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Cross-Cultural Adaptation and Psychometric Evaluation of the Healthcare Professionals Patient Safety Assessment Curriculum Survey (HPPSACS) for Health Professions Education

Gizem Açıkgöz

gizem.acikgoz@atlas.edu.tr

Atlas Üniversitesi

Tuba Çatak

Gedik University

Article

Keywords: Patient safety, Patient safety education, Health professions education, Psychometrics, Validity, Reliability

Posted Date: September 16th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10673570/v1

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Additional Declarations: No competing interests reported.

Abstract

Aim

To evaluate the validity and reliability of the Turkish version of the Healthcare Professionals Patient Safety Assessment Curriculum Survey (HPPSACS) for use in health professions education.

Design:

Methodological study.

Methods

A total of 616 undergraduate students from nursing, medicine, dentistry, pharmacy, physiotherapy and rehabilitation, and nutrition and dietetics programmes participated. Cross-cultural adaptation followed internationally accepted guidelines, including forward and back translation, expert review, and pilot testing. Content validity was assessed using the content validity index. Construct validity was evaluated through confirmatory factor analysis, convergent validity, and discriminant validity. Reliability was examined using internal consistency, split-half reliability, item analysis, and test–retest reliability.

Results

The Turkish version retained the original 23-item, four-factor structure. Content validity was excellent (S-CVI = 0.91). Confirmatory factor analysis demonstrated good model fit ($\chi^2/df = 1.983$, CFI = 0.973, TLI = 0.970, RMSEA = 0.040). Standardized factor loadings ranged from 0.652 to 0.840. Convergent and discriminant validity were supported, and internal consistency was excellent (Cronbach's $\alpha = 0.932$; McDonald's $\omega = 0.939$). Split-half reliability, item analysis, and test–retest findings (ICC = 0.900–0.999) further confirmed the scale's reliability and temporal stability.

Conclusions

The Turkish HPPSACS is a valid and reliable instrument for evaluating patient safety education in health professions education. It provides educators and researchers with a standardized measure to evaluate curricula, support educational quality improvement, and facilitate future research across health professions.

INTRODUCTION

Preparing healthcare professionals to deliver safe, high-quality care has become a central goal of health professions education. As healthcare systems become increasingly complex, patient safety is now recognised as a fundamental educational priority that should be systematically integrated throughout undergraduate curricula (Al Qarni et al., 2021; Ferreira Netto et al., 2025; Johl et al., 2022; WHO, 2011). Despite sustained international efforts, preventable harm remains a major global challenge, reinforcing the need to equip future healthcare professionals with the competencies required to recognise risks, minimise avoidable harm, and contribute to safer healthcare systems (WHO, 2021; WHO, 2024). Accordingly, patient safety education extends beyond discipline-specific knowledge to encompass systems thinking, teamwork, communication, safety culture, and quality improvement competencies that are essential for safe clinical practice (Goldman et al., 2021; Johl et al., 2022; WHO, 2011). Reviews of patient safety education indicate that well-designed curricula are associated with improvements in learners' knowledge, attitudes, confidence, and preparedness for clinical practice (Al Qarni et al., 2021; Ferreira Netto et al., 2025).

Although education aimed at developing individual patient safety competencies remains a cornerstone of health professions education, contemporary patient safety frameworks emphasise that safe care also depends on understanding the healthcare system in which care is delivered (Goldman et al., 2021; Klamen et al., 2013; WHO, 2011). Accordingly, systems-oriented perspectives have become an essential component of patient safety education by recognising safety as an emergent property of interactions among healthcare professionals, patients, technologies, organisational processes, and the wider healthcare environment, rather than solely the actions of individual practitioners (Goldman et al., 2021; Klamen et al., 2013). Reflecting this perspective, health professions education increasingly aims to develop shared competencies, including systems thinking, communication, teamwork, human factors, organisational learning, and safety culture, across multiple professional disciplines (Bowes et al., 2023; Goldman et al., 2021; WHO, 2011). Consequently, educational assessment should also reflect this systems perspective. Because patient safety competencies are developed through collaborative and interdependent professional practice, evaluating them within a single discipline provides only a partial understanding of curriculum effectiveness (Bowes et al., 2023; Goldman et al., 2021). Educational assessment therefore requires instruments that are conceptually aligned with systems thinking and capable of evaluating patient safety education across multiple health professions using a common assessment framework (Chenot & Daniel, 2010; Ginsburg et al., 2012; WHO, 2011).

Despite this growing need, evaluating patient safety curricula remains challenging. Numerous instruments have been developed to assess patient safety-related outcomes; however, they differ substantially in their conceptual focus, intended purpose, target population, and educational context (Carruthers et al., 2009; Okuyama et al., 2011; Singla et al., 2006). Existing instruments variously measure patient safety knowledge, attitudes, skills, competencies, teamwork, safety culture, or error reporting, and many have been developed for specific disciplines such as nursing, medicine, or pharmacy (Carruthers et al., 2009; Ginsburg et al., 2012; Lee et al., 2014; Mira et al., 2015; Piscotty et al., 2013). Consequently, although these instruments provide valuable information about individual learners, they offer limited utility for evaluating patient safety curricula across multiple health professions using a

common systems-oriented framework (Chenot & Daniel, 2010; Ginsburg et al., 2012). Reviews of patient safety measurement instruments have likewise highlighted considerable heterogeneity in their conceptual foundations, measured domains, psychometric characteristics, and intended users, limiting comparisons across educational programmes and hindering evidence-informed curriculum evaluation (Okuyama et al., 2011; Singla et al., 2006; Taskiran et al., 2020).

Among the available instruments, the Healthcare Professionals Patient Safety Assessment Curriculum Survey (HPPSACS) is particularly well aligned with a systems-oriented perspective because it was specifically developed to evaluate how patient safety is embedded within undergraduate curricula across multiple health professions rather than within a single discipline (Chenot & Daniel, 2010). Unlike many existing instruments that primarily assess students' knowledge, attitudes, self-perceived competencies, or specific patient safety behaviours (Ginsburg et al., 2012; Lee et al., 2014; Mira et al., 2015), HPPSACS evaluates students' perceptions of patient safety education through four curriculum-related domains: comfort, error reporting, denial, and patient safety culture (Chenot & Daniel, 2010). By focusing on the educational environment rather than solely on individual learner attributes, HPPSACS provides educators with a common framework for evaluating curriculum implementation, identifying shared strengths and weaknesses, comparing educational outcomes across programmes, and supporting institution-wide curriculum improvement (Chenot & Daniel, 2010; Ginsburg et al., 2012).

