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## Research Paper

## Reliability and validity of the Chinese version of the Self-Efficacy Perception Scale for Administrator Nurses

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## ABSTRACT

**Objectives:** This study aimed to translate the Self-Efficacy Perception Scale of Administrator Nurses (SEPSAN) into Chinese and test its reliability and validity among nurse managers.

**Methods:** A scale translation and cross-sectional validation study was conducted. The English version was translated for Chinese by the Brislin translation model included direct translation, back translation, integration, and cultural adjustment. A total of 382 nurse administrators were recruited from 20 general hospitals in five Chinese cities to assess the reliability and validity of the scale from April to May 2023. Validity assessments included content, structural, and convergent validity. Reliability was evaluated using Cronbach's  $\alpha$  coefficient and test–retest reliability.

**Results:** The item-content validity index (I-CVI) of the scale ranged from 0.86 to 1.00, and the average scale-level content validity index (S-CVI/Ave) for the overall scale was 0.98. The exploratory factor analysis indicated five dimensions (planning, organizing, commanding, coordinating, controlling, and inspecting) with 41 items. The cumulative variance contribution rate was 63.72%. Confirmatory factor analysis showed an acceptable fit. The general Cronbach's  $\alpha$  coefficient was 0.95, and the test–retest reliability was 0.87.

**Conclusion:** The Chinese version of SEPSAN showed satisfactory reliability and validity and thus can be used to assess the self-efficacy of nurse administrators in China.

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## What is known?

- Nurse administrators are constantly under immense strain in their work and personal life, which can compromise their self-efficacy and quality of life. Therefore, self-efficacy is essential for nurse administrators to enhance their work efficiency and living quality.
- Few professional instruments have been developed to assess self-efficacy in nurse administrators.

## What is new?

- This study translated the Self-Efficacy Perception Scale for Administrator Nurses (SEPSAN) into Chinese and verified its reliability and validity.
- Nurse managers can use the Chinese version SEPSAN to evaluate their self-efficacy and motivate them to seek targeted interventions.

## 1. Introduction

Nursing management is the systematic management of nursing staff, technology, equipment, finance, and other elements; it uses the theory and method of management to plan, organize, command, coordinate, and control the system to provide correct, timely,

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safe, effective, and perfect nursing service for nursing workplace [1]. Nursing managers, including head nurses and above, are required to be skilled in nursing management [2]. Many nursing administrators are chosen for their excellent clinical skills rather than efficient management skills [3]. In hospitals, nursing managers are in charge of nursing administration and technical management [4]. Nursing managers are contractors, supervisors, communicators, representatives, administrators, and so on [5]. Nursing managers are critical in ensuring hospital care, safeguarding, and enhancing medical and nursing services [6]. Nursing managers, as leaders, are vital in facilitating communication among teams to achieve goals and innovated practices [7].

With the development of the global economy and health care and increasing demands for medical services, traditional models of nursing care can no longer satisfy the individualized and diversified healthcare needs of patients [8]; the unique and complex content of the healthcare environment in China, both medical institutions and care team, are confronted with numerous challenges. In accordance with the principles of the International Council of Nurses on nursing management, nursing managers are not merely the managers of nurses and nursing services but also the managers of future healthcare services [9]. Nursing managers are forced to improve their academic qualifications, conduct scientific research, and promote professional titles to adapt to the reforms and high demands of the complex healthcare system. In addition, managers have to deal with constant mental stress from patients, leaders, and subordinates, ranging from work to society; their continuous, highly stressful state not only affects the working atmosphere and motivation of the organization but also reduces the efficiency and self-efficacy of the team [10,11]. Many nurse managers plan to leave their current jobs due to occupational stress and burnout [12]. Consequently, it is a thought-provoking question for nurse managers and hospital administrators.

Self-efficacy is a belief or confidence in one's ability to achieve specified goals under certain circumstances [13]. The self-efficacy of nurse managers is mainly a subjective judgment of their confidence in their competence in clinical management [14]. People with low self-efficacy tend to give up when faced with complex tasks, whereas people with high self-efficacy see them as challenges and respond positively [15,16].

