$).

	Index values	Acceptable values
χ^2/SD	1.76	≤ 3
GFI	.89	$\geq .85$
IFI	.94	$\geq .90$
TLI (NNFI)	.92	$\geq .90$
CFI	.94	$\geq .90$
RMSEA	.07	$\leq .08$
SRMR	.08	$\leq .10$

Note. CFI = comparative fit index; GFI = goodness of fit index; IFI = incremental fit index; NNFI = nonnormed fit index; RMSEA = root mean square error of approximation; SNSI = Student Nurse Stress Index; SRMR = standardized root mean square residual; TLI = Tucker-Lewis Index.

validity index score was .97. Davis [17] have recommended a minimum CVI score of .80. We decided that the experts were harmonious because the calculated values were higher than the minimum value.

The reliability of scales used to evaluate psychometric characteristics is related to internal consistency. Internal consistency indicates how consistent the scale items are when measuring the same situation or characteristic [20]. Test-retest and Cronbach α coefficient were used to evaluate internal consistency in this study. The lack of a statistically significant difference between test-retest measurements demonstrates the stability of the SNSI scores over time and supports the reliability of this measurement tool. Test-retest and Cronbach α coefficient were also used to evaluate reliability in this study. The lack of a statistically significant difference between test-retest measurement mean scores and a correlation coefficient of .63 ($p = .001$) indicates stability of the SNSI scores over time and supports the reliability of this measurement tool. The Cronbach α coefficient was .86 for SNSI and .85, .83, .73, and .74 respectively for the “personal problems”, “clinical concerns”, “interface worries” and “academic load” subscales. Another study where the stress levels of student nurses in India and the affecting factors were investigated has reported the Cronbach α coefficient of SNSI as .79 [21]. The Cronbach α coefficient of SNSI was reported as .89 in a California study on 154 student nurses [22]. A Cronbach α coefficient higher than .70 is recommended for measurement tools [23]. These results show the reliability of the Turkish form of SNSI. On the other hand, the lack of a statistically significant difference between the test-retest results over time supports the stability and consistency of the scale.

Factor analysis, which is used in identifying structural validity, is a statistical technique for finding a small number of new (common) unassociated variables by bringing related variables together in a multivariable event [18,19]. The Turkish SNSI was found to have a four-factor structure similar to the original structure of the scale in exploratory factor analysis conducted to investigate its structural validity. However, after analysis, seven items were removed from the scale and in this case the items in the subscales differed according to the original version of the scale. Factor loading was .67–.87 in the “personal problems” subscale, .58–.88 in the “clinical concerns” subscale, .58–.78 in the “interface worries” subscale, and .53–.83 in the “academic load” subscale. Jones and Johnston also

Table 4 Reliability Results of SNSI ($N = 152$).

	No. of items	Cronbach α	Level of reliability
SNSI total	15	.86	Reliable at high grade
Personal problems	4	.85	Reliable at high grade
Clinical concerns	4	.83	Reliable at high grade
Interface worries	4	.73	Reliable
Academic load	3	.75	Reliable

Note. SNSI = Student Nurse Stress Index.

reported that the SNSI had a four-factor structure, naming the factors as “personal problems”, “academic load”, “clinical sources” and “interface worries” [9]. The relationships between SNSI and the students' self-efficacy, objective structured clinical examination, and grade point average were investigated in order to evaluate the structural validity of the scale in a study conducted in Korea. A negative relationship was found between SNSI and all three factors [24]. According to Öksüz and Malhan, the factor load coefficient explains the relationship of the items with the factors [25]. The load of the items is expected to be high in the factor they are included in [23]. For a study with a sample number of 152, a factor load value of .50 or higher is a good choice [26].

The confirmatory factor analysis was conducted on the basis of chi-square goodness, GFI, CFI, TLI, IFI, RMSEA and SRMR. Schermelleh-Engel et al. [27] mentioned that the acceptable values of CFI, TLI, IFI should be $\geq .90$; RMSEA should be $\leq .08$; χ^2/SD should be ≤ 3 ; GFI should be $\geq .85$; SRMR should be $\leq .10$ [27]. Based on these results, a good factoring was obtained. Confirmatory factor analysis and exploratory factor analysis of 15-item scale (Turkish version of SNSI) supports its structural validity.

Strengths and limitations of study

The test-retest measurements and high Cronbach α coefficient of SNSI indicated its consistency and lack of variability over time. We were unable to evaluate the criterion validity of the SNSI due to the lack of a relevant test in Turkey. Another limitation of our study was that our sample was drawn from a single center.

Conclusion

The SNSI is an index evaluating the stress experienced regarding academic loads, clinical concerns, personal relationships and other problems by student nurses being trained in nursing schools. We believe this index will help determine the stress levels of student nurses and the influencing factors so that they can be supported with the help of academic advisors. We believe that the SNSI could guide the development of new measurement tools in Turkey. As a result of the findings obtained from the validity and reliability studies of the Turkish form of the SNSI, we can say that this scale is valid and reliable when evaluating the stress of student nurses. However, multicenter studies including nursing students from different nursing schools are recommended for the SNSI to be generalizable. We recommend comparing the SNSI with new scales in Turkish to evaluate its criterion validity.

Conflict of Interests

The authors declare no financial support or relationships that would lead to conflicts of interest.

Acknowledgement

The investigators would like to thank the students who contributed to the realization of the study.

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