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Research

Reliability and validity testing of the Turkish version of the clinical adjustment scale for student nurses (CAS-SN)

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ABSTRACT

Background: Clinical adjustment is essential for student nurses' professional development, yet they face challenges during this transition.
Aim: This cross-sectional study aimed to examine the reliability and validity of the Turkish version of the (CAS-SN).
Methods: The study was performed with 315 third- and fourth-year student nurses enrolled in the nursing departments of a university. Confirmatory factor analysis (CFA) was applied to evaluate construct validity, and the scale's reliability was assessed using Cronbach's alpha coefficient and item–total correlations.
Results: The Turkish version of CAS-SN consists of three subdimensions and 15 items. Exploratory factor analysis (EFA) revealed three factors explaining 66.65% of the variance. CFA results demonstrated that the model achieved a good level of fit. Reliability analyses revealed a high overall Cronbach's alpha coefficient of 0.918, with the subdimensions demonstrating coefficients ranging from 0.731 to 0.883.
Conclusions: The Turkish version of CAS-SN is a valid and reliable tool for assessing the clinical adjustment levels of student nurses. This scale enables nursing educators to effectively assess students' clinical adjustment and identify key facilitators and barriers.

Introduction

Clinical practices are a fundamental component of nursing education (Lee et al., 2023). They offer student nurses an important opportunity to develop their essential clinical skills and gain experience in real clinical environments (Najafi Kalyani et al., 2019; Woo & Newman, 2020). These practices enable student nurses to acquire the knowledge, clinical decision-making, and critical thinking skills they will need in professional practice (Aktas & Karabulut, 2016). Additionally, this practicum process supports students in making independent nursing decisions while also helping them develop social problem-solving abilities (Aktas & Karabulut, 2016; Kim & Yeo, 2019). Clinical practice settings provide students with the opportunity to interact with diverse patient groups, observe patient care processes, and actively participate in these processes while supporting their collaboration with healthcare teams (Pienaar et al., 2022; Zhang et al., 2022). Through the experiences they gain in clinical practicum, students gain confidence in communicating with patients, patient relatives, and healthcare workers, performing complex patient care procedures, and making ethical decisions (Albert et al., 2020; Jaganath et al., 2022).

The transition to the clinical environment for student nurses can often be a stressful and challenging process, as it requires adapting to a different setting, coping with increased responsibilities, and meeting clinical expectations (Baharum et al., 2023). The difficulties experienced by students include managing the patient care process, adapting to changing clinical environments, and collaborating with the healthcare team (Loureiro et al., 2024). When they encounter unsupportive situations, such as negative behaviors and attitudes of nurses in the clinical setting, student nurses realize that they experience a conflict between their own expectations and learned knowledge and the reality in clinical practice (Najafi Kalyani et al., 2019). Moreover, witnessing patients in difficult and distressing situations and being confronted with ethical dilemmas can lead to emotional stressors that negatively affect their clinical adjustment processes (Panda et al., 2021).

Transition from classroom settings to clinical practice environments requires students to rapidly adapt to new routines and roles as well as to develop effective communication and empathetic care skills (Loureiro et al., 2024; McCloughen et al., 2020). A successful clinical adjustment process supports student nurses in enhancing both their competencies and compassion-based care skills and improves the quality of patient care (Woo & Newman, 2020). However, inadequate clinical adjustment can lead to high levels of stress, anxiety, and emotional exhaustion in students, negatively affecting

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their self-confidence and academic success, and may even cause them to leave the nursing program (Hwang & Kim, 2022; Ma et al., 2022). Therefore, it is considered necessary to evaluate student nurses' clinical adjustment before they begin their professional careers.