Nurse managers with higher self-efficacy are more interested in work and more capable of nurse management, and their self-efficacy and working quality will be improved [17]. In a cross-sectional study of nurse managers in China, self-efficacy helps to promote the time management skills of nursing managers; effective time management skills are important for managers to achieve organizational goals [2]. An interventional study showed that the self-efficacy of nurse managers was positively correlated with their professional identity, which is of great value in reducing pressure on nursing staff, improving professional recognition, reducing burnout, and promoting the overall performance of nurses in the department [18]. Nursing administrators can develop and carry out targeted continuing education courses for clinical nurses to help them advance their skills and enhance their self-efficacy while increasing the nurse–patient connection and quality of care [19]. With their higher self-efficacy, the head nurse can more effectively identify the negative emotions of others; they can control and regulate their own emotions through their own high emotional intelligence skills to rationally analyze the causes of conflicts and adopt an “integration” style to effectively resolve conflicts and create a harmonious working atmosphere [20]. High self-efficacy has many benefits, whereas low self-efficacy can impair work performance, mental health, and quality of clinical services [21,22]. Therefore, scholars suggest that nurse educators and administrators should work together to develop and implement strategies,

such as continuing education and training, organizational support, and protective measures, to improve their self-efficacy, self-confidence, and patient interactions [23]. Brief computer-based simulation exercises can promote nurse leaders' management skills and general self-efficacy, as evidenced by short patient treatment times [24]. Domestic research mainly focuses on nurses' work stress and self-efficacy; however, few studies are available on the self-efficacy of nursing managers, and professional self-efficacy assessment tools for nurse managers are lacking.

According to the literature review, the main tools currently applied are the Cultural Self-efficacy Scale (CSES) [25], the Transcultural Self-efficacy Tool (TSET) [26], the Occupational Coping Self-efficacy Scale for Nurses (OCSE-N) [27], General Self-efficacy Scale (GSES), etc. [28]. CSES is initially used to assess the self-efficacy of community nurses when performing nursing operations for patients from multicultural backgrounds, such as African Americans and Southeast Asians. TSET measures nursing students' self-efficacy in performing transcultural nursing practices, but it is limited to nursing students only. OCSE-N tests the ability of clinical nurses to cope with occupational stress. GSES is the most frequently and widely used by many people in education, healthcare, counseling, and sociology. Most studies on the self-efficacy of nursing managers at home and abroad used the General Self-efficacy Scale (GSES) [28,29]. GSES has universal and oversimplified content and is mostly designed for adolescents and adults initially; as such, it needs to reflect the special medical environment and management process of nurse managers [30]. The above questionnaire focuses mostly on the self-efficacy of various groups of people; thus far, few professional self-efficacy assessment tools targeted for nursing have been revised and validated for use in China. Katrancı Nilgün's team has developed the Self-Efficacy Perception Scale of Administrator Nurses (SEPSAN), and the research exhibited satisfactory validity and reliability among 330 nurse managers in 15 hospitals [31]. Based on Henri Fayol's process management theory, the items in SEPSAN stand for the core management competencies required by nursing managers in a clinical work environment; SEPSAN can be applied to assess nurse managers' self-efficacy in various managerial procedures, such as planning, organizing, commanding, coordinating, and so on [32]. The present study aimed to translate SEPSAN into Chinese and test its reliability and validity among Chinese nurse managers.

## 2. Methods

### 2.1. Study design

This study was carried out in two stages to achieve the equivalence of operability, semantics, conception, and measurability between the original English and Chinese versions. Firstly, the Chinese version of SEPSAN was generated in the initial step through translation and intercultural modification. Then, a cross-sectional survey was conducted to validate the reliability and validity of the Chinese version of SEPSAN.

