PSYCHOMETRIC VALIDATION OF THE BRAZILIAN VERSION OF THE ATTITUDES TO PATIENT SAFETY QUESTIONNAIRE (APSQ-III) AMONG HEALTH STUDENTS

VALIDAÇÃO PSICOMÉTRICA DA VERSÃO BRASILEIRA DO QUESTIONÁRIO DE ATITUDES EM RELAÇÃO À SEGURANÇA DO PACIENTE (APSQ-III) ENTRE ESTUDANTES DA ÁREA DA SAÚDE

VALIDACIÓN PSICOMÉTRICA DE LA VERSIÓN BRASILEÑA DEL CUESTIONARIO DE ACTITUDES HACIA LA SEGURIDAD DEL PACIENTE (APSQ-III) ENTRE ESTUDIANTES DE LA SALUD

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ABSTRACT

This chapter details the cross-cultural adaptation and psychometric validation of the Attitudes to Patient Safety Questionnaire III (APSQ-III) for Brazilian Portuguese, aiming to assess the attitudes of health area students regarding patient safety. Driven by the growing importance of patient safety in education, the study sought to provide a reliable tool to identify training gaps and support pedagogical interventions. The methodology employed a quantitative, descriptive, and cross-sectional study involving 292 first-year Medicine, Nursing, and Psychology students from a Brazilian public university. The cross-cultural adaptation process

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followed rigorous guidelines, including multiple translations, back-translations, and evaluation by an expert committee, which resulted in high semantic, idiomatic, experiential, and cultural equivalence of the Brazilian version. A pre-test with 50 students allowed for minor adjustments to improve item clarity. In the validity analysis, a final model of 26 items and 9 factors of the APSQ-III showed a satisfactory fit to the data through confirmatory factor analysis (CFA). Factor loadings were mostly high, confirming the structure. However, the factors "Inevitability of error" (F4) and "Importance of patient safety in the curriculum" (F9) demonstrated low reliability, suggesting the need for future revisions of these constructs. Correlations between factors revealed significant associations, such as the strong link between team functioning and the valuing of safety in the curriculum, and the relationship between training and confidence in reporting errors. Comparison by sex indicated a statistically significant difference only in the "Confidence in reporting error" (F2) factor, with men showing slightly more confidence than women, albeit with a small effect size. In conclusion, the Brazilian version of the APSQ-III is a valid and reliable tool for most of its dimensions, useful for identifying strengths and weaknesses in training and for monitoring safety culture. Limitations include the convenience sample and the low reliability of two factors. Future research is recommended to diversify samples, revise less robust factors, and conduct longitudinal studies to monitor the evoluton of students' attitudes.

Keywords: Patient Safety. Attitudes. Health Students. Health Education. Cross-Cultural Adaptation. Psychometric Validation. Attitudes to Patient Safety Questionnaire. Confirmatory Factor Analysis.

RESUMO

Este capítulo detalha a adaptação transcultural e a validação psicométrica do Attitudes to Patient Safety Questionnaire III (APSQ-III) para o português brasileiro, com o objetivo de avaliar as atitudes de estudantes da área da saúde em relação à segurança do paciente. Impulsionado pela crescente importância da segurança do paciente na educação, o estudo buscou fornecer um instrumento confiável para identificar lacunas na formação e apoiar intervenções pedagógicas. A metodologia empregou um estudo quantitativo, descritivo e transversal envolvendo 292 estudantes do primeiro ano de Medicina, Enfermagem e Psicologia de uma universidade pública brasileira. O processo de adaptação transcultural seguiu diretrizes rigorosas, incluindo múltiplas traduções, retrotraduções e avaliação por um comitê de especialistas, resultando em alta equivalência semântica, idiomática, experiencial e cultural da versão brasileira. Um pré-teste com 50 estudantes permitiu ajustes menores para melhorar a clareza dos itens. Na análise de validade, um modelo final com 26 itens e 9 fatores do APSQ-III apresentou ajuste satisfatório aos dados por meio da análise fatorial confirmatória (AFC). As cargas fatoriais foram, em sua maioria, elevadas, confirmando a estrutura. Contudo, os fatores “Inevitabilidade do erro” (F4) e “Importância da segurança do paciente no currículo” (F9) apresentaram baixa confiabilidade, sugerindo a necessidade de revisões futuras desses construtos. As correlações entre fatores revelaram associações significativas, como a forte relação entre o funcionamento da equipe e a valorização da segurança no currículo, além da relação entre formação e confiança na notificação de erros. A comparação por sexo indicou diferença estatisticamente significativa apenas no fator “Confiança na notificação de erro” (F2), com homens apresentando ligeiramente mais confiança que mulheres, embora com pequeno tamanho de efeito. Em conclusão, a versão brasileira do APSQ-III é um instrumento válido e confiável para a maioria de suas dimensões, sendo útil para identificar pontos fortes e fragilidades na formação e para monitorar a cultura de segurança. Entre as limitações destacam-se a amostra por conveniência e a baixa confiabilidade de dois fatores. Recomenda-se que pesquisas futuras diversifiquem as amostras, revisem fatores menos robustos e realizem estudos longitudinais para acompanhar a evolução das atitudes dos estudantes.

Palavras-chave: Segurança do Paciente. Atitudes. Estudantes da Área da Saúde. Educação em Saúde. Adaptação Transcultural. Validação Psicométrica. Attitudes to Patient Safety Questionnaire. Análise Fatorial Confirmatória.