In the literature, various scales have been developed to assess university students' adjustment to college. Internationally, the "Student Adaptation to College Questionnaire" (Baker & Siryk, 1989), "Chinese College Student Adjustment Scale" (Xiaoyi et al., 2005), and "Campus Life Adaptation Scale for Nursing Undergraduates" (Park & Kim, 2019) have been developed. In Turkiye, similarly, the "Occupational Adaptation Inventory for University Students" (Ultanir, 2001), "University Life Scale" (Aladag et al., 2003), "University Adjustment Scale" (Kulaksizoglu et al., 2003), "Adaptation to University Life Scale" (Aslan, 2015)," University Adjustment Scale" (Sevinc & Gizir, 2020), and "Adjustment Problems Scale for University Students" (Topuzoglu et al., 2021) have been developed. However, these scales assess university students' social, emotional, personal, academic, and campus adjustment and are insufficient for comprehensively evaluating clinical adjustment specific to nursing education. Therefore, there is a clear need for a scale that specifically evaluates the challenges student nurses face in clinical settings. Based on this need, Labrague et al. (2024) developed the CAS-SN to evaluate professional development, interpersonal interaction, clinical competence and confidence, coping strategies, and support strategies for student nurses. Factor 1, Professional Development and Interpersonal Interaction, reflects student nurses' understanding of professional roles, communication, teamwork, and professionalism (Labrague et al., 2024). Turkish studies show that communication skills improve clinical attitudes, while teamwork and cohesion enhance collaboration and awareness of care quality (Burgaz Kinas et al., 2025; Cavusoglu et al., 2020; Saydamli et al., 2025). Factor 2, Clinical Competence and Confidence, refers to applying knowledge, demonstrating technical skills, and adapting to dynamic environments (Labrague et al., 2024). It has been found that supportive attitudes of clinical educators play an important role in the development of clinical competence among Turkish nursing students (Menekse et al., 2024). In addition, hands-on experiences in clinical settings have been reported to enhance critical thinking and problem-solving skills, further supporting the significance of this dimension in clinical adjustment (Woo & Newman, 2020). Factor 3, Coping and Support Strategies, involves managing stress, adapting to challenges, and engaging in self-care (Labrague et al., 2024). Studies from Turkiye highlight the effectiveness of orientation programs, stress management training, and social support in strengthening students' coping abilities (Bayraktar et al., 2023; Pehlivan Saribudak, 2024; Yurdakul & Beydag, 2023).

The scale offers nursing educators a comprehensive evaluation opportunity to assess students' clinical adjustment processes and identify facilitating factors and barriers. In addition, by determining supportive strategies to enhance students' clinical learning experiences, it contributes to a better preparation for professional practice (Labrague et al., 2024). CAS-SN has not been validated and tested for reliability in Turkiye. Conducting the validity and reliability study of the scale in Turkish will make a significant contribution to comprehensively assess the clinical adjustment of student nurses in our country. Therefore, the aim of the present study was to adapt CAS-SN into Turkish and examine its psychometric properties.

Method

Design and Sample

This study was conducted using a methodological design. The population of the study consisted of 3rd- and 4th-year student nurses enrolled in the Nursing and Health Sciences Faculties of a university during the fall semester of the 2024–2025 academic year. Participants were recruited through in-class announcements in two nursing programs at the same university. All eligible students present during the data collection period were invited to participate voluntarily. Of the 351 eligible students, 315 participated, yielding a response rate of 89.7%. No significant differences in basic demographic characteristics were observed between participants and nonparticipants, indicating a low risk of nonresponse bias.

Sample size evaluation categorized <100 participants as insufficient, 100–200 as adequate, 200–500 as good, 500–1000 as very good, and >1000 participants as excellent. To ensure the stability of the scale's factor structure and the generalizability of the results, a sample size of at least 300 participants is recommended (DeVellis & Thorpe, 2021; Karagoz, 2016). Additionally, a sample size of ≥ 300 is considered sufficient for factor analysis in the literature (Tabachnick & Fidell, 2019). In line with the literature, this study aimed to include at least 300 students. Data were collected from 315 student nurses aged 18–30 years, enrolled in the 3rd or 4th year of a nursing program, who fully completed the questionnaire and agreed to participate in the study. First- and second-year students with insufficient clinical experience, those who did not consent, and those with incomplete forms were excluded. Ten volunteers who participated in the pilot study were not included in the final sample.

Instruments

Data were collected using the "Descriptive Information Form" and the "CAS-SN–Turkish Version."

Descriptive Information Form

Developed by the researchers based on the relevant literature (Jaganath et al., 2022; Labrague et al., 2024), this form consists of eight items: "age, gender, academic year, place of residence, participation in extracurricular activities, academic performance, voluntary selection of the profession, and enjoyment of the profession."