### 2.2. Ethical considerations

The researchers obtained approval and authorization to use the scale from Dr. Katrancı Nilgün. Our research was scrutinized by the Hunan Provincial Hospital of Integrative Medicine ethics committee (No. [2023] 63). The researchers made advance contact with the nursing service director, described the study's purpose, and obtained permission to issue electronic questionnaires to nurse managers. Given the nature of a multisite study comprising 20 hospitals in five cities, the participants were given a clear description of the study's purpose. We highlighted that completing

the questionnaire is entirely voluntary, allowing researchers to terminate and withdraw from the study at any time. When compiling and evaluating data, the principle of information confidentiality should be strictly obeyed.

### 2.3. Translation and cross-cultural adaptation

The specific steps are as follows [33]. 1) In direct translation: the research team members referred to the Brislin translation model [34]; the translation was done independently by two native Chinese nursing master's students proficient in English. Another researcher fluent in bilingual languages evaluated the quality of the model, compared two versions, and summarized data to form SEPSAN-I in the Chinese version. 2) In back translation, a postgraduate nursing student from the University of Edinburgh, UK, and a doctor of nursing graduate from the University of Queensland, Australia, independently back-translated the first draft of the Chinese version of SEPSAN-I into the English version of SEPSAN-3 and SEPSAN-4 without access to the original scales. 3) In integration, a doctoral student who has been engaged in nursing management for ten years and has many years of work experience in the United States compared and analyzed the two back translation scales, namely, SEPSAN-3 and SEPSAN-4, with the original scale; the student also adjusted and modified them according to the differences between the two to form the Chinese version of SEPSAN-II. 4) In cross-cultural adaptation, the Chinese version of SEPSAN-II was culturally debugged by expert consultation. Seven experts were invited (two nursing management experts in psychology research, two experts in nursing management, one nursing management expert in geriatric chronic disease research, and two bilingual experts). The experts proposed some changes to facilitate understanding by Chinese people in the Chinese cultural context, and the entry was unchanged. For example, the experts changed the word "department" to "nursing department" in item 4 because the latter had a broader responsibility. Experts believe that adjusting "unit" to "department" in item 19 was more in line with the reality of the work of most nursing managers. 5) In pre-experiment, 40 participants were asked to determine whether the scale's entries were semantically confusing and challenging to understand. The opinion of nurse managers was modified to create a Chinese version of the SEPSAN scale.

### 2.4. Psychometric testing

#### 2.4.1. Study setting and participants

Considering that the data need to be representative and available, we mainly centered on Hunan; the rest of the participants are from secondary and tertiary hospitals in Guangzhou, Hubei, Chongqing, and Guangxi. Nursing managers from 20 general hospitals were recruited from April to May 2023. The inclusion criteria were as follows: 1) engaged in nursing management in the unit for more than one year; and 2) voluntary participation. The exclusion criteria were as follows: 1) nursing care managers who opted for further education and 2) those not on duty during the investigation period, such as maternity leave, personal leave, etc. In accordance with the requirements of factor analysis, the sample number should be 5–10 times the whole quantity of entries in the scale, considering that 20% of questionnaires may be invalid; this scale has a total of 41 entries, so the required sample size is 246 [35]. After two weeks, 45 retest participants were randomly selected, and the effective recovery rate was 100%.

#### 2.4.2. Measurements

2.4.1.1. *The general data questionnaire.* It mainly included gender, age, professional titles, marital status, position, education level, working years, management work years, employment methods etc.

2.4.1.2. *The Chinese version of SEPSAN.* The scale was translated directly from English into Chinese. After expert consultation and a pre-survey of nursing administrators, the items were not deleted, the format of the original scale was maintained, and the expression of the words in individual entries was modified and adjusted to ensure that the respondents could accurately comprehend the questions and give reliable answers. The scale consists of five dimensions with 41 items: planning (item 1–9), organization (item 10–16), commanding (item 17–25), coordinating (item 26–32), and controlling and inspecting (item 33–41). The Likert 5-point scale was applied in the scale: not at all likely = 1, likely = 2, uncertain = 3, certain = 4, very certain = 5; the total score was 41–205 points. In the original study, the Cronbach's  $\alpha$  coefficient of the original scale was 0.86–0.91, and the total content validity was 0.86, indicating that the scale displayed excellent reliability and validity [31].