The value of such an assessment framework is becoming increasingly important as health professions education promotes collaborative practice and interprofessional learning (Bowes et al., 2023; Ferreira Netto et al., 2025; WHO, 2011). Evaluating curricula using separate profession-specific instruments makes it difficult to determine whether shared patient safety competencies are being achieved consistently across programmes and limits meaningful comparisons across health professions (Ginsburg et al., 2012; Lee et al., 2016; WHO, 2011). In contrast, a common assessment framework enables educators to evaluate patient safety education from a systems perspective, compare curricular implementation across disciplines, and generate evidence to inform programme development, curriculum evaluation, and continuous quality improvement (Bowes et al., 2023; Chenot & Daniel, 2010; WHO, 2011).

In Türkiye, patient safety has become an increasingly important component of undergraduate health professions education (Arslan & Basit, 2021; Kocaman & Arslan Yürümezoğlu, 2015). However, previous Turkish validation studies have predominantly focused on nursing students or other profession-specific samples, leaving educators without a validated instrument capable of evaluating patient safety curricula across multiple health professions using a common systems-oriented framework (Eskici et al., 2021; Taskiran et al., 2020). As patient safety education continues to expand across undergraduate health professions programmes, the absence of a multidisciplinary curriculum assessment instrument limits cross-programme comparisons, institution-wide curriculum evaluation, and evidence-informed educational improvement (Arslan & Basit, 2021; WHO, 2011).

Therefore, this study aimed to cross-culturally adapt HPPSACS into Turkish and evaluate its psychometric properties among undergraduate students enrolled in nursing, medicine, dentistry, pharmacy, physiotherapy and rehabilitation, and nutrition and dietetics programmes. By providing a valid and reliable Turkish version of HPPSACS, this study introduces a systems-oriented, multidisciplinary educational assessment instrument that supports standardised curriculum evaluation across health professions, facilitates meaningful comparisons between programmes, and contributes to evidence-informed curriculum development and continuous quality improvement in undergraduate health professions education.

MATERIALS AND METHODS

Aim

The aim of this study was to cross-culturally adapt the HPPSACS into Turkish and to evaluate its validity and reliability among undergraduate health professions students in Türkiye.

Study Design

This methodological study was conducted between May 2025 and February 2026 and comprised two sequential phases: Phase I, cross-cultural adaptation of the HPPSACS into Turkish, and Phase II, psychometric evaluation of the adapted Turkish version. The cross-cultural adaptation was performed in accordance with the six-step guidelines proposed by Beaton et al. (2000), whereas the psychometric evaluation included assessments of content validity, construct validity, convergent validity, discriminant validity, internal consistency, item discrimination, and test–retest reliability.

Participants

Participants were undergraduate health professions students enrolled in public and private universities in Istanbul, Türkiye. Data were collected between July and November 2025 using a non-probability snowball sampling method. Participation was voluntary, and only students who provided informed consent were included in the study.

Recommendations for psychometric studies suggest including at least 300 participants or approximately 5–10 participants per questionnaire item, whereas more conservative recommendations propose up to 15 participants per item to obtain stable factor-analytic estimates (Hair et al., 1995; Stevens, 2002; Tabachnick & Fidell, 2018; Yurdabakan & Çüm, 2017). Based on the conservative criterion of 15 participants per item, the minimum required sample size for the 23-item HPPSACS was calculated as 345 participants. A total of 616 undergraduate health professions students were included in the final analyses.

Eligible participants were undergraduate students enrolled in a health professions programme at a public or private university in Istanbul, able to read and understand Turkish, and willing to participate by providing electronic informed consent. Questionnaires with incomplete responses were excluded from the analyses.

Instruments

Descriptive Information Form

The Descriptive Information Form was developed by the researchers based on the relevant literature and consisted of 10 items. The form collected information on participants' age, sex, university type, academic programme, and previous education and experiences related to patient safety.

Healthcare Professionals Patient Safety Assessment Curriculum Survey (HPPSACS): The HPPSACS was developed by Chenot and Daniel (2010) to evaluate health professions students' perceptions of patient safety education. The instrument consists of 23 items across four subscales: Comfort with Patient Safety Skills, Error Reporting Confidence, Denial of Error, and Culture of Safety. Items are rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating more positive perceptions of patient safety education.

Study Procedure

The study procedure comprised two sequential phases: Phase I, cross-cultural adaptation of the HPPSACS into Turkish, and Phase II, validation of the adapted Turkish version (Fig. 1).

Phase I. Cross-Cultural Adaptation

The Turkish version of the HPPSACS was developed following the six-step guidelines for the cross-cultural adaptation of self-report measures proposed by Beaton et al. (2000) to ensure semantic, conceptual, and cultural equivalence (Beaton et al., 2000; Çapık et al., 2018). The original instrument was independently forward-translated into Turkish by two bilingual translators and synthesised into a single Turkish version by the research team. This version was subsequently back-translated into English by two independent bilingual translators blinded to the original instrument to verify conceptual equivalence (Beaton et al., 2000). The translated version was reviewed by an expert committee using the Davis technique and revised according to their recommendations to improve semantic, conceptual, and cultural equivalence (Davis, 1992). The pre-final Turkish version was pilot-tested with undergraduate health professions students to evaluate item clarity and comprehensibility. Following minor linguistic revisions based on participants' feedback, the research team reached consensus on the final Turkish version of the HPPSACS for psychometric evaluation (Beaton et al., 2000).

Phase II. Psychometric Evaluation

The psychometric evaluation of the Turkish version of the HPPSACS comprised the evaluation of content validity, construct validity, convergent validity, discriminant validity, internal consistency, item discrimination, and test–retest reliability. The statistical methods used to evaluate these psychometric properties are described in the Statistical Analysis section.

Data Collection

Data were collected using an online questionnaire between July and November 2025. The survey link was distributed electronically using a snowball sampling approach, with participants encouraged to forward the survey to other eligible students. Data collection continued throughout the predefined study period.