Clinical Adjustment Scale for Student Nurses (CAS-SN)

The scale was developed by Labrague et al. (2024) to comprehensively assess student nurses' adjustment in clinical practice. It is a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree) consisting of 15 items and three subdimensions: "Professional Development and Interpersonal Interaction" (items 1–6), "Clinical Competence and Confidence" (items 7–12), and "Coping and Support Strategies" (items 13–15)." The total possible score ranged from 15 to 75, with higher scores indicating better clinical adjustment. High scores reflected strong clinical adjustment, characterized by the student nurse's ability to effectively integrate into the clinical environment, demonstrate competence and confidence, and employ effective coping strategies. Conversely, low scores suggested challenges in clinical adjustment, such as difficulty adapting to the clinical environment, limited confidence in clinical skills, or inadequate coping mechanisms for stressors (Labrague et al., 2024). There is not a cut of point. Labrague et al. (2024) found that CAS-SN explained 65.92% of the total variance in clinical adjustment. The total Cronbach's alpha coefficient of the original scale was 0.913. Cronbach's alpha coefficients of the subdimensions were 0.876 for Professional Development and Interpersonal Interaction, 0.895 for Clinical Competence and Confidence, and 0.786 for Coping and Support Strategies (Labrague et al., 2024).

Language Validity

The Turkish translation and cultural adaptation of the scale were conducted following the guidelines developed by "The Professional Society for Health Economics and Outcomes Research (ISPOR)" and in line with the information presented on the intercultural adaptation

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process (Wild et al., 2005). After obtaining permission from the original author, two independent translators and three nursing academics with doctoral degrees translated the scale from English into Turkish. The researchers compared and reconciled these versions. A specialist in Turkish Language and Literature reviewed the Turkish draft and made the necessary adjustments. Finally, an independent professional translator back-translated the Turkish version into English and compared both versions. Discrepancies with the original were resolved to ensure language validity.

Content Validity

In the content validity phase, the draft scale was evaluated by ten nursing academics with doctoral degrees. Experts rated each item for language and content using a four-point scale (4 = no change needed, 3 = minor revision, 2 = major revision, 1 = not suitable/removal suggested) (Davis, 1992). Item-level content validity index (I-CVI) and scale-level content validity index (S-CVI) were calculated using the Davis method (Polit & Beck, 2020). I-CVI and S-CVI of >0.80 indicates acceptable agreement among experts (DeVellis & Thorpe, 2021; Johnson & Christensen, 2024). In the present study, I-CVI values ranged from 0.80 to 1.00 and S-CVI was 0.973.

Pilot Study

A pilot study was conducted with ten student nurses (five third-year and five fourth-year) to evaluate item clarity and appropriateness. Preliminary analyses assessed structural validity and internal consistency. Furthermore, students provided feedback on how they interpreted items, and adjustments were made accordingly. In the pilot study (n = 10), student feedback was recorded in writing and analyzed using a basic content analysis approach, which involved reading all responses, grouping similar comments under common categories (e.g., clarity, wording, cultural relevance), and identifying recurring issues. Revisions were made when at least two participants raised the same concern, ensuring that changes were systematic and based on consistent feedback, while preserving the original construct definitions. These 10 students were not included in the main study sample.

Construct Validity

Construct validity was assessed via Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). Suitability for EFA was determined by the Kaiser–Meyer–Olkin (KMO) measure (> 0.80) and Bartlett's test of sphericity ($p < 0.05$) to assess sampling adequacy and inter-item correlations (Carpenter, 2018).

Various fit indices were used to assess the factor validity of the model tested in CFA (Brown, 2015). Model fit was evaluated using chi-square (χ^2), degrees of freedom (df), χ^2/df ratio, root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), comparative fit index (CFI), incremental fit index (IFI), Tucker–Lewis index (TLI), and goodness-of-fit index (GFI) (Aylar & Evci, 2017; Brown, 2015).

Reliability

Reliability was evaluated using item–total correlations, Cronbach's alpha for internal consistency, Spearman–Brown and Guttman split-half coefficients and split-half correlations. Cronbach's alpha was also calculated separately for the two halves (Alpar, 2016). Response bias was assessed using Hotelling's T^2 and Tukey's test of additivity.