### 2.5. Data collection

Data were collected through an online survey between April and May 2023. After seeking the consent of the nursing department's director, the QR code of the questionnaire was sent to nurse managers through the online working group. The questionnaire starts with information about its purpose, content, and completion method. Respondents answered anonymously and voluntarily, and all items were completely answered before submitting the questionnaire. The minimum answer time was set to 5 min to ensure the quality of the questionnaire and prevent repeated filling. The same IP address, computer, or mobile phone can only be filled in once. The validity of the questionnaire was examined. Confidentiality and anonymity were maintained throughout the investigation. The feedback rate was 94.09% (382 of 406 eligible dates).

### 2.6. Data analysis

SPSS 25.0 software and AMOS 22 software were used for statistical analysis. Descriptive statistical methods analyzed demographic characteristics. Categorical variables were presented by count and percentage, and continuous variables were expressed as mean and standard deviation (*SD*). Differences at  $P < 0.05$  were considered statistically significant.

Differentiation and correlation analyses were used for the combined testing of the items [36]. 1) The total scale scores were ranked in ascending order. Independent sample *t*-test was used to analyze the high subgroups in the top 27% of the total scale scores versus the low subgroups in the bottom 27%. Entries that were not statistically different ( $P > 0.05$ ) were removed. 2) Pearson correlation analysis was used to calculate the correlation coefficients between each item and the overall score. Items with correlation coefficients less than 0.4 were removed.

Structural validity and content validity were assessed. Structural validity is often estimated by exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The total sample size should be 5–10 times the overall items and randomly divided into two groups. The EFA sample size should be at least 100, and the CFA sample size should be at least 200 [37]. When  $KMO > 0.70$ , Bartlett's spherical test results ( $P < 0.05$ ) were considered suitable for CFA. Factors with Tegen values  $> 1$  were extracted using principal component analysis and variance maximization orthogonal rotation [37,38]. If the common factor accumulation of the scale can explain more than 40% of the variation, then the load value of each item on the corresponding common factor that is greater than or equal to 0.4 in the factor analysis will be retained; as such, the scale is considered to have good structural validity [39]. Confirmatory factors verified the results of the EFA. The following indicators

revealed that the model fit was reasonable: value of  $\chi^2/df < 3$ ; Goodness-of-Fit Index (GFI), Normative Fit Index (NFI), Incremental Fit Index (IFI), Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), and Adjusted Goodness-of-Fit Index (AGFI)  $> 0.8$  [40]. The scale-level content validity index (S-CVI/Ave) and the item content validity index (I-CVI) were tested through the Delphi method. Two nursing management experts in psychology research, two experts in nursing management, one nursing management expert in geriatric chronic disease research, and two bilingual experts were included in the expert group. They were required to score the entries (1 = not relevant, 2 = weakly relevant, 3 = relatively relevant, 4 = very relevant). They revised the expressions and words based on our cultural background and linguistic habits. I-CVI value  $\geq 0.780$  and S-CVI/Ave value  $\geq 0.90$  indicated good content validity [41].

Convergent validity refers to the degree of similarity of measurement results when different measures determine the same objective. Commonly used indicators of convergent validity were average variance extracted (AVE) and construct reliability (CR). The convergent validity is good when the AVE value is greater than 0.50 and the CR value is greater than 0.70 [42].

A reliability test was conducted using Cronbach's  $\alpha$  coefficient. The whole scale's minimum internal consistency reliability coefficient should be above 0.7, which means acceptable; values of 0.8 and 0.9 indicate ideal reliability and very good reliability, respectively [43]. We randomly invited 45 nurses to fill out the questionnaire again at an interval of two weeks. We then calculated the Pearson correlation coefficient of the total questionnaire to determine the test–retest reliability [37].