Statistical Analysis

Data were analysed using IBM SPSS Statistics version 22.0 and IBM SPSS AMOS version 25.0. Descriptive statistics were presented as frequencies, percentages, means, standard deviations, and minimum and maximum values. Data normality was assessed using skewness and kurtosis coefficients (George & Mallery, 2010; Tabachnick & Fidell, 2013). Content validity was evaluated using the Davis technique by calculating the item-level and scale-level content validity indices (I-CVI and S-CVI) (Davis, 1992). Construct validity was examined using confirmatory factor analysis (CFA), and model fit was assessed using χ^2/df, CFI, TLI, NFI, GFI, AGFI, RMSEA, and RMR (Hu & Bentler, 1999; Hooper et al., 2008; Kline, 2016). Convergent and discriminant validity were evaluated using CR, AVE, MSV, ASV, and HTMT (Bagozzi & Yi, 1988; Henseler et al., 2015). Reliability was assessed using Cronbach's alpha, McDonald's omega, split-half reliability, item-total correlations, upper–lower 27% group comparisons, paired-samples t-tests, and the intraclass correlation coefficient (ICC) (Cohen, 1988; Ebel & Frisbie, 1991; Koo & Li, 2016; McDonald, 1999; Nunnally & Bernstein, 1994). Statistical significance was set at $p < 0.05$.

Ethical Considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki and the principles of research and publication ethics. Ethical approval was obtained from the İstanbul Kent University Health Sciences Research Ethics Committee (Meeting No. 2025-02; Approval Date: 5 March 2025). Permission to translate, culturally adapt, and validate the Turkish version of the HPPSACS was obtained from the original developer prior to the study. Electronic informed consent was obtained from all participants before data collection.

RESULTS

The results are presented in three sections: (1) participant characteristics and patient safety-related variables, (2) Phase I (cross-cultural adaptation), and (3) Phase II (psychometric evaluation).

Participant Characteristics and Patient Safety-Related Variables

The mean age of the participants was 21.25 ± 3.00 years (range: 18–45). Most participants were female (74.4%), enrolled in private universities (61.5%), studying nursing (30.2%), and in the first year of their programme (41.4%). Regarding patient safety, 84.7% of participants had previously heard of the concept; however, only 37.2% had received formal education on the topic, and 74.8% had not participated in any patient safety-related scientific activity. Although 68.8% of participants considered patient safety to be very important, only 23.1% perceived their knowledge as adequate and 22.1% felt competent in patient safety practices (Table 1).

Table 1
Participant Characteristics and Patient Safety-Related Variables

Characteristic	Category	n (%) / Mean ± SD	Variables	Category	n (%)
Age (years)	—	21.25 ± 3.00 (18–45)	**Heard of patient safety**	Yes	522 (84.7)
Gender	Female	458 (74.4)		No	56 (9.1)
	Male	154 (25.0)		Do not remember	38 (6.2)
	Other	4 (0.6)	**Received patient safety education**	Yes	229 (37.2)
University type	Public	237 (38.5)		No	278 (45.1)
	Private	379 (61.5)		Do not remember	109 (17.7)
Program	Nursing	186 (30.2)	**Participation in scientific activities**	Yes	95 (15.4)
	Nutrition and Dietetics	138 (22.4)		No	461 (74.8)
	Medicine	90 (14.6)		Do not remember	60 (9.7)
	Physiotherapy and Rehabilitation	86 (14.0)	**Perceived knowledge**	Yes	142 (23.1)
	Pharmacy	78 (12.7)		Partly	288 (46.8)
	Dentistry	38 (6.2)		No	186 (30.2)
Year of study	First	255 (41.4)	**Perceived competence**	Yes	136 (22.1)
	Second	141 (22.9)		Partly	259 (42.0)
	Third	109 (17.7)		No	221 (35.9)
	Fourth	87 (14.1)	**Importance of patient safety**	1	7 (1.1)
	Fifth	24 (3.9)		2	16 (2.6)

Characteristic	Category	n (%) / Mean ± SD	Variables	Category	n (%)
				3	36 (5.8)
				4	133 (21.6)
				5	424 (68.8)

Phase I. Cross-Cultural Adaptation

The cross-cultural adaptation of the HPPSACS was completed in accordance with the six-step guidelines proposed by Beaton et al. Forward and back translations demonstrated conceptual equivalence with the original instrument. Following expert review and pretesting, the final Turkish version of the HPPSACS was established.

Content validity was evaluated using the Davis technique. The item-level content validity index (I-CVI) ranged from 0.84 to 1.00, while the scale-level content validity index (S-CVI) was 0.91. All items exceeded the recommended threshold for content validity and were therefore retained. Based on the experts' recommendations, minor linguistic revisions were made to improve the clarity and cultural appropriateness of several items before establishing the final Turkish version of the HPPSACS (Table 2).

Table 2
Expert Evaluation and Content Validity Results of the Turkish Version of the Healthcare Professionals Patient Safety Assessment Curriculum Survey (HPPSACS)

Item	1	2	3	4	I-CVI	Item	1	2	3	4	I-CVI
1	1	0	2	10	**0.92**	13	1	0	1	11	**0.92**
2	1	1	2	9	**0.84**	14	1	0	1	11	**0.92**
3	1	0	2	10	**0.92**	15	2	0	0	11	**0.84**
4	2	0	2	9	**0.84**	16	2	0	2	8	**0.84**
5	1	0	3	9	**0.92**	17	1	1	3	8	**0.84**
6	0	1	6	6	**0.92**	18	2	0	0	11	**0.84**
7	1	1	2	9	**0.84**	19	1	0	1	11	**0.92**
8	0	0	1	12	**1.00**	20	0	0	3	10	**1.00**
9	0	0	1	12	**1.00**	21	2	0	2	8	**0.84**
10	0	0	0	13	**1.00**	22	1	0	3	9	**0.92**
11	0	1	2	10	**0.92**	23	1	0	3	9	**0.92**
12	1	0	1	11	**0.92**						
S-CVI 0.91											

Phase II. Psychometric Evaluation

Confirmatory factor analysis (CFA) was conducted to examine the four-factor structure of the Turkish version of the HPPSACS (Figure.2).

The model demonstrated a good fit to the data, with $\chi^2/df = 1.983$, RMR = 0.048, GFI = 0.934, AGFI = 0.919, NFI = 0.948, TLI = 0.970, CFI = 0.973, and RMSEA = 0.040 (Table 3).