Data Collection

Data were collected by the author through face-to-face survey interviews in the classroom between January 10 and 20, 2025. Prior to data collection, students were informed about the study and provided verbal and written consent. Completion of the survey took approximately 15 minutes. Anonymity and confidentiality were ensured, and to match test–retest responses while preserving confidentiality, participants used pseudonyms on their questionnaires. Fifteen days later, the researcher collected data again from 30 students in person, at a time convenient for them.

Data Analysis

Data were analyzed using IBM SPSS Statistics Standard Concurrent User V 26 (IBM Corp., Armonk, NY, USA) and AMOS 25.0 software. The normality of the data was assessed via Skewness/Kurtosis values and the Kolmogorov–Smirnov test. Descriptive statistics were presented as frequency (n), percentage (%), mean (X), standard deviation (SD), median (M), and minimum (min) and maximum (max) values.

For content validity analyses, content and construct validity of the scale were evaluated. I-CVI and S-CVI values of the items were determined using the Davis method (Polit & Beck, 2020). For each item, the I-CVI value was calculated as the ratio of the number of experts scoring the item 3 or 4 to the total number of experts minus one (Davis, 1992). The S-CVI value was determined by averaging the I-CVI values of all items (Davis, 1992). To ensure strong consensus among experts, I-CVI and S-CVI values of >0.80 were required, indicating a high level of agreement (DeVellis & Thorpe, 2021; Johnson &Christensen, 2024).

EFA and CFA were conducted to evaluate construct validity (Carpenter, 2018). Varimax rotation was applied during EFA to enhance the interpretability of the factor structure, as the factors were expected to represent different and largely unrelated dimensions of clinical adjustment, consistent with the original scale development study (Tabachnick & Fidell, 2019). This approach also facilitated comparison with the original factor model by allowing items to be more clearly separated into their relevant factors. EFA was performed to determine item–factor relationships, and the Bartlett's test of sphericity ($p < 0.05$) was used to assess the correlation between variables (Bartlett, 1950). KMO coefficient was calculated to determine whether the sample size was suitable for factor analysis, and a value >0.80 was considered sufficient (Cerny & Kaiser, 1977).

CFA was conducted to evaluate whether the items adequately reflected the original scale structure. Model fit and modification indices were assessed using χ^2, df, χ^2/df ratio, RMSEA, SRMR, CFI, IFI, TLI, and GFI (Aylar & Evci, 2017). Statistical significance level was set at $p < 0.05$.

Reliability analyses included item–total correlation coefficients, internal consistency via Cronbach's alpha, Spearman–Brown and Guttman split-half coefficients and split-half correlation coefficients. Split-half reliability was further analyzed via Cronbach's α for each half (Alpar, 2016). The 15-item scale was divided into two parts: eight odd-numbered items and seven even-numbered items. Response bias was assessed using Hotelling's T^2 and Tukey's test of additivity.

Test–retest analysis was conducted to assess the scale's temporal reliability and invariance. This method measures response consistency and stability over time by reapplying the scale to the same group after an interval. Test–retest reliability was calculated, and the intraclass correlation coefficient (ICC) was determined (Liljequist et al., 2019). ICC ranges from 0 to 1, with values ≥0.70 indicating reliable and consistent results across repeated measurements (Liljequist et al., 2019).

None of the items from the original scale were removed in our study. The item retention criteria were as follows: content validity

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Table 1
Descriptive Characteristics of the Participants (n = 315).

Characteristics	$X \pm SD$	M(Min-Max)
Age	21.54 ± 1.23	21(19–29)
	n	**%**
Gender		
Female	247	78.4
Male	68	21.6
Grade		
3rd years	153	48.6
4th years	162	51.4
Lives		
Dormitory	211	67.0
Home	104	33.0
Participation in extracurricular activities		
Yes	216	68.6
No	99	31.4
Evaluation of own academic performance		
Low	5	1.6
Moderate	221	70.2
Good	89	28.3
Status of choosing the profession voluntarily		
Yes	204	64.8
No	111	35.2
Loving the profession		
Yes	276	87.6
No	39	12.4

indices above 0.78 (Polit & Beck, 2006), factor loadings greater than 0.40 without collinearity (Cokluk et al., 2012), and item–total correlations above 0.30 (Kline, 2023).