### 3. Results

#### 3.1. Characteristics of nurse managers

Among all nurse managers, 376 (98.4%) were females, 47 (12.3%) were from secondary hospitals, and 335 (87.7%) were from tertiary hospitals. Most of the participants were aged between 31 and 40 years, 365 (95.5%) were married, 257 (67.3%) were undergraduates, and 185 (48.4%) worked for 11–20 years. Table 1 shows the characteristics of the nurse managers ( $n = 382$ ).

#### 3.2. Item analysis

The mean difference was applied to compare the total scores of 27% high and 27% low subgroups. Each entry in the Chinese version of SEPSAN was statistically significant ( $P < 0.05$ ). The Pearson correlation coefficient between 41 items and the total score of the Chinese version of SEPSAN was 0.49–0.68 ( $P < 0.05$ ).

#### 3.3. Validity test

##### 3.3.1. Content validation

The I-CVI of each item in the Chinese version of SEPSAN ranged from 0.86 to 1.00, and the S-CVI/Ave for the overall scale was 0.98. These results indicated good content validation of the Chinese version of SEPSAN.

##### 3.3.2. Structural validity

EFA was performed on 152 samples. The Kaiser-Meyer-Olkin (KMO) index was 0.89, and the Chi-square value of the Bartlett spherical test was 4352.68 ( $P < 0.001$ ). Thus, the results of the data analysis were considered suitable for EFA. Principal component analysis and maximum variance orthogonal rotation were used to examine the scale. Under the condition of an undefined factor number, five factors were extracted. The cumulative variance

**Table 1**  
Demographic characteristics of participants ( $n = 382$ ).

Characteristics		n	%
Grade of hospital	Secondary	47	12.3
	Tertiary	335	87.7
Gender	Male	6	1.6
	Female	376	98.4
Age (years)	$\leq 30$	11	2.9
	31–40	179	46.9
	41–50	171	44.8
	$\geq 51$	21	5.5
Marital status	Married	365	95.5
	Unmarried	17	4.5
Professional titles	Junior	17	4.5
	Intermediate	220	57.6
	Senior	145	37.9
Education level	Junior college and below	14	3.7
	Bachelor's degree	257	67.3
	Master's degree and above	111	29.1
Years of nursing experience	$\leq 5$	5	1.3
	6–10	23	6.0
	11–20	185	48.4
	$\geq 21$	169	44.2
Years of nursing manager experience	$\leq 5$	148	38.7
	6–10	105	27.5
	11–20	108	28.3
	$\geq 21$	21	5.5
Employment method	Regular appointment	310	81.2
	Contract	72	18.8

contribution rate was 63.72%, and the dimensional load to which each item belonged was  $> 0.4$ . Accordingly, no entry was deleted, and the factor load matrix after rotation is shown in Table 2.

Based on the results of EFA, 230 sample cases were used to build a prior model containing five common factors. CFA validated the model. The results were  $\chi^2/df = 1.48$ , RMR = 0.042, IFI = 0.93, TLI = 0.93, CFI = 0.93, and RMSEA = 0.046. All observed variables were significantly loaded on five potential variables, with values in the range of 0.54–0.87 ( $P < 0.05$ ). Each fitting index conforms to the general research criteria, indicating that the total fitting effect of the model was excellent. (Fig. 1).

##### 3.3.3. Convergent validity

The AVE estimates for the five dimensions of the Chinese version of SEPSAN were 0.56, 0.50, 0.48, 0.55, and 0.52, and the CR values were 0.91, 0.88, 0.89, 0.89, and 0.91. The convergence validity of the Chinese version of SEPSAN was considered acceptable.

#### 3.4. Reliability

The internal consistency estimation range of the five dimensions of SEPSAN was 0.88–0.95, and the Cronbach's  $\alpha$  coefficient was 0.95 (Table 3). The scale's overall test–retest reliability was 0.87, which means acceptable.