RESUMEN

Este capítulo detalla la adaptación transcultural y la validación psicométrica del Attitudes to Patient Safety Questionnaire III (APSQ-III) para el portugués brasileño, con el objetivo de evaluar las actitudes de los estudiantes del área de la salud en relación con la seguridad del paciente. Impulsado por la creciente importancia de la seguridad del paciente en la educación, el estudio buscó proporcionar un instrumento confiable para identificar brechas en la formación y apoyar intervenciones pedagógicas. La metodología empleó un estudio cuantitativo, descriptivo y transversal con la participación de 292 estudiantes de primer año de Medicina, Enfermería y Psicología de una universidad pública brasileña. El proceso de adaptación transcultural siguió directrices rigurosas, incluyendo múltiples traducciones, retrotraducciones y evaluación por un comité de expertos, lo que resultó en una alta equivalencia semántica, idiomática, experiencial y cultural de la versión brasileña. Un pretest con 50 estudiantes permitió realizar ajustes menores para mejorar la claridad de los ítems. En el análisis de validez, un modelo final con 26 ítems y 9 factores del APSQ-III mostró un ajuste satisfactorio a los datos mediante el análisis factorial confirmatorio (AFC). Las cargas factoriales fueron en su mayoría elevadas, confirmando la estructura. Sin embargo, los factores “Inevitabilidad del error” (F4) e “Importancia de la seguridad del paciente en el currículo” (F9) mostraron baja fiabilidad, lo que sugiere la necesidad de futuras revisiones de estos constructos. Las correlaciones entre factores revelaron asociaciones significativas, como la fuerte relación entre el funcionamiento del equipo y la valoración de la seguridad en el currículo, así como la relación entre la formación y la confianza en la notificación de errores. La comparación por sexo indicó una diferencia estadísticamente significativa únicamente en el factor “Confianza en la notificación de errores” (F2), con los hombres mostrando ligeramente más confianza que las mujeres, aunque con un tamaño de efecto pequeño. En conclusión, la versión brasileña del APSQ-III es una herramienta válida y confiable para la mayoría de sus dimensiones, útil para identificar fortalezas y debilidades en la formación y para monitorear la cultura de seguridad. Entre las limitaciones se destacan la muestra por conveniencia y la baja fiabilidad de dos factores. Se recomienda que futuras investigaciones diversifiquen las muestras, revisen los factores menos robustos y realicen estudios longitudinales para monitorear la evolución de las actitudes de los estudiantes.

Palabras clave: Seguridad del Paciente. Actitudes. Estudiantes de la Salud. Educación en Salud. Adaptación Transcultural. Validación Psicométrica. Attitudes to Patient Safety Questionnaire. Análisis Factorial Confirmatorio.

1 INTRODUCTION

Patient safety emerges as an unavoidable pillar in modern clinical practice and, consequently, in health education. Globally, concern with preventing adverse events and promoting safe care has driven significant transformations in undergraduate curricula, aiming to cultivate a safety culture from the initial stages of professional training. The ability to identify, analyze, and mitigate risks, as well as to effectively communicate errors, are essential competencies for future health professionals, given the inherent complexity of health systems and the potential impact on patients' lives.

In this context, the assessment of health students' knowledge and attitudes regarding patient safety becomes a strategic tool. This evaluation not only allows for the identification of training gaps but also directs pedagogical efforts towards the continuous improvement of educational approaches. Such monitoring is crucial to ensure that graduates of health courses are capable of integrating patient safety principles into their future clinical practices, contributing to the construction of safer and more effective care environments (Bohomol & Freitas, 2016).

One of the most widely recognized and internationally used instruments to measure attitudes towards patient safety is the Attitudes to Patient Safety Questionnaire (APSQ). Over the years, the APSQ has undergone several revisions, culminating in the most recent version, the APSQ-III. This version, composed of 26 items distributed across nine factors, has demonstrated applicability in different cultural contexts, such as the United Kingdom, Australia, and Saudi Arabia (Carruthers et al., 2009; Almaramhy et al., 2011; Alser et al., 2020). However, the mere existence of an instrument validated in one context does not guarantee its universal suitability. For its use in a new culture, it is imperative that the instrument undergoes a rigorous process of cross-cultural adaptation and psychometric validation, ensuring that its structure, items, and properties faithfully reflect the construct it proposes to measure in the new population (Sousa & Rojjanasrirat, 2011).

The process of cross-cultural adaptation goes beyond literal translation. It demands an in-depth analysis of linguistic, conceptual, and cultural nuances, so that the instrument maintains its validity and is understandable to the target audience (Epstein et al., 2015). Subsequent psychometric validation is vital to verify properties such as reliability and validity, ensuring the robustness of the instrument for research and practical application in the new population (Perneger et al., 2014).

In Brazil, patient safety has gained considerable prominence in recent decades. The implementation of public policies, such as the National Patient Safety Policy (PNSP) in 2013, solidified an institutional framework for promoting quality and safety in health care (Ministério

da Saúde, 2013). Furthermore, there is a growing movement and clear guidelines for the inclusion of patient safety as a cross-cutting and integrating theme in health course curricula, as recommended by regulatory bodies and professional associations (Conselho Nacional de Educação, 2018).

In this context of increasing valorization of patient safety in professional training and practice, the need for validated and culturally adapted instruments for the Brazilian scenario becomes urgent. The availability of a Brazilian version of the APSQ-III would allow for a robust assessment of the attitudes and knowledge of first-year health students, providing valuable subsidies for improving patient safety education and monitoring attitudinal changes throughout their academic and professional trajectories. Previous studies already highlight the importance of integrated and longitudinal approaches in patient safety education, with the use of active methodologies and opportunities for practical application (Nora et al., 2022; Sherwood & Barnsteiner, 2022).

Thus, this chapter seeks to present a study that aimed at the cross-cultural adaptation and psychometric validation of the APSQ-III for the Portuguese language and Brazilian culture. By doing so, we contribute to the advancement of patient safety research in the country, enabling international comparisons and offering a reliable tool for attitudinal assessment, essential for the development of professionals who are more aware and committed to the quality and safety of health care.

1.1 PATIENT SAFETY CONTEXT AND HEALTH EDUCATION

Patient safety is not a new concept, but its formalization and systematic integration into health systems and education are phenomena of recent decades. Historically, medicine and nursing were often focused on disease treatment and intervention, with less explicit emphasis on preventing iatrogenic harm. The report "To Err Is Human: Building a Safer Health System," published by the Institute of Medicine (IOM) in the United States in 1999, was a watershed moment, revealing the magnitude of medical errors and the thousands of annual deaths associated with them (Kohn et al., 1999). This report catalyzed a global movement for awareness and action in patient safety, transforming it into a public health priority.

In Brazil, this international trend was accompanied by the development of policies and programs. The creation of the National Patient Safety Policy (PNSP) in 2013, through Ordinance No. 529 of the Ministry of Health, institutionalized concern with patient safety, establishing guidelines and encouraging the creation of Patient Safety Units (NSP) in

hospitals (Ministério da Saúde, 2013). These initiatives demonstrate a formal recognition of the need for safer systems and processes, and not just more vigilant professionals.