Ethical Considerations

Permission for the Turkish adaptation of CAS-SN was obtained from the scale's corresponding author. Ethics committee approval (Date: 02.10.2024, Decision No: 2024/822) was obtained from the Health Sciences Scientific Research Ethics Committee of a university and the necessary institutional permission was obtained from the dean's office (Date: 11.10.2024, Number: E-18689117-100-578518) and (Date: 07.01.2025, Number: E-33205045-100-619890) of the relevant faculty to conduct the study. In addition, participants were informed about the study's purpose, and verbal and written consent were obtained. The study was conducted and reported in accordance with the Test Adaptation Reporting Standards (TARES) checklist and the ethical standards of the Declaration of Helsinki (Iliescu et al., 2024).

Results

The mean age of the students was 21.54 ± 1.23 years, 78.4% were female, 51.4% were 4th-year students, and 67.0% were living in dormitories. Additionally, 68.6% participated in extracurricular activities, 70.2% rated their academic performance as moderate, 64.8% voluntarily chose the nursing profession, and 87.6% reported loving their profession (Table 1).

Content Validity

In this study, I-CVI values ranged between 0.80 and 1.00 and S-CVI value was calculated as 0.973.

Construct Validity

EFA

KMO coefficient was 0.920, Bartlett's test yielded χ^2 = 2623.155 (df = 105, $p < 0.001$), confirming the suitability of the data for factor analysis. EFA revealed three primary factors explaining 66.65% of the total scale variance (Table 2).

CFA

CFA was conducted to confirm the original three-factor structure of the CAS-SN. Model fit indices were χ^2/df = 2.090, RMSEA = 0.059, SRMR = 0.040, IFI = 0.964, CFI = 0.964, GFI = 0.930 and TLI = 0.955 (Table 3).

These indices indicated acceptable model fit and confirmed the three-factor structure. Standardized factor loadings ranged from 0.64 to 0.83 (Professional Development and Interpersonal Interaction = 0.68–0.81, Clinical Competence and Confidence = 0.64–0.83, Coping and Support Strategies = 0.66–0.74). The model with standardized coefficients is illustrated in Fig. 1.

Table 3
Fit Indices of the CAS-SN Model (n = 315).

Ölçek	(χ^2/df)	RMSEA	SRMR	IFI	CFI	GFI	TLI
Three-Factor Model	2.090	0.059	0.040	0.964	0.964	0.930	0.955

χ^2 =Chi-Square Test, df =Degrees of Freedom, RMSEA= Root Mean Standard Error Approximation; SRMR= Standardized Root Mean Square Residual, IFI= İncremental Fit İndex, CFI= Comparative Fit İndex, GFI= Goodness of Fit, TLI= Tucker–Lewis index.

Table 2
Exploratory Factor Analysis Results of CAS-SN (n = 315).

Factor	Item No	Factor Loadings	Eigenvalue	Explained variance (%)
Professional growth and interpersonal engagement	1	0.769	3.83	25.56
	2	0.836		
	3	0.721		
	4	0.753		
	5	0.727		
	6	0.692		
Clinical Competence and confidence	7	0.699	4.02	26.80
	8	0.783		
	9	0.78		
	10	0.824		
	11	0.799		
	12	0.711		
Coping and support strategies	13	0.696	2.14	14.29
	14	0.817		
	15	0.724		
Explained total variance (%)		66.65%		
***K*MO coefficient**		0.920		
df		105		
Barlett test		χ^2=2623.155 ($p < 0.001$)		