### 4. Discussion

This study aimed to translate SEPSAN into Chinese and evaluate its validity among Chinese nursing managers. Seven experts revised the Chinese version of SEPSAN according to the situation and language expression habits of nurse managers in China. The I-CVI ranged from 0.86 to 1.00, the S-CVI/Ave = 0.98, and the content validity of the Chinese version of SEPSAN was higher than the original scale. The pre-test results indicated that the scale was reasonable and easy to understand. The project analysis results showed that each item has some correlation with the scale. Therefore, all entries and dimensions in this scale were retained. Overall, the Chinese version of SEPSAN possesses excellent applicability and discrimination.

**Table 2**  
Factor loading values for each item of the scale (n = 152).

Items	Planning	Organizing	Commanding	Coordinating	Controlling and inspecting
A5	<b>0.78</b>	0.10	0.13	0.08	0.13
A7	<b>0.74</b>	0.07	0.17	0.11	0.18
A4	<b>0.74</b>	0.11	0.06	0.10	0.19
A8	<b>0.73</b>	0.18	0.17	0.01	0.23
A9	<b>0.68</b>	0.18	0.04	0.13	0.17
A3	<b>0.66</b>	0.13	0.10	−0.03	0.33
A2	<b>0.66</b>	0.09	0.10	0.12	0.14
A1	<b>0.65</b>	0.22	0.22	0.07	0.17
A6	<b>0.64</b>	0.24	0.22	0.14	0.17
B2	0.13	<b>0.78</b>	0.07	0.06	0.13
B1	0.15	<b>0.77</b>	0.02	0.07	0.10
B3	0.17	<b>0.76</b>	0.13	0.15	0.02
B4	0.24	<b>0.74</b>	0.16	0.12	0.12
B6	0.16	<b>0.74</b>	0.01	0.14	0.20
B7	0.13	<b>0.71</b>	0.00	0.13	0.14
B5	0.08	<b>0.69</b>	0.02	0.28	0.10
C9	0.11	−0.01	<b>0.85</b>	0.15	0.18
C1	0.17	−0.01	<b>0.78</b>	0.21	0.16
C5	0.22	−0.04	<b>0.77</b>	0.08	0.00
C6	0.14	0.06	<b>0.76</b>	0.23	0.03
C3	0.01	−0.01	<b>0.75</b>	0.15	0.14
C8	0.24	0.08	<b>0.74</b>	0.19	0.05
C4	0.07	0.03	<b>0.71</b>	0.17	0.24
C2	0.20	0.20	<b>0.68</b>	0.22	0.08
C7	0.07	0.23	<b>0.64</b>	0.19	0.09
D7	0.09	0.22	0.15	<b>0.84</b>	0.12
D3	0.00	0.16	0.34	<b>0.80</b>	0.07
D1	0.04	0.10	0.17	<b>0.80</b>	−0.05
D5	0.09	0.11	0.25	<b>0.77</b>	0.07
D2	0.13	0.22	0.13	<b>0.72</b>	0.17
D6	0.15	0.19	0.24	<b>0.67</b>	0.03
D4	0.17	0.02	0.21	<b>0.65</b>	0.01
F1	0.16	0.07	0.23	0.00	<b>0.85</b>
F5	0.11	0.11	0.09	0.13	<b>0.81</b>
F2	0.23	0.10	0.17	0.09	<b>0.79</b>
F3	0.26	0.19	0.17	0.10	<b>0.79</b>
F6	0.15	0.03	0.00	0.07	<b>0.79</b>
F8	0.16	0.08	0.12	−0.01	<b>0.78</b>
F4	0.23	0.18	0.02	0.08	<b>0.77</b>
F7	0.22	0.06	0.11	−0.05	<b>0.76</b>
F9	0.16	0.18	0.09	0.07	<b>0.71</b>
Variance contribution rate (%)	15.11	13.93	12.66	11.13	10.90
Cumulative variance contribution rate (%)	15.11	29.04	41.70	52.83	63.72

Construct validity refers to how well a test evaluates the theoretical structure and attributes it should examine [44]. The scale has excellent structural validity when the factor loading is > 0.40 and the common factor explains 50% of the overall variance [37]. Based on the EFA results, the Chinese version of the SEPSAN scale identified five common factors consistent with the original scale. The cumulative contribution rate was 63.72%, and the factor loading values of all items were above 0.4. The double loading phenomenon was not detected, indicating that the Chinese version of the SEPSAN had reliable structural validity. The model was further evaluated using the validation factor analysis, which displayed that the fit indices met the statistical requirements. The model's overall fit was credible; thus, the Chinese version of SEPSAN has excellent construct validity.