Health education, in turn, is a fundamental vector for the dissemination and internalization of these principles. It is not enough to have policies; it is necessary to train professionals who understand them and incorporate them into their daily lives. The inclusion of patient safety as a theme in undergraduate curricula, as recommended by the National Education Council for courses such as Medicine (Conselho Nacional de Educação, 2018), reflects the understanding that attitudes and behaviors related to safety are shaped early on. Training should transcend the mere transfer of technical knowledge, encompassing the development of communication skills, teamwork, critical thinking for risk identification, and a proactive stance in the pursuit of safety.

Assessing students' attitudes regarding patient safety is, therefore, an indicator of the effectiveness of these educational strategies. Understanding how future professionals perceive error, responsibility, communication, and the patient's role in safety is crucial for adjusting teaching programs. If, for example, students perceive error as a sign of incompetence, this can inhibit reporting and learning from incidents, perpetuating a cycle of silence and insecurity (Kiesewetter et al., 2014).

1.2 RATIONALE FOR ADAPTING THE APSQ-III

The need to adapt and validate the APSQ-III in the Brazilian context is multifaceted and crucial for the advancement of research and practice in the field of patient safety. The justifications for this endeavor are based on several foundations:

Differences in Health Education: There are significant variations in pedagogical approaches to patient safety among different countries and, even within Brazil, among various institutions. Nursing, medicine, and psychology curricula may differ in course design, content covered, timing of safety topics introduction, assessment processes, and expected outcomes. An instrument developed in a distinct educational context may not adequately capture the attitudes of Brazilian students unless it is adapted to their realities (Bohomol & Freitas, 2016).

Challenges in Curricular Integration: Despite the recognized importance of patient safety, its effective integration into undergraduate health curricula still faces challenges. Often, the topic is addressed fragmentally or superficially. A validated instrument allows for quantitative verification of the impact of formal and informal curricula on the training of undergraduates regarding patient safety precepts, identifying areas where education can be more effective.

Methodological Validity and Reliability: For any measurement instrument to be used in a new cultural and linguistic context, it is fundamental that it undergoes a rigorous process of cross-cultural adaptation and psychometric validation. Literal translation is insufficient; it is necessary to ensure semantic, idiomatic, cultural, and conceptual equivalence. This ensures that the instrument measures the same construct in the target population, producing valid and reliable results. The absence of a psychometrically robust instrument can lead to erroneous conclusions about student attitudes.

International Comparability: The validation of a Brazilian version of the APSQ-III allows Brazilian researchers to compare their findings with studies conducted in other countries that also use the instrument. This comparability is essential for identifying global gaps, best educational practices, and contributing to the international body of knowledge on patient safety in education.

Subsidies for Educational Interventions: The availability of a validated instrument provides a solid basis for the design, implementation, and evaluation of educational interventions. By identifying specific attitudes that need improvement (e.g., confidence in reporting errors, perception of error inevitability), educators can develop more targeted and effective teaching strategies.

Longitudinal Monitoring: A reliable instrument allows for monitoring changes in student attitudes throughout their training. This is vital to understand how exposure to different curriculum phases and clinical experiences affects the perception of patient safety, enabling real-time adjustments in teaching programs.

In summary, the validation of the APSQ-III for Brazilian Portuguese is not merely a methodological issue but a strategic necessity to strengthen health education and, consequently, the quality and safety of care provided to the Brazilian population.

1.3 RELEVANCE AND IMPACT OF THE STUDY

The realization of a study focused on the cross-cultural adaptation and validation of an instrument like the APSQ-III for the Brazilian context possesses intrinsic relevance and long-reaching impact, both in the academic sphere and in clinical practice.

Firstly, the study contributes directly to the quality and improvement of health education programs. In recent decades, there has been an exponential growth in the number of institutions training health professionals in Brazil, concomitantly with an increase in the number of graduates. Given this scenario, evaluating the effectiveness of these programs has become a priority (Pascali, 2010). This study offers concrete subsidies for institutions to identify gaps and implement improvements in patient safety teaching strategies. By

quantifying the training of undergraduates and the impact of the curriculum, it will be possible to refine approaches, pedagogical methods, and content, aligning theory with the practical needs of a safe care environment.

Additionally, the research reinforces the social responsibility of training institutions. Society places its trust in universities that the professionals trained there will be fully capable of meeting its needs. This implies not only technical excellence but also a deep understanding and commitment to patient safety. A validated instrument allows institutions to demonstrate and improve the quality of their educational programs in this vital aspect (Joseph et al., 2019).

The study has a direct impact on reducing health error rates. Patient safety during undergraduate studies is a predictor of safe behavior in professional practice. By instrumentalizing the assessment of attitudes and knowledge, the study helps train more conscious professionals, proactive in identifying and preventing errors. This ultimately translates into tangible benefits for patients, who will receive safer and higher-quality care.

The cross-cultural adaptation and validation of the APSQ-III also promote the advancement of patient safety research in Brazil. With a reliable and valid instrument, Brazilian researchers will have the ability to conduct more robust studies, comparing their findings with international literature and identifying particularities of the national context. This enriches the existing body of knowledge and drives the creation of new research lines focused on effective educational interventions and the promotion of a safety culture.

Finally, the validated tool supports the planning and implementation of more effective educational interventions. By identifying which dimensions of patient safety attitudes are most challenging or require more attention, educators can develop more targeted training programs. This can range from reforming disciplines and modules to introducing new active teaching-learning methodologies, such as clinical simulations, case studies, and discussions on ethical dilemmas related to error. Such interventions are crucial for fostering the training of professionals who not only possess technical knowledge but are also imbued with a proactive and empathetic safety culture.

In essence, this study transcends purely academic value, projecting itself as a facilitator of positive changes in health training and the quality of care provided to the population, consolidating patient safety as an intrinsic value of professional practice.

2 OBJECTIVES

The clarity of objectives is fundamental to guide any scientific research, and this study is no exception. In seeking to adapt and validate a complex psychometric instrument such as

the APSQ-III, the objectives were delineated to cover all necessary steps to ensure the robustness and applicability of the Brazilian version.

2.1 GENERAL OBJECTIVE (PRIMARY)

The primary objective of this study was:

To validate for Brazilian Portuguese the Attitudes to Patient Safety Questionnaire III (APSQ-III) data collection instrument.

This general objective encapsulates the essence of the research: to make the APSQ-III a reliable and culturally appropriate tool for use in the Brazilian scenario.