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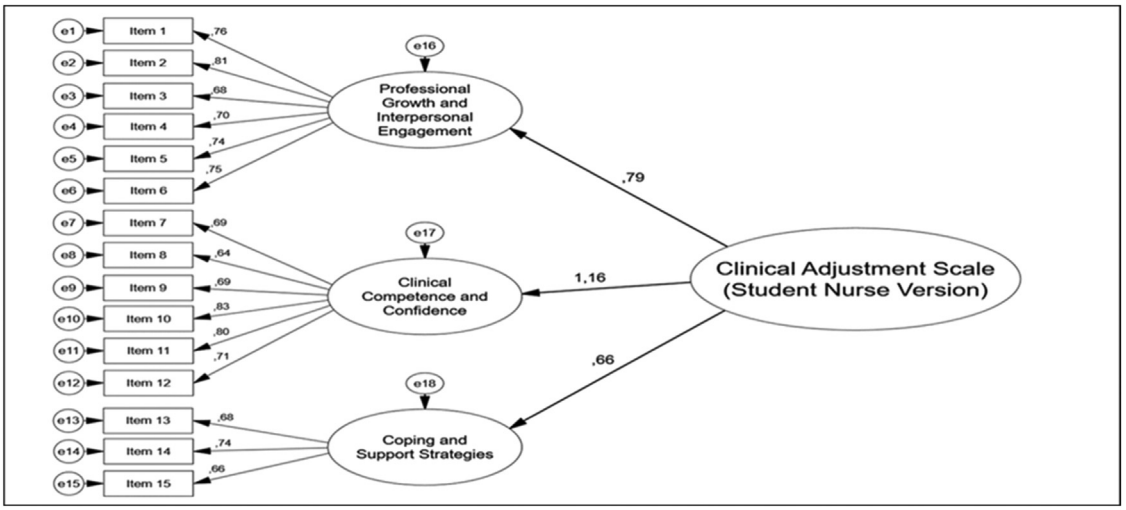

Fig. 1. Confirmatory factor analysis (CFA).

Reliability Analysis

The total Cronbach's alpha coefficient for the CAS-SN was 0.918. Cronbach's alpha coefficients for the subdimensions were as follows: Professional Development and Interpersonal Interaction, α = 0.883; Clinical Competence and Confidence, α = 0.868; and Coping and Support Strategies, α = 0.731 (Table 4).

The split-half method was used to assess the reliability of the CAS-SN. The 15-item scale was divided into two parts: eight odd-numbered items and seven even-numbered items. The Cronbach's alpha values were 0.841 for the first half and 0.840 for the second half. The Spearman–Brown alpha value was 0.950, and the Guttman split-half coefficient was 0.946. The inter-half correlation coefficient was 0.905, and the results indicated excellent reliability (Table 4).

Response bias was assessed using Hotelling's T^2 and Tukey's test of additivity. Hotelling's T^2 is a multivariate technique that evaluates the effectiveness of a scale in measuring the desired information (DeVellis & Thorpe, 2021). In this study, Hotelling's T^2 test was applied to determine response bias. Based on the analysis, Hotelling's T^2 statistic was 446.960 (F = 30.520, $p < 0.001$). Tukey's test of additivity yielded a coefficient of F = 85.85 ($p < 0.05$). These results indicate that the items are summable, and participants responded consistently across items (DeVellis & Thorpe, 2021).

As shown in Supplemental Material Table 5, ICC for the overall scale was 0.91 ($p < 0.05$). Test–retest correlations between individual items and total scores were statistically significant ($p < 0.05$). Item–total correlation values of >0.20 indicate that the item is important for the scale (Marianti et al., 2023). According to the results obtained, item–total correlations ranged from 0.456 to 0.733. These results indicate that the scale is a valid measurement tool. No item showed a statistically significant difference between the two time points ($p > 0.05$) (Supplemental Material Table 5).

Test–retest analysis yielded an overall ICC of 0.91 ($p < 0.05$). ICC values for the first, second, and third subdimensions were 0.89, 0.87, and 0.85, respectively (Supplemental Material Table 5).

According to CFA results, unstandardized factor loadings (β) for all items ranged from 0.774 to 1.363. Standardized beta coefficients ($z\beta$) ranged from 0.622 to 0.862, indicating strong associations with their respective factors. All t-values were high and significant for each item ($p < 0.001$) (Supplemental Material Table 6).

Discussion

This section discusses the validity and reliability of CAS-SN Turkish version.