Table 3
Confirmatory Factor Analysis Model Fit Indices of the Turkish Version of the HPPSACS

Model fit index	Value	Recommended threshold
χ^2	444.172	—
df	224	—
p	< 0.001	—
χ^2/df	1.983	≤ 5.00
RMR	0.048	≤ 0.08
GFI	0.934	≥ 0.85
AGFI	0.919	≥ 0.80
NFI	0.948	≥ 0.90
RFI	0.941	≥ 0.90
IFI	0.973	≥ 0.90
TLI	0.970	≥ 0.90
CFI	0.973	≥ 0.90
PGFI	0.548*	≥ 0.50
RMSEA	0.040	≤ 0.08

All standardised factor loadings were statistically significant ($p < 0.001$) and ranged from 0.652 to 0.840. The corresponding R^2 values ranged from 0.426 to 0.706, indicating adequate representation of the latent constructs by their respective items (Table 4).

Composite reliability (CR) values ranged from 0.859 to 0.920, whereas average variance extracted (AVE) values ranged from 0.561 to 0.660. All CR and AVE values exceeded the recommended thresholds, providing evidence of convergent validity for the Turkish version of the HPPSACS (Table 5).

Discriminant validity was supported, as the square root of the AVE (√AVE) exceeded the inter-factor correlations for all constructs, whereas the maximum shared variance (MSV) and average shared variance (ASV) were lower than the corresponding AVE values. In addition, HTMT values ranged from 0.440 to 0.561, all of which were below the recommended threshold of 0.90, providing further evidence of discriminant validity (Table 5).

Table 4
Item Descriptions and Standardized Factor Loadings of the Turkish Version of the HPPSACS

Factor	Item	Original English Item	Turkish Item	β	R^2
F1. Comfort	19	Accurately completing an incident report.	Bir olay bildirim raporunu doğru bir şekilde doldurmada	0.803	0.645
	20	Analyzing a case to find the causes of an error.	Bir hatanın nedenlerini bulmak için bir vakayı analiz etmede	0.840	0.706
	21	Supporting and advising a peer who must decide how to respond to an error.	Bir hataya nasıl yanıt vereceğine karar vermesi gereken bir meslektaşımı desteklemede ve ona tavsiyede bulunmada	0.778	0.606
	22	Disclosing an error to a faculty member.	Bir hatayı bir öğretim üyesine açıklamada	0.823	0.677
	23	Disclosing an error to another healthcare professional.	Bir hatayı başka bir sağlık profesyoneline açıklamada	0.817	0.667
F2. Error Reporting	2	Competent healthcare professionals do not make medical errors that lead to patient harm.	Yetkin sağlık profesyonelleri hastanın zarar görmesine yol açan tıbbi hatalar yapmaz.	0.705	0.497
	4	Only physicians can determine the causes of a medical error.	Tıbbi bir hatanın nedenlerini yalnızca hekimler belirleyebilir.	0.724	0.524
	5	Healthcare professionals should not tolerate uncertainty in patient care.	Sağlık profesyonelleri hasta bakımında belirsizliğe tolerans göstermemelidir.	0.746	0.557
	6	The culture of healthcare makes it easy for healthcare professionals to deal constructively with errors.	Hasta güvenliği kültürü, sağlık profesyonellerinin hatalarla yapıcı bir şekilde başa çıkmasını kolaylaştırır.	0.789	0.623
	8	Healthcare professionals routinely share information about medical errors and what caused them.	Sağlık profesyonelleri tıbbi hatalar ve bunlara neyin sebep olduğu hakkında bilgileri düzenli olarak paylaşırlar.	0.652	0.426
	10	Healthcare professionals routinely report medical errors.	Sağlık profesyonelleri tıbbi hataları düzenli olarak bildirirler.	0.806	0.649
	12	Physicians should be the healthcare professionals that report errors to an affected patient and their family.	Tıbbi hataları hastaya ve ailesine bildiren sağlık profesyonelleri hekimler olmalıdır.	0.767	0.588

Factor	Item	Original English Item	Turkish Item	β	R^2
	13	Effective responses to errors focus primarily on the healthcare professional involved.	Hatalara verilen etkili yanıtlar öncelikle ilgili sağlık profesyoneline odaklanır.	0.711	0.505
	17	After an error occurs, an effective strategy is to work harder to be more careful.	Bir hata meydana geldikten sonra, daha dikkatli olmak için daha çok çalışmak etkili bir stratejidir.	0.827	0.684
F3. Denial	11	Reporting systems do little to reduce future errors.	Bildirim sistemleri gelecekteki hataları azaltmada pek etkili değildir.	0.777	0.604
	14	If there is no harm to a patient, there is no need to address an error.	Bir hata hastaya zarar vermiyorsa bildirmeye gerek yoktur.	0.829	0.687
	15	If I saw a medical error, I would keep it to myself.	Bir tıbbi hata görseydim, bunu kendime saklardım.	0.781	0.610
	16	Most errors are due to things that healthcare professionals can't do anything about.	Çoğu hata, sağlık profesyonellerinin müdahale edemeyeceği durumlardan kaynaklanır.	0.719	0.517
F4. Safety Culture	1	Making errors in healthcare is inevitable.	Sağlık hizmetlerinde hata yapmak kaçınılmazdır.	0.711	0.505
	3	Healthcare professionals should routinely spend part of their professional time working to improve patient care.	Sağlık profesyonelleri, çalışma zamanlarının bir kısmını düzenli olarak hasta bakımını iyileştirmeye ayırmalıdır.	0.835	0.697
	7	Learning how to improve patient safety is an appropriate use of time in health programs in school.	Hasta güvenliğinin nasıl iyileştirileceğini öğrenmek, okuldaki sağlık programlarına ait zamanın verimli bir kullanımıdır.	0.719	0.517
	9	In my clinical experiences so far, faculty and staff communicate to me that patient safety is a high priority.	Şimdiye kadarki klinik deneyimlerimde, öğretim üyeleri ve sağlık profesyonelleri bana hasta güvenliğinin öncelikli bir konu olduğunu belirttiler.	0.765	0.586
	18	There is a gap between what we know as 'best care' and what we provide on a day to day basis.	'En iyi bakım' olarak bildiğimiz şey ile günlük olarak sunduğumuz bakım arasında fark vardır.	0.772	0.596

Table 5
Convergent and Discriminant Validity of the Turkish Version of the HPPSACS

Factor	CR	AVE	MSV	ASV	√AVE
F1. Comfort	0.907	0.660	0.268	0.244	0.812
F2. Error Reporting	0.920	0.561	0.317	0.269	0.749
F3. Denial	0.859	0.604	0.319	0.246	0.777
F4. Safety Culture	0.873	0.580	0.319	0.301	0.762
Heterotrait–Monotrait Ratio (HTMT)					
Comparison		HTMT			
F1–F2		0.512			
F1–F3		0.440			
F1–F4		0.516			
F2–F3		0.461			
F2–F4		0.561			
F3–F4		0.560			

The Turkish version of the HPPSACS demonstrated excellent internal consistency, with a Cronbach's alpha of 0.932 and a McDonald's omega of 0.939. Cronbach's alpha coefficients for the four subscales ranged from 0.859 to 0.919, whereas McDonald's omega coefficients ranged from 0.904 to 0.933. Guttman split-half coefficients ranged from 0.739 to 0.865, and Spearman–Brown coefficients ranged from 0.850 to 0.928, indicating satisfactory split-half reliability.