2.2 SPECIFIC OBJECTIVES (SECONDARY)

To achieve the general objective, the following specific objectives were established, detailing the methodological and analytical steps:

a) To translate and culturally adapt the Attitudes to Patient Safety Questionnaire III (APSQ-III) instrument for Brazilian Portuguese, considering the specificities of the academic context of undergraduate nursing, psychology, and medicine students;

This objective addresses the initial and crucial phase of instrument adaptation, ensuring that it is not only linguistically translated but also adjusted to resonate with the particularities of Brazilian culture and educational environment, especially for nursing, psychology, and medicine courses.

b) To evaluate the psychometric properties of the Brazilian version of the Attitudes to Patient Safety Questionnaire III (APSQ-III) instrument in medical, psychology, and nursing students, including:

a) content validity;

b) construct validity (exploratory and confirmatory factor analysis);

c) internal consistency;

d) test-retest reliability;

This objective details the statistical analyses necessary to ensure the quality of the instrument. Content validity ensures that the items are relevant and representative of the construct. Construct validity, through factor analysis, verifies whether the underlying conceptual structure of the instrument is maintained. Internal consistency evaluates the coherence of the items comprising each factor, while test-retest reliability verifies the stability of measures over time.

This objective aims to provide a detailed overview of the sample, including information such as age, sex, undergraduate course, course period, and other relevant data. This

characterization is important for contextualizing the results and identifying possible associations between student characteristics and their attitudes toward patient safety.

The achievement of these specific objectives allows for a systematic and rigorous approach to the validation of the APSQ-III, culminating in a robust tool capable of contributing significantly to the field of patient safety in Brazilian health education.

3 MATERIAL AND METHODS

The methodology adopted in this study was carefully planned to ensure the validity and reliability of the results of the cross-cultural adaptation and psychometric validation of the Attitudes to Patient Safety Questionnaire III (APSQ-III). The methodological design comprised several stages, from the study design and ethical considerations to data collection and analysis procedures.

3.1 STUDY DESIGN

This was a quantitative, descriptive, non-randomized, uncontrolled, prospective, and cross-sectional study.

Quantitative: The study focused on collecting and analyzing numerical data, using statistics to describe and infer relationships.

Descritive: Its objective was to describe the characteristics of a population (health students) and the psychometric properties of the instrument.

Non-randomized and uncontrolled: Participant selection occurred by convenience, and there was no control group or experimental intervention.

Prospective: Data were collected after the study's conception, and not from past records.

Cross-sectional: Data collection was performed at a single point in time, providing a "snapshot" of students' attitudes.

This design is appropriate for instrument validation studies, which aim to assess the psychometric properties of a scale in a specific population at a given time.

3.2 ETHICAL ASPECTS

The research was conducted in strict compliance with the ethical principles governing research involving human beings in Brazil. The study obtained formal approval from the Research Ethics Committee (CEP) of the institution (Opinion 4,543,158, of 02/17/2021), as required by regulatory standards.

All participants were duly informed about the study objectives, the procedures involved, potential risks and benefits, confidentiality assurance, and the freedom to participate or withdraw at any time, without any prejudice. After this explanation, participants who agreed to participate signed an Informed Consent Form (ICF). This document ensured that participation was voluntary and informed, respecting the autonomy of the individuals involved. The collected information was treated anonymously and confidentially, guaranteeing the privacy of data and participants.

3.3 PARTICIPANTS

The study sample was one of convenience, consisting of first-year undergraduate health students, specifically in medicine, nursing, and psychology, from a Brazilian public university.

The sample size was determined based on recognized guidelines for psychometric instrument validation studies, which suggest a minimum of 10 participants per instrument item (Pascali, 2010). Considering that the final version of the APSQ-III to be validated has 26 items, the calculated minimum sample was 260 participants (26 items x 10 participants/item). To ensure a safety margin and greater representativeness, and also to compensate for an expected loss, a final sample size of 292 participants was chosen, which corresponds to a 20% increase over the calculated minimum.

Inclusion Criteria: Included students regularly enrolled in the selected courses who voluntarily agreed to participate in the study and were over 18 years old.

Exclusion Criteria: Students under 18 years old or those who did not consent to participate in the study were excluded. The online data collection platform was configured to prevent submission of incomplete responses or from participants who had not accepted the ICF, ensuring data integrity and compliance with ethical criteria. The sample was stratified by course and semester, seeking a balanced representation, with approximately 86.7 participants per course and 28.9 per year, although exact variations might occur during collection.

3.4 INSTRUMENTS

The central instrument of this study was the Attitudes to Patient Safety Questionnaire III (APSQ-III), originally developed by Carruthers et al. (2009). This version of the APSQ-III is composed of 26 items, organized into nine dimensions (factors). The dimensions and corresponding number of items are detailed in Table 1:

Table 1

Dimensions and number of items of the APSQ-III. FAMERP, São José do Rio Preto-SP, 2024

DIMENSION	NUMBER OF ITEMS
1. TEAM TRAINING	3
2. ERROR AND RESPONSIBILITY	3
3. CONFIDENCE	3
4. TRAINING AND SKILLS	3
5. ERROR REPORTING	3
6. ORGANIZATIONAL FACTORS	3
7. INDIVIDUAL FACTORS	3
8. PATIENT FACTORS	3
9. ERROR DISCLOSURE AND DISCUSSION	2
TOTAL	26

Source: Adapted from Menezes (2024).

The APSQ-III items are answered on a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree." This scale allows participants to express their degree of agreement or disagreement with the statements, providing ordinal data for psychometric analysis.

In addition to the APSQ-III, a sociodemographic variables questionnaire, developed by the researchers themselves, was used. This questionnaire collected relevant information to characterize the sample, such as:

Age Sex Undergraduate course Course period Other pertinent data, including gender identity, sexual orientation, marital status, number of children, personal/family income, religion, previous schooling (elementary, secondary, higher education) and parents' education level, employment status, primary source of funds to cover study costs, and information about admission to FAMERP.

These variables were included based on previous studies that demonstrated their potential influence on students' attitudes towards patient safety (Alser et al., 2020; Almaramhy et al., 2011).

3.5 PROCEDURES

The methodological procedures were divided into two main phases: cross-cultural adaptation and psychometric validation, both executed rigorously to ensure the quality of the Brazilian version of the APSQ-III.