Content Validity

To test the content validity of the scale, opinions from 10 nursing experts were obtained. I-CVI and S-CVI of >0.80 indicate acceptable agreement among experts (DeVellis & Thorpe, 2021; Johnson & Christensen, 2024). In the present study, I-CVI values ranged from 0.80 to 1.00 and S-CVI was 0.973. These results demonstrate that the scale adequately assesses the construct and achieves content validity. Content validity analysis confirmed that the items are sufficient and appropriate for evaluating student nurses' clinical adjustment.

Cultural adaptation was carefully addressed during the scale adaptation process to secure measurement equivalence in the Turkish context. The translation and back-translation procedure,

Table 4
Reliability Results of the CAS-SN Total Scale and Subdimensions (n = 315).

	Cronbach α	Split into two halves			
		First half Cronbach α	Second half Cronbach α	Guttman split-half	Spearman-Brown	Correlation between two halves
CAS-SN total	0.918	0.841	0.840	0.946	0.950	0.905
Factor1: professional growth and interpersonal engagement	0.883					
Factor2: clinical competence and confidence	0.868					
Factor 3: coping and support strategies	0.731					

supported by expert panel reviews and pilot testing with nursing students, ensured that no items were culturally ambiguous or prone to misinterpretation. These steps confirm that the adapted CAS-SN preserves both conceptual integrity and cultural validity, thereby maintaining theoretical coherence and cross-cultural comparability within Turkish nursing education.

Construct Validity

The construct validity of the scale was first evaluated using EFA. The adequacy of the sample size and presence of moderate correlations between items were examined. Sample adequacy was assessed via the KMO value, and the Bartlett's test was used to determine correlations between items. In this study, the Bartlett's test was significant ($p < 0.05$), and the KMO value was >0.60 (KMO = 0.920). Literature suggests that for EFA suitability, the KMO value should be at least 0.80, and the Bartlett's test must be statistically significant ($p < 0.05$) (Carpenter, 2018). These findings confirm that the correlation matrix was suitable for factor analysis and the sample size was adequate.

EFA identified three subscales with eigenvalues of >1. This three-factor structure explained 66.65% of the total variance. As literature recommends that newly developed multifactorial scales should explain over 50% of the variance, these results confirm the scale's construct validity (DeVellis & Thorpe, 2021; Johnson & Christensen, 2024). In EFA, the factor loadings of items under the three subscales ranged from 0.692 to 0.836. Literature suggests retaining items with factor loadings of >0.30 (DeVellis & Thorpe, 2021; Johnson & Christensen, 2024). In this study, all factor loadings exceeded 0.30, indicating a robust factor structure. Scale items effectively capture the clinical adjustment levels of student nurses. Based on EFA, the scale comprises three subdimensions: "Professional Development and Interpersonal Interaction, Clinical Competence and Confidence, and Coping and Support Strategies."

Taken together, these three factors reflect the multidimensional nature of clinical adjustment by capturing student nurses' abilities to integrate into the clinical environment, fulfill their responsibilities effectively, and succeed in the learning process (Labrague et al., 2024). Alignment with the theoretical framework confirms that the adapted CAS-SN preserves both its conceptual integrity and contextual validity. In particular, the Turkish version of the scale demonstrates theoretical coherence by encompassing professional development and interpersonal interaction, clinical competence and confidence, as well as coping and support strategies, which lie at the core of nursing education in Turkiye. This alignment not only preserves the universal dimensions of clinical adjustment but also underscores its cultural significance, as communication, practical competence, and coping resources hold central importance in the context of Turkish nursing education.

CFA was conducted to validate the relationships between items, subscales, and the factor structure identified in EFA. CFA confirmed the scale's validity and reliability by demonstrating significant correlations between items and subscales. Various fit indices were used to assess the factor validity of the model tested in the CFA (Brown, 2015). CFA results showed a χ^2/df ratio < 5, factor loadings > 0.30 for all subdimensions, fit indices (GFI, CFI, IFI) > 0.90, and RMSEA < 0.080. Strong and significant relationships were found between the scale and its subdimensions. In the literature, model fit indices > 0.90, χ^2/df ratio < 5, and RMSA value < 0.08 are accepted as good fit indicators (Hooper, 2008; Simsek, 2007). The CFA results in this study align with the thresholds reported in the literature. The results confirm that the data fit the model, factor structure derived by EFA is valid, subdimensions align with the overall scale, and items are adequately associated with their respective factors.