Item-total correlations ranged from 0.612 to 0.788, with all values exceeding the recommended threshold of 0.30. Furthermore, all items significantly differentiated between the upper and lower 27% groups ($p < 0.001$), with large effect sizes (Cohen's $d = 2.503–4.358$), demonstrating good item discrimination.

The test–retest analysis demonstrated excellent temporal stability. No significant differences were observed between the first and second administrations ($p > 0.05$), whereas intraclass correlation coefficients (ICC) ranged from 0.900 to 0.999, indicating excellent stability over time (Table 6).

Table 6
Reliability of the Turkish Version of the Healthcare Professionals Patient Safety Assessment Curriculum Survey (HPPSACS)

Section	Measure	Result
Internal Consistency Reliability	**Cronbach's α (Comfort / Error Reporting / Denial / Safety Culture / Total)**	0.906 / 0.919 / 0.859 / 0.873 / 0.932
	McDonald's ω (Comfort / Error Reporting / Denial / Safety Culture / Total)	0.930 / 0.933 / 0.904 / 0.908 / 0.939
	Guttman split-half coefficient	0.808 / 0.865 / 0.739 / 0.763 / 0.794
	Spearman–Brown coefficient	0.894 / 0.928 / 0.850 / 0.865 / 0.885
Item Analysis and Item Discrimination	**Item-total correlation**	0.612–0.788
	Upper–lower 27% comparison (t-test)	22.804–39.705 (all $p < 0.001$)
	Cohen's d	2.503–4.358
Test–Retest Reliability (n = 40)	**ICC (Total / Comfort / Error Reporting / Denial / Safety Culture)**	0.938 / 0.955 / 0.900 / 0.991 / 0.999
	Paired-samples t-test	All $p > 0.05$

DISCUSSION

This study translated, culturally adapted, and psychometrically evaluated the Turkish version of the Healthcare Professionals Patient Safety Assessment Curriculum Survey (HPPSACS) among undergraduate students from multiple health professions in Türkiye. The findings demonstrated that the Turkish version preserved the original four-factor structure and showed satisfactory evidence of validity and reliability. Unlike previously adapted patient safety instruments in Türkiye, which have been validated exclusively among nursing students, this study provides the first psychometric evidence supporting the use of the HPPSACS in multidisciplinary undergraduate health professions education.

The cross-cultural adaptation process demonstrated that the Turkish version of the HPPSACS achieved conceptual, semantic, and cultural equivalence with the original instrument. The adaptation was conducted in accordance with internationally recognised guidelines for the cross-cultural adaptation of self-report measures (Beaton et al., 2000; International Test Commission, 2018; WHO, n.d.). Content validity findings further supported the appropriateness of the Turkish version, with both I-CVI (0.84–1.00) and S-CVI (0.91) exceeding the recommended thresholds (Davis, 1992; Polit & Beck, 2012). No items required removal during the adaptation process; instead, only minor linguistic revisions were made following expert review and pilot testing. These findings indicate that the original conceptual structure of

the HPPSACS was successfully preserved while ensuring its suitability for the Turkish educational context.

The construct validity findings supported the preservation of the original four-factor structure of the HPPSACS in the Turkish version. Confirmatory factor analysis demonstrated good model fit across all indices, indicating that the original conceptual framework of the instrument was successfully retained in the Turkish context (Hair et al., 2022; Hu & Bentler, 1999; Kline, 2016). These findings are consistent with the theoretical framework proposed by Chenot and Daniel and support the cross-cultural stability of the instrument for evaluating patient safety education among undergraduate health professions students.

All standardised factor loadings were statistically significant and exceeded the recommended threshold, indicating that the items adequately represented their intended latent constructs. Unlike some previous cross-cultural adaptations of patient safety instruments that required item removal or substantial model modifications (Bressan et al., 2016), all items were retained within their original factors. This finding suggests that the Turkish version preserved the structural integrity of the original instrument while supporting its applicability in a multidisciplinary educational context.

Convergent and discriminant validity were also supported. All CR, AVE, MSV, ASV, and HTMT values met the recommended criteria (Fornell & Larcker, 1981; Henseler et al., 2015), indicating that the Turkish version of the HPPSACS demonstrates a conceptually coherent and psychometrically sound measurement structure for evaluating patient safety education among undergraduate health professions students.

Reliability analyses provided consistent evidence supporting the internal consistency of the Turkish version of the HPPSACS. Both Cronbach's alpha and McDonald's omega coefficients exceeded the recommended thresholds, indicating that the instrument demonstrated a high level of internal consistency across all subscales (McDonald, 1999; Nunnally & Bernstein, 1994; Tavakol & Dennick, 2011). The close agreement between the alpha and omega coefficients further supports the robustness of the measurement structure and suggests that the Turkish version provides reliable measurements of patient safety education among undergraduate health professions students.

Additional evidence supporting the reliability of the Turkish version of the HPPSACS was obtained through split-half analysis. The Guttman and Spearman–Brown coefficients indicated satisfactory agreement between the two halves of the instrument, demonstrating consistent measurement across different portions of the scale (McDonald, 1999; Tavakol & Dennick, 2011).

Item-level analyses further supported the psychometric performance of the instrument. All item-total correlations exceeded the recommended criterion, indicating that each item contributed meaningfully to the overall construct being measured (Ebel & Frisbie, 1991). Furthermore, significant differences between the upper and lower 27% groups, together with large effect sizes, demonstrated that all items effectively discriminated between participants with lower and higher levels of patient safety perceptions

(Cohen, 1988). These findings provide additional evidence supporting the internal consistency and discriminatory capacity of the Turkish version of the HPPSACS.