3.5.1 Phase 1: Cross-Cultural Adaptation

The cross-cultural adaptation process of the APSQ-III followed the widely recognized guidelines of Beaton et al. (2000) and Epstein et al. (2015), which advocate a series of steps to ensure equivalence between the original instrument and its adapted version.

Independent Translation: Three independent translations were performed by native Brazilian Portuguese speakers. This multiplicity of translations aims to capture different linguistic nuances and avoid bias from a single translator. The initial translations showed semantic equivalence of 92%, 95%, and 94% with the original instrument.

Synthesis of Translations: Based on the three translations, the study researchers produced a synthesis version. This step is crucial for consolidating the best translation options and resolving any discrepancies. The synthesis version achieved 96% semantic equivalence with the original questionnaire.

Back-translation: The synthesis version was then submitted to three independent back-translations, performed by native English speakers who had no prior knowledge of the original questionnaire. This process serves as a check on the quality of the translation, ensuring that the meaning of the items was not altered in the transition to Portuguese. The back-translations showed 93%, 91%, and 94% semantic equivalence with the original version.

Expert Committee Evaluation: An expert committee was formed, consisting of 5 professors from health undergraduate courses and 3 specialists in cross-cultural instrument adaptation. This committee evaluated the proposed synthesis regarding four types of equivalence:

- **Semantic Equivalence:** Is the meaning of the words the same?
- **Idiomatic Equivalence:** Were expressions and slang well adapted?
- **Experiential Equivalence:** Is the experience portrayed in the items relevant to the local culture?
- **Cultural Equivalence:** Is the cultural context appropriate? The committee achieved a high level of consensus: 97% for semantic equivalence, 95% for idiomatic, 98% for experiential, and 96% for cultural, resulting in an average of 96.5% consensus for the pre-final version.

3.5.2 Phase 2: Pre-test and Psychometric Validation

After the completion of the cross-cultural adaptation phase, the pre-test stage followed, along with data collection for psychometric validation in the Brazilian context.

Pre-test: The pre-final version of the APSQ-III was applied to 50 second and third-year Nursing, Medicine, and Psychology students. After completing the questionnaire, these participants were interviewed to identify any comprehension problems, ambiguities, or suggestions for improving items and instructions.

Adjustments: Based on suggestions from pre-test participants, the expert committee made minor adjustments to the wording of three items. These specific modifications aimed to optimize the clarity and comprehension of the instrument without altering its conceptual meaning. After these adjustments, the final version of the APSQ-III was deemed suitable for the subsequent psychometric validation stage.

Data Collection for Validation: Data collection for the validation itself was carried out with the 292 participants from the convenience sample, excluding students who participated in the pre-test to avoid any bias.

Collection Method: Collection was performed using an online form, utilizing the Google Forms platform. This modality allowed for wide dissemination and efficient data collection.

Invitation: Students were invited to participate in the study via institutional email and through the social media of the courses, ensuring significant reach of the target population.

Form Content: The online form contained an initial section with detailed information about the study objectives and the Informed Consent Form (ICF). Only after explicit agreement with the ICF did the participant gain access to the sociodemographic questionnaire and, subsequently, to the adapted version of the APSQ-III.

Complete Filling: The Google Forms configuration ensured that responses could only be submitted after all items were fully completed, minimizing missing data and ensuring data completeness for subsequent analyses.

These systematic procedures were crucial to ensure that the Brazilian version of the APSQ-III was not only linguistically accurate but also culturally relevant and psychometrically robust for the Brazilian health student population.

3.6 DATA ANALYSIS

Data analysis for this study was undertaken with a high degree of methodological rigor, using advanced statistical techniques appropriate for the validation of psychometric instruments with ordinal data. The objective was to evaluate the validity and reliability properties of the APSQ-III adapted for the Brazilian context.

3.6.1 Confirmatory Factor Analysis (CFA)

The factorial structure of the APSQ-III was evaluated using Confirmatory Factor Analysis (CFA). This technique is used to verify whether observed data fit a pre-specified theoretical model (in this case, the 9-factor structure of the APSQ-III).

Polychoric Correlation Matrix: Given the ordinal nature of the data (5-point Likert scale), a polychoric correlation matrix was used. This matrix is more appropriate than the Pearson correlation matrix for ordinal data, as it estimates the underlying correlations between latent variables that give rise to the ordinal items.

WLSMV Estimation Method: The estimation method employed was the Weighted Least Squares Mean and Variance Adjusted (WLSMV). This is a robust estimator considered ideal for factor analysis with ordinal data and non-normal distributions (DiStefano et al., 2018). This procedure aligns with recent instrument validation studies, which recommend similar approaches to ensure the accuracy of results (Green et al., 2016; Stefanek et al., 2023).

Software and Packages: Confirmatory factor analyses were performed using the lavaan 0.6-8 package of the R Statistical language (version 4.3.2) (Rosseel, 2012; R Core Team, 2016).

3.6.2 Model Fit Criteria

The fit of CFA models was evaluated using a set of three widely recognized indices in psychometric literature. Table 2 presents the fit criteria used to determine model acceptability:

Table 2

Fit criteria for confirmatory factor analysis models. FAMERP, São José do Rio Preto-SP, 2024

INDEX	ACCEPTABLE FIT CRITERION
RMSEA	< 0.08 (CI not reaching 0.10)
CFI	≥ 0.90
TLI	≥ 0.90

Source: Adapted from Menezes (2024).

Root Mean Square Error of Approximation (RMSEA): Indicates how well the model fits the data, considering parsimony. Values below 0.08 are generally acceptable, and a confidence interval that does not reach 0.10 is preferable (Brown, 2006; Kline, 2023).

Comparative Fit Index (CFI): Compares the fit of the proposed model with a null model (where all variables are uncorrelated). Values of 0.90 or higher are considered indicative of a good fit (Cangur & Ercan, 2015).

Tucker-Lewis Index (TLI): Similar to CFI, it is also a comparative fit index, with values above 0.90 being acceptable (Lai & Green, 2016).

3.6.3 Reliability Analysis

For models that showed acceptable fit in the CFA, the following reliability indices were calculated for the latent variables:

Cronbach's Alpha: A classic indicator of internal consistency.

McDonald's Omega: Considered a more robust reliability estimator than Cronbach's Alpha, especially for ordinal data or when the assumption of tau-equivalence is not met (Viladrich et al., 2024; Zhang & Yuan, 2016).