Higher coefficient values indicate higher reliability and smaller measurement error [37]. The total Cronbach's  $\alpha$  coefficient of the Chinese version of the SEPSAN was 0.95, and the Cronbach's  $\alpha$  coefficient of each dimension was greater than 0.80, slightly higher than the original scale results. Hence, the scale has strong internal consistency. The total test–retest reliability of the Chinese version of the SEPSAN was 0.87, indicating satisfactory retest reliability and temporal stability.

This study strictly follows the process of the Brislin model for direct translation, back translation, integration, cultural debugging,

and pre-survey revision to form the Chinese version of SEPSAN. The content of the scale was clearly expressed and easy to understand. The average time to complete a questionnaire was about 10 min, and the operability was strong. Overall, the reliability and validity of the scale were creditable. SEPSAN was designed based on mature management process theory [32]. The self-efficacy of nursing managers in the management process can be estimated using the scale in the future. The scale can also be used to analyze changes in psychological characteristics in the management process, clarify the focus of nursing quality improvement, and provide a reliable and scientific theoretical basis for subsequent formulation and implementation of precise intervention programs. Such programs will improve self-efficacy and enhance the management ability of nursing managers, thereby improving nursing quality and promoting the overall quality of medical service.

This study was conducted in general hospitals in five provinces due to various limited conditions, such as geographical limitations and differences in the study population. As a result, more data were needed to be collected. In the future, a multi-center, large-sample study should be conducted to validate the adaptability of the Chinese version of the SEPSAN among Chinese nursing managers and to provide a theoretical basis for improving the self-efficacy of Chinese nursing managers.