Finally, temporal stability was supported by the test–retest analysis. The absence of significant differences between repeated measurements, together with high intraclass correlation coefficients, indicates that the Turkish version of the HPPSACS provides stable and reproducible measurements over time (Koo & Li, 2016). Taken together, the findings from internal consistency, split-half reliability, item-level analyses, and temporal stability provide robust and complementary evidence supporting the reliability of the Turkish version of the HPPSACS. These results indicate that the instrument can be used to generate reliable assessments of patient safety education among undergraduate health professions students across repeated administrations.

Limitations

This study has several limitations. First, participants were recruited using a non-probability snowball sampling method, which may limit the generalisability of the findings. Second, the study was conducted exclusively among undergraduate health professions students enrolled in public and private universities in Istanbul. Consequently, the findings may not be generalisable to students from other regions of Türkiye or to different educational contexts. Finally, although the study provides comprehensive evidence of validity and reliability, the responsiveness of the instrument to changes following patient safety educational interventions was not examined. Future research should therefore evaluate the instrument in larger and more diverse samples and investigate its sensitivity to educational change over time.

CONCLUSIONS

The Turkish version of the HPPSACS consists of 23 items organised into four dimensions (Comfort, Error Reporting, Denial, and Safety Culture). The findings provide robust evidence that the instrument is a valid and reliable measure for evaluating patient safety education among undergraduate health professions students in Türkiye.

As international recommendations increasingly emphasise multidisciplinary approaches to patient safety education, the availability of a valid instrument that can be applied across different health professions is essential for evaluating educational outcomes and informing curriculum development. Unlike existing Turkish patient safety education instruments, which have primarily been validated among nursing students, the HPPSACS provides a common framework for assessing patient safety education across multiple health professions.

The instrument may be used to assess students' perceptions of patient safety education, identify educational needs, compare educational outcomes across disciplines, and support the evaluation and continuous improvement of multidisciplinary patient safety curricula. Future studies should further examine its psychometric performance in larger and more diverse populations, evaluate its

responsiveness to educational interventions, and explore its applicability across different educational and healthcare contexts.

Declarations

Competing Interests

The authors declare that they have no competing interests.

STATEMENTS AND DECLARATIONS

Funding

The authors received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Competing Interests

The authors declare that they have no competing interests.

Ethics Approval

The study was conducted in accordance with the Declaration of Helsinki and was approved by the Health Sciences Research Ethics Committee of İstanbul Kent University (Approval No. E-10420511-051-42542; Decision No. 2025-02; 5 March 2025).

Consent to Participate

Informed consent was obtained from all individual participants included in the study.

Funding

The authors received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author Contribution

G.A. and T.Ç. conceived and designed the study. G.A. and T.Ç. developed the methodology. G.A. performed the formal analysis and curated the data. G.A. and T.Ç. conducted the investigation and interpreted the findings. G.A. prepared the original draft of the manuscript. G.A. and T.Ç. reviewed and

revised the manuscript. G.A. prepared the visualisations, supervised the study, and managed the project administration. All authors read and approved the final manuscript.

Acknowledgement

The authors would like to thank all undergraduate health professions students who voluntarily participated in this study.

Data Availability

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request. The data are not publicly available because they contain information that could compromise the privacy of research participants.

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Figures

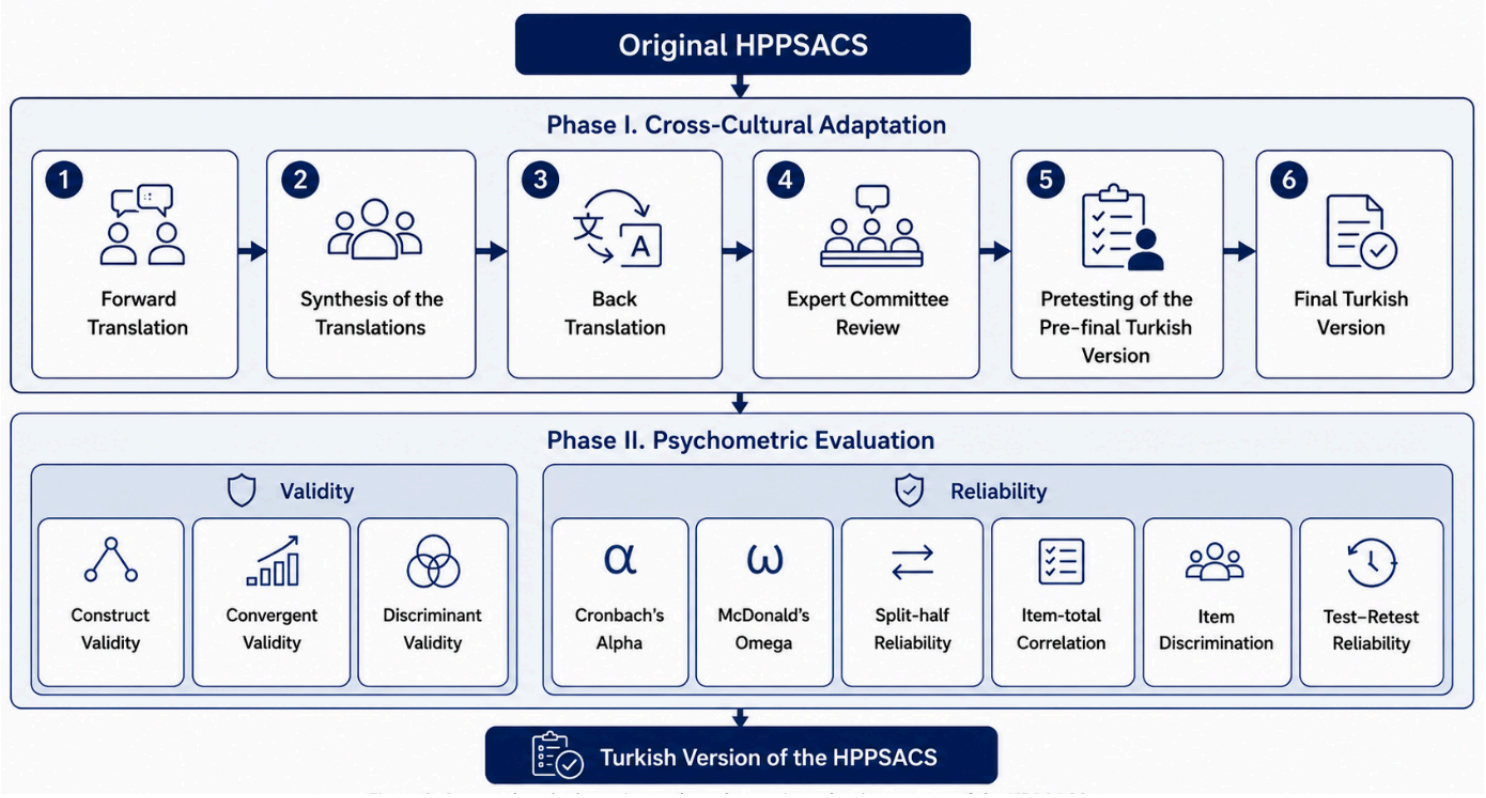


Figure 1

Study procedure for the cross-cultural adaptation and psychometric evaluation of the Healthcare Professionals Patient Safety Assessment Curriculum Survey (HPPSACS)