Composite Reliability: Evaluates the proportion of variance in a construct that is explained by its observed items. A latent variable was considered reliable if it presented a minimum value of 0.60 in McDonald's omega or composite reliability (Hair et al., 2019).

Software and Packages: Reliability indices were calculated using the semTools package (Jorgensen et al., 2019).

3.6.4 Comparison Between Groups (Invariance Analysis)

Comparison between groups, especially between sexes, was ideally planned to be performed using invariance analysis (Putnick & Bornstein, 2016). This analysis unfolds in three stages:

Configural Invariance: Verifies whether the factorial structure (number of factors and which items load on each factor) remains consistent across groups.

Metric Invariance: Investigates whether the factor loadings (the strength of the relationship between items and their respective factors) are equivalent across groups.

Scalar Invariance: Evaluates the equivalence of item intercepts or thresholds between groups, indicating whether participants from different groups with the same latent score tend to respond to items in the same way.

However, due to material limitations (missing responses for at least one of the response categories for one of the groups), a complete verification of measurement invariance was not possible. Therefore, scalar invariance between sexes was assumed as a premise, a common practice in many studies in the health and education fields, although without direct empirical support in this case.

Factor Scores: For comparison, factor scores estimated by the tenBerge method, which preserves correlations between factors, were used (Grice, 2001; DiStefano et al., 2019; Logan et al., 2022). The tenBerge factor score is a refined score, using standardized information to create standardized scores, ranging from approximately -3.0 to +3.0. These values were then normalized to a scale of 1 to 7, compatible with the instrument's original

Likert scale. Although more appropriate than raw scores (summation), the use of factor scores is still not widespread (DiStefano et al., 2019; Logan et al., 2022).

Comparison Tests: Before comparing score differences between sexes, the normality of the distribution of factor scores was checked using the Shapiro-Wilk test (p-value > 0.05 as an indicator of normality).

If the assumption of normal distribution was not rejected, Student's t-test would be used.

Otherwise (which was the case), the Mann-Whitney test was used to compare medians between groups.

Effect Sizes: To complement the statistical analyses, effect sizes were calculated using the ggstatsplot package (Patil, 2021), providing a measure of the magnitude of observed differences.

Graphical Analyses: Graphical analyses were performed with the ggplot2 package (Wickham, 2016) for visualization of results.

This robust set of analyses ensured a comprehensive evaluation of the psychometric properties of the APSQ-III in the Brazilian population, providing a solid basis for its conclusions.

4 RESULTS

The results of this study are presented in two main sections: the cross-cultural adaptation of the APSQ-III and the validity analysis, which includes confirmatory factor analysis and comparison between groups.

4.1 CROSS-CULTURAL ADAPTATION OF THE APSQ-III

The cross-cultural adaptation process, fundamental to ensuring the instrument's applicability in a new cultural context, was performed in two distinct phases, according to methodological guidelines.

4.1.1 Phase 1: Translations and Expert Committee

The first phase, focused on linguistic and conceptual equivalence, demonstrated a high degree of rigor. The three initial independent translations into Brazilian Portuguese showed semantic equivalence of 92%, 95%, and 94% with the original instrument. From these, the researchers synthesized a version, which achieved a semantic equivalence of 96%.

Subsequently, the three back-translations into English, performed by translators without prior knowledge of the original, obtained semantic equivalences of 93%, 91%, and 94% with the original version. These high indices attest to the fidelity of the translation and back-translation.

The evaluation by an expert committee, composed of 5 health area professors and 3 specialists in cross-cultural adaptation, was crucial to refine the pre-final version. The committee achieved notable consensuses: 97% for semantic equivalence, 95% for idiomatic, 98% for experiential, and 96% for cultural, resulting in an average of 96.5% consensus. This level of agreement is a strong indicator of the adapted version's suitability across multiple domains.

4.1.2 Phase 2: Pre-test

In the second phase, the pre-test was conducted with 50 Nursing, Medicine, and Psychology students. Participants responded to the pre-final version of the APSQ-III and were interviewed to identify clarity problems or suggestions for improvement.

Based on the valuable contributions of the pre-test participants, the expert committee made minor adjustments to the wording of three items. These specific modifications aimed to optimize the clarity and comprehension of the instrument without altering its conceptual meaning. After these adjustments, the final version of the APSQ-III was considered fully adequate for the subsequent psychometric validation stage.

4.2 VALIDITY ANALYSIS OF THE APSQ-III

The validity analysis was conducted using Confirmatory Factor Analysis (CFA), evaluating the fit of models with different item configurations.

4.2.1 Confirmatory Factor Analysis of the Attitudes to Patient Safety Questionnaire (APSQ) with 30 items

Initially, a model with 30 items, representing an earlier or broader configuration of the instrument, was tested. This model showed an acceptable fit to the data, with the following indices: χ^2 [369] = 653.262, CFI = 0.983, TLI = 0.981, and RMSEA = 0.043 [95% CI: 0.037 – 0.048]. These values are within the acceptability criteria (Table 2), allowing the conclusion that the latent variables measured by this model were valid.

Table 3 details the factor loadings of the items in this 30-item model. It is important to note that some items exhibited behaviors that required attention.

Table 3

Distribution of Factor Loadings by APSQ Items, with 30 items. FAMERP, São José do Rio Preto-SP, 2024