Reliability

The reliability of the scale was evaluated using Cronbach's alpha to assess internal consistency. Cronbach's alpha indicates whether the items measure similar attributes and reflects the homogeneity of a scale; acceptable values generally range from 0.60 to 1.00 (Carpenter, 2018). In the present study, Cronbach's alpha coefficients ranged between 0.731 and 0.918. These results showed that the scale has a high level of reliability (DeVellis & Thorpe, 2021).

In this study, item–total correlations, item–subscale correlations, and correlations between subscale and total scale scores were all positive, statistically significant, and exceeded 0.30. These results demonstrate that each item correlates sufficiently with its subscale's total score, subscale item reliability is high, and the scale exhibits strong internal consistency (Kartal & Bardakci, 2018; Secer, 2018). Hotelling's T^2 and Tukey's test of additivity results indicated that participants responded consistently across items (Secer, 2018).

Split-half reliability analysis was also conducted. Literature recommends that Cronbach's alpha values for both halves exceed 0.70, inter-half correlations be ≥0.70, and Spearman–Brown/Guttman split-half coefficients exceed 0.80 (Cam et al., 2010; Sencan, 2005). The results surpassed these thresholds, confirming the scale's high reliability.

Test–retest analysis yielded an overall ICC of 0.91 ($p < 0.05$). ICC values for the first, second, and third subdimensions were 0.89, 0.87, and 0.85, respectively (Supplemental Material Table 5). ICC values <0.50 indicate poor reliability, values between 0.50–0.75 indicate moderate reliability, values between 0.75–0.90 indicate good reliability, and values >0.90 indicate excellent reliability (Koo & Li, 2016). The overall scale demonstrated excellent test–retest reliability and each subdimension demonstrated good reliability over a two-week interval.

The total ICC of CAS-SN was 0.91. Test–retest correlations between individual items and total scores were statistically significant ($p < 0.05$). Item–total correlation values of >0.20 indicate that the item is important for the scale (Marianti et al., 2023). According to the results obtained, item–total correlations ranged from 0.456 to 0.733. These results indicate that the scale is a valid measurement tool. No statistically significant differences were observed between measurements at two time points for any of the items.

According to CFA results, unstandardized factor loadings (β) for all items ranged from 0.774 to 1.363. Standardized beta coefficients ($z\beta$) ranged from 0.622 to 0.862, indicating strong associations with their respective factors. All t-values were high and significant for each item ($p < 0.001$) (Supplemental Material Table 6).

Conclusion and Recommendations

The results obtained in the present study indicate that the Turkish version of the CAS-SN is a valid and reliable instrument for assessing clinical adjustment among student nurses. The CAS-SN can aid in identifying students' levels of clinical adjustment and the factors influencing this adjustment, thereby informing the design of targeted interventions and support mechanisms to foster effective clinical adaptation. Educators may use the scale to tailor mentorship and guidance to students' individual needs, allowing early detection of stress, anxiety, and emotional exhaustion that may arise from adjustment difficulties. Proactive support can help preserve students' self-confidence, sustain academic performance, and reduce attrition from nursing programs. Future research should test the validity and reliability of the scale in student nurse populations from different cultural contexts and larger sample groups and employ it in longitudinal studies to monitor changes in clinical adjustment over time.

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Limitations

This study has several limitations. It was conducted in two nursing programs within a single university, which may limit the generalizability of the findings. Data were collected via self-report, and the majority of participants were female, potentially restricting sample diversity and external validity. This study is limited by the potential risk of inflated validity arising from the use of the same sample for both EFA and CFA, as well as by the omission of other validity assessments.

Data Availability Statement

The authors do not have permission to share data.

Declaration of Competing Interest

The authors report no actual or potential conflicts of interest.

CRediT authorship contribution statement

Gizem Nur Kati: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Asude Guney:** Writing – review & editing, Writing – original draft, Validation, Software, Formal analysis, Data curation. **Gulden Basit:** Writing – review & editing, Writing – original draft, Validation, Supervision, Software, Project administration, Formal analysis. **Hilal Turkben Polat:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.teln.2025.09.024.

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