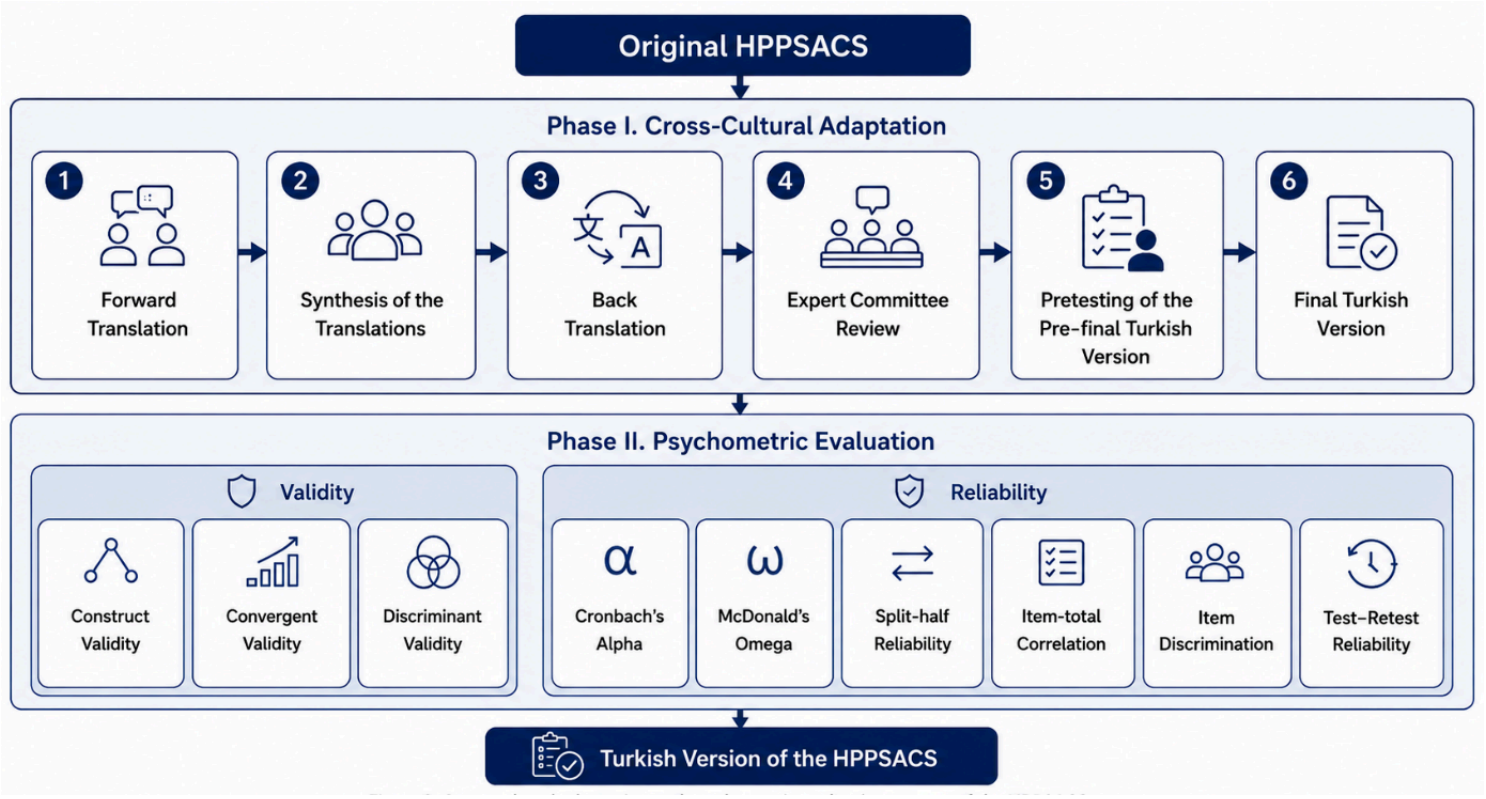


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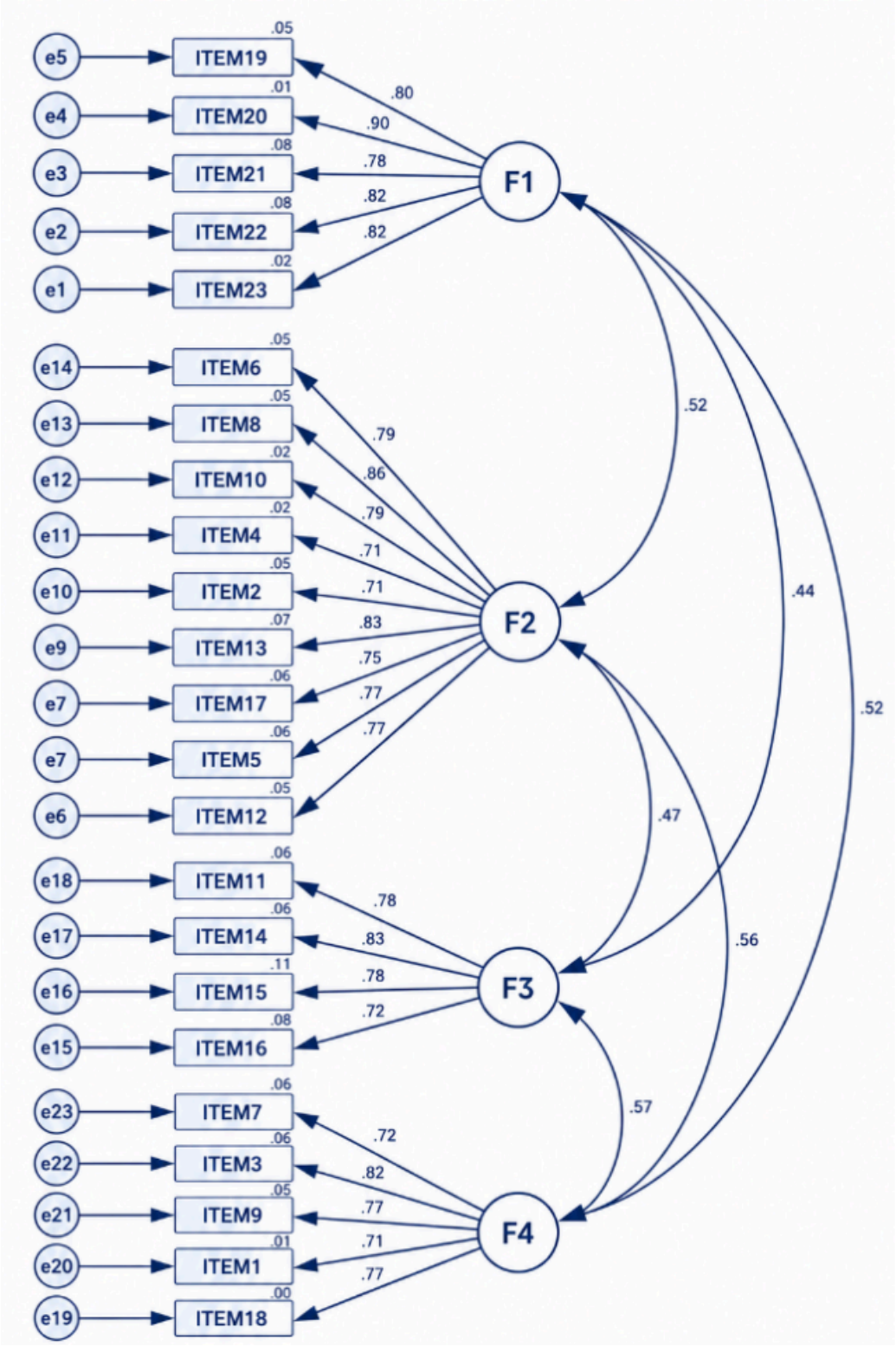


Figure 2

Confirmatory factor analysis of the four-factor structure of the Turkish version of the Healthcare Professionals Patient Safety Assessment Curriculum Survey (HPPSACS)