FACTOR	ITEM	FL	INVERSE FL
F1	1. My training is preparing me to understand the causes of medical errors.	0.801	0.801
F1	2. I have a good understanding of patient safety issues as a result of my undergraduate training.	0.602	0.602
F1	3. My training is preparing me to prevent medical errors.	0.935	0.935
F2	4. I would feel comfortable reporting any errors I had made, no matter how serious the outcome was for the patient.	0.922	0.922
F2	5. I would feel comfortable reporting any errors others had made, no matter how serious the outcome was for the patient.	0.714	0.714
F2	6. I am confident that I could openly speak with my supervisor about an error I made if it resulted in potential or actual harm to my patient.	0.760	0.760
F2	7. I feel confident that I could report an error I made without feeling I would be blamed.	0.506	0.506
F3	8. Shorter shifts for medical healthcare professionals will reduce errors in healthcare.	0.792	0.792
F3	9. By not taking regular breaks during shifts, healthcare professionals are at greater risk of making errors in healthcare.	0.932	0.932
F3	10. The number of working hours for healthcare professionals increases the likelihood of making errors in healthcare.	0.893	0.893
F4	11. Even the most experienced and competent healthcare professionals make mistakes.	0.765	0.765
F4	12i. A true professional does not make mistakes or errors.	-0.769	0.769
F4	13. Human error is inevitable.	0.291	0.291
F4	14. I don't think I will make mistakes once I am a qualified healthcare professional.	-0.702	0.702
F5	15. Most errors in healthcare result from careless nurses.	0.547	0.547
F5	16i. If people paid more attention at work, errors in healthcare would be avoided.	0.652	0.652
F5	17i. Most errors in healthcare result from careless healthcare professionals.	0.793	0.793
F5	18i. Errors in healthcare are a sign of incompetence.	0.699	0.699
F6	19i. It is not necessary to report errors that do not result in adverse patient outcomes.	0.684	0.684
F6	20. Healthcare professionals have a responsibility to disclose errors to patients only if they result in harm to patients.	0.633	0.633
F6	21. All errors in healthcare should be reported.	-0.933	0.933
F6	22. It is the responsibility of all healthcare professionals to formally report all healthcare errors that occur.	-0.804	0.804
F7	23. Better multidisciplinary teamwork will reduce errors in healthcare.	0.845	0.845
F7	24. Teaching teamwork skills will reduce errors in healthcare.	0.964	0.964
F8	25. Patients have an important role in preventing errors in healthcare.	0.738	0.738
F8	26. Encouraging patients to be more involved in their care can help reduce the risk of errors occurring in healthcare.	0.942	0.942
F9	27. Teaching students about patient safety should be an important priority in the training of health area students.	0.737	0.737
F9	28i. Patient safety issues cannot be taught and can only be learned through clinical experience when qualified.	-0.509	0.509
F9	29. Learning about patient safety issues before I qualify will allow me to become a more effective healthcare professional.	0.825	0.825
F9	30. Learning about patient safety issues is not as important as learning other more skill-based aspects of being a healthcare professional.	-0.615	0.615

Source: Adapted from Menezes (2024).

Analysis of factor loadings (FL) in Table 3 revealed that, although items 12, 16, 17, 18, 19, and 28 were expected to be inverse items (i.e., scored opposite to the dimension), only items 12 and 28 behaved as such. Additionally, items 14, 21, 22, and 30 also exhibited inverse behavior. Four items (7, 13, 15, 28) showed low factor loadings, suggesting that their contribution to their respective factors was limited or that they did not fit well into the proposed structure.

Table 4 summarizes the factor loadings and reliability indices for this 30-item model.

Table 4

Summary of factor loadings and reliability indices of the APSQ, with 30 items. FAMERP, São José do Rio Preto-SP, 2024

FACTOR	N	MEAN	SD	MIN	MAX	CRONBACH'S ALPHA	MCDONALD'S OMEGA	COMPOSITE RELIABILITY
F1	3	0.779	0.167	0.602	0.935	0.770	0.810	0.619
F2	4	0.726	0.171	0.506	0.922	0.770	0.780	0.609
F3	3	0.872	0.072	0.792	0.932	0.830	0.850	0.763
F4	4	0.632	0.229	0.291	0.769	**0.500**	**0.520**	**0.487**
F5	4	0.673	0.102	0.547	0.793	0.720	0.740	0.528
F6	4	0.763	0.134	0.633	0.933	0.750	0.800	0.658
F7	2	0.905	0.084	0.845	0.964	0.800	0.830	0.754
F8	2	0.840	0.144	0.738	0.942	0.750	0.780	0.624
F9	4	0.672	0.138	0.509	0.825	**0.520**	**0.590**	**0.529**

Source: Adapted from Menezes (2024).
Note: N: Number of items per factor; SD: Standard Deviation; Min: minimum; Max: Maximum. Bold: Values below .60. F1: Received patient safety training; F2: Confidence in reporting error; F3: Working hours as a cause of error; F4: Inevitability of error; F5: Professional incompetence as a cause of error; F6: Responsibility for disclosure; F7: Team functioning; F8: Patient involvement in error reduction; F9: Importance of patient safety in the curriculum.

Table 4 highlights that, although many factors exhibited good reliability (values above 0.60 for McDonald's Omega or composite reliability), factors 4 ("Inevitability of error") and 9 ("Importance of patient safety in the curriculum") did not meet this reliability criterion. This finding indicated the need to refine the model, leading to the consideration of the original 26-item version of the APSQ-III.

4.2.2 Confirmatory Factor Analysis of the Attitudes to Patient Safety Questionnaire (APSQ) with 26 items

Based on observations from the 30-item model, a 26-item model (the original APSQ-III version) was tested, excluding the 4 items with low factor loadings or reliability issues: items 7, 13, 15, and 28. This model showed a superior and acceptable fit to the data: χ^2 [263] = 407.602, CFI = 0.990, TLI = 0.987, and RMSEA = 0.036 [95% CI: 0.029 – 0.043]. These indices indicate an excellent fit, confirming that the latent variables measured by this model are valid in the studied context.

In this final model, items 12, 21, and 28 were used inversely, as expected and adjusted for correct interpretation. Table 5 presents the factor loadings for this 26-item version.

Table 5

Distribution of Factor Loadings by APSQ Items, with 26 items. FAMERP, São José do Rio Preto-SP, 2024