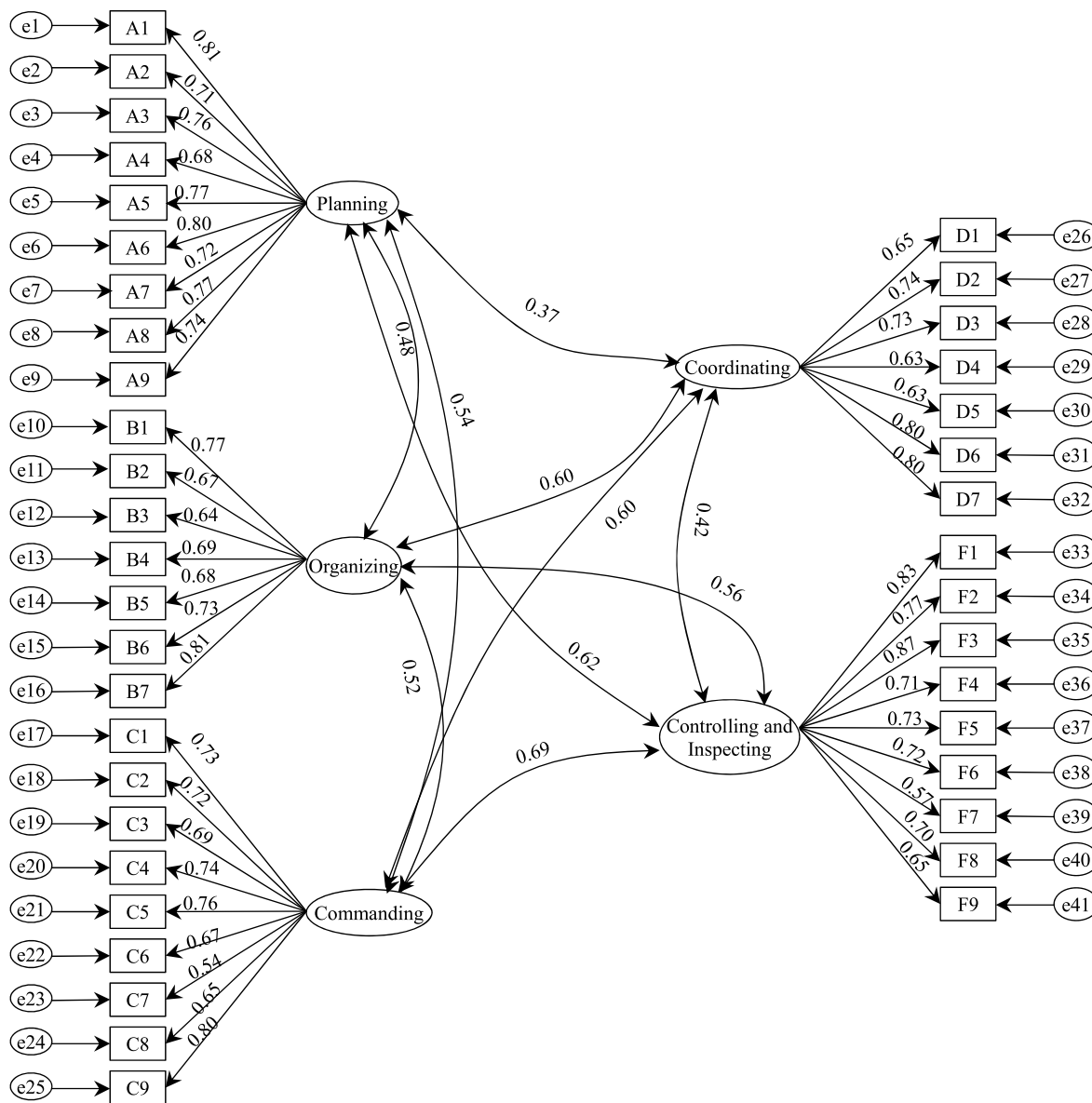


Fig. 1. Modified results of the confirmatory factor analysis of the Chinese version of the Self-Efficacy Perception Scale of Administrator Nurses.

**Table 3**  
The reliability of the scale and each dimension.

Dimensions	Number of items	Cronbach's $\alpha$ coefficient
Planning	9	0.92
Organizing	7	0.88
Commanding	9	0.90
Coordinating	7	0.89
Controlling and inspecting	9	0.92
Total scale	41	0.95

**5. Conclusion**

Nursing managers are a crucial link between the nursing team and senior managers. The self-efficacy level of nursing managers affects not only their personal career development, such as skills, behavior, and achievements but also the hospital's nursing efficiency and quality improvement [45]. This study introduced the foreign SEPSAN, which includes five dimensions and 41 items. The

Chinese version of the SEPSAN has satisfactory reliability and validity among nursing managers and good scientific validity and applicability. In summary, the Chinese version of SEPSAN can be a valuable and promising tool for assessing the self-efficacy of nurse managers.

**Data availability statement**

The datasets generated during and analyzed during the current study are available from the corresponding author upon reasonable request.

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## CRediT authorship contribution statement

**Taotao He:** Conceptualization, Methodology, Data curation, Writing – original draft, Writing – review & editing. **Yang Chen:** Conceptualization, Formal analysis, Investigation, Writing – original draft, Revising, Writing – review & editing, Supervision, Project administration. **Caini Song:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Data Collection, Formal analysis. **Chaoqun Li:** Conceptualization, Methodology, Validation, Formal analysis, Investigation. **Jia Liu:** Conceptualization, Validation, Investigation, Data Collection, Formal analysis. **Jing Huang:** Conceptualization, Methodology, Validation, Formal analysis, Funding acquisition, Writing – review & editing, Supervision, Project administration.

## Declaration of competing interest

The authors have declared no conflict of interest.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2023.09.015>.

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