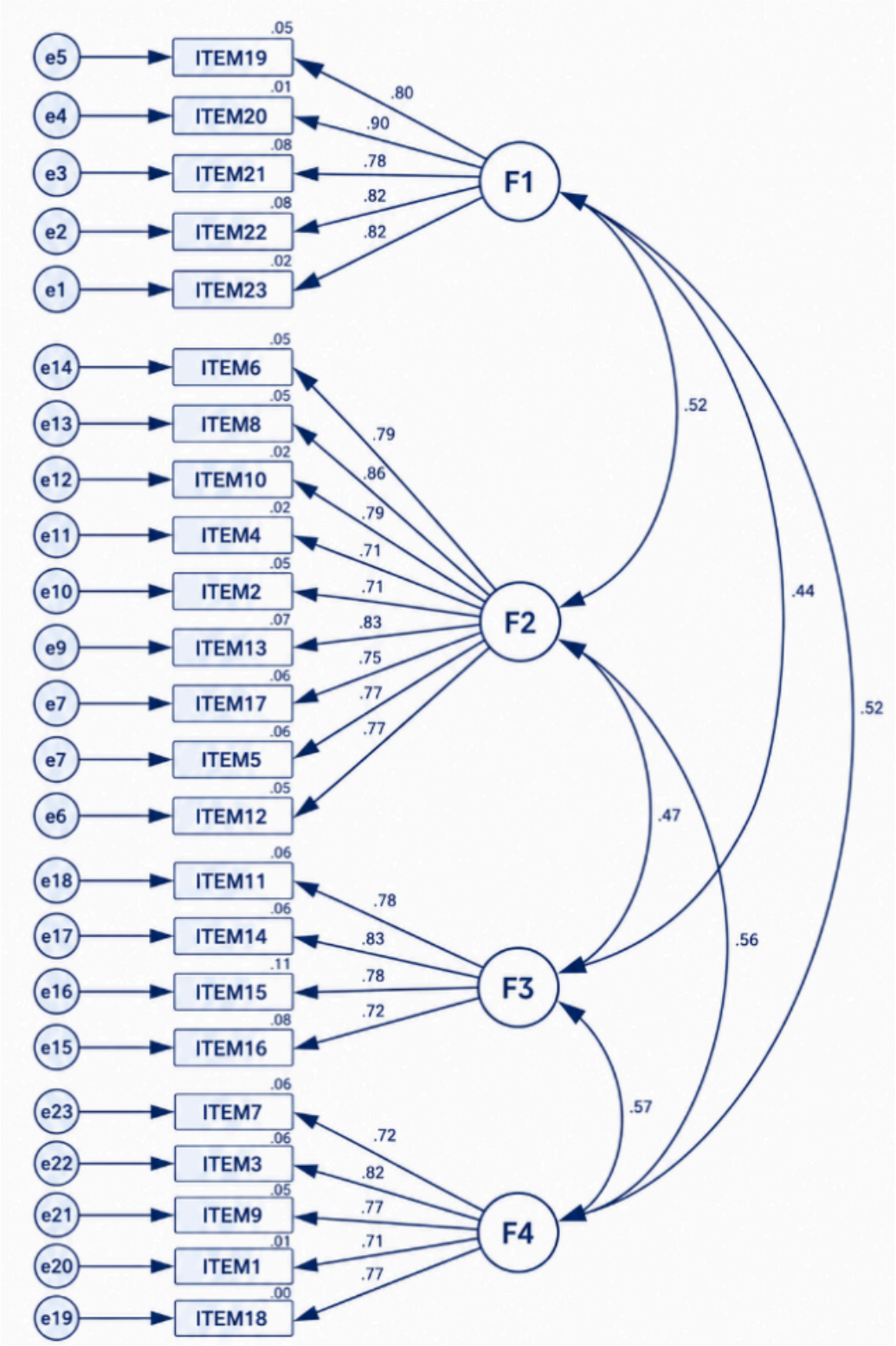


Figure 2

Confirmatory factor analysis of the four-factor structure of the Turkish version of the Healthcare Professionals Patient Safety Assessment Curriculum Survey (HPPSACS)

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