FACTOR	ITEM	FL
F1	1. My training is preparing me to understand the causes of medical errors.	0.806
F1	2. I have a good understanding of patient safety issues as a result of my undergraduate training.	0.601
F1	3. My training is preparing me to prevent medical errors.	0.932
F2	4. I would feel comfortable reporting any errors I had made, no matter how serious the outcome was for the patient.	0.933
F2	5. I would feel comfortable reporting any errors others had made, no matter how serious the outcome was for the patient.	0.705
F2	6. I am confident that I could openly speak with my supervisor about an error I made if it resulted in potential or actual harm to my patient.	0.742
F3	8. Shorter shifts for medical healthcare professionals will reduce errors in healthcare.	0.785
F3	9. By not taking regular breaks during shifts, healthcare professionals are at greater risk of making errors in healthcare.	0.931
F3	10. The number of working hours for healthcare professionals increases the likelihood of making errors in healthcare.	0.895
F4	11. Even the most experienced and competent healthcare professionals make mistakes.	0.867
F4	12i. A true professional does not make mistakes or errors.	0.689
F4	13. Human error is inevitable.	0.231
F5	15. Most errors in healthcare result from careless nurses.	0.533
F5	16. If people paid more attention at work, errors in healthcare would be avoided.	0.670
F5	17. Most errors in healthcare result from careless healthcare professionals.	0.826
F5	18. Errors in healthcare are a sign of incompetence.	0.645
F6	19. It is not necessary to report errors that do not result in adverse patient outcomes.	0.743
F6	20. Healthcare professionals have a responsibility to disclose errors to patients only if they result in harm to patients.	0.688
F6	21i. All errors in healthcare should be reported.	0.852
F7	23. Better multidisciplinary teamwork will reduce errors in healthcare.	0.840
F7	24. Teaching teamwork skills will reduce errors in healthcare.	0.970
F8	25. Patients have an important role in preventing errors in healthcare.	0.747
F8	26. Encouraging patients to be more involved in their care can help reduce the risk of errors occurring in healthcare.	0.932
F9	27. Teaching students about patient safety should be an important priority in the training of health area students.	0.760
F9	28i. Patient safety issues cannot be taught and can only be learned through clinical experience when qualified.	0.451
F9	29. Learning about patient safety issues before I qualify will allow me to become a more effective healthcare professional.	0.819

Source: Adapted from Menezes (2024)

Note: F1: Received patient safety training; F2: Confidence in reporting error; F3: Working hours as a cause of error; F4: Inevitability of error; F5: Professional incompetence as a cause of error; F6: Responsibility for disclosure; F7: Team functioning; F8: Patient involvement in error reduction; F9: Importance of patient safety in the curriculum; FL: Factor Loading; i: inverted.

Table 5 shows that factor loadings were, on average, high, which is a good indication of the instrument's convergent validity. However, three items (13, 15, and 28) exhibited lower factor loadings, suggesting that, although the model converged well, these items may require additional adaptation or reformulation for the Brazilian sample.

Table 6 presents the summary of factor loadings and reliability indices for the 26-item model.

Table 6

Summary of factor loadings and reliability indices of the APSQ, with 26 items. FAMERP, São José do Rio Preto-SP, 2024

FACTOR	N	MEAN	SD	MIN	MAX	CRONBACH'S ALPHA	MCDONALD'S OMEGA	COMPOSITE RELIABILITY
F1	3	0.780	0.167	0.601	0.932	0.770	0.800	0.619
F2	3	0.793	0.122	0.705	0.933	0.790	0.820	0.636
F3	3	0.871	0.076	0.785	0.931	0.830	0.850	0.761
F4	3	0.596	0.328	0.231	0.867	**0.310**	**0.330**	**0.382**
F5	4	0.669	0.121	0.533	0.826	0.720	0.740	0.524
F6	3	0.761	0.083	0.688	0.852	0.700	0.740	0.582
F7	2	0.905	0.092	0.840	0.970	0.800	0.840	0.756
F8	2	0.840	0.131	0.747	0.932	0.750	0.780	0.621
F9	3	0.676	0.198	0.451	0.819	**0.420**	**0.480**	**0.470**

Source: Adapted from Menezes (2024)

Note: N: Number of items per factor; SD: Standard Deviation; Min: minimum; Max: Maximum. Bold: Values below .60. F1: Received patient safety training; F2: Confidence in reporting error; F3: Working hours as a cause of error; F4: Inevitability of error; F5: Professional incompetence as a cause of error; F6: Responsibility for disclosure; F7: Team functioning; F8: Patient involvement in error reduction; F9: Importance of patient safety in the curriculum.

Consistent with the 30-item model, Table 6 reveals that factors 4 ("Inevitability of error") and 9 ("Importance of patient safety in the curriculum") continued to show low reliability (values below 0.60 for McDonald's Omega or composite reliability). This is a critical point suggesting that, although the structural model is adequate, the internal consistency of these specific factors still requires attention or reformulation in future studies.

Table 7 presents the correlations between the latent variables estimated by the 9-factor, 26-item model, providing insights into the inter-relationships among different patient safety dimensions.

Table 7

Correlation between latent variables of the 9-factor, 26-item model. FAMERP, São José do Rio Preto-SP, 2024

	F1	F2	F3	F4	F5	F6	F7	F8	F9
F1	1.00								
F2	0.46	1.00							
F3	0.05	0.00	1.00						
F4	0.09	0.11	0.34	1.00					
F5	0.08	-0.03	0.02	-0.38	1.00				
F6	-0.06	-0.29	-0.18	-0.21	0.08	1.00			
F7	0.14	0.15	0.50	0.30	0.06	-0.26	1.00		
F8	0.27	0.12	0.20	0.13	-0.04	-0.01	0.36	1.00	
F9	0.26	0.23	0.41	0.38	0.03	-0.36	0.66	0.35	1.00

Source: Adapted from Menezes (2024)

Note: Bold: p-value < .05; F1: Received patient safety training; F2: Confidence in reporting error; F3: Working hours as a cause of error; F4: Inevitability of error; F5: Professional incompetence as a cause of error; F6: Responsibility for disclosure; F7: Team functioning; F8: Patient involvement in error reduction; F9: Importance of patient safety in the curriculum.

Table 7 shows that the majority of significant correlations between factors are of low to moderate magnitudes, following Cohen's (1988) criterion, where correlations between 0.10 and 0.29 are low and between 0.30 and 0.49 are moderate.

Strong Positive Correlations:

- **F7 (Team functioning) and F9 (Importance of patient safety in the curriculum):** With a correlation of 0.66, this is the strongest relationship, suggesting that a positive perception of teamwork is strongly associated with a greater valuing of patient safety in academic training.
- **F7 (Team functioning) and F3 (Working hours as a cause of error):** With a correlation of 0.50, this indicates that problems in team functioning may be related to the perception that long working hours contribute to errors.

Moderate Positive Correlations:

- **F1 (Received patient safety training) and F2 (Confidence in reporting error):** A correlation of 0.46, indicating that perceived effective patient safety training is positively related to confidence in reporting errors.
- **F3 (Working hours as a cause of error) and F9 (Importance of patient safety in the curriculum):** A correlation of 0.41.
- **F4 (Inevitability of error) and F9 (Importance of patient safety in the curriculum):** A correlation of 0.38.

Negative Correlations:

- **F6 (Responsibility for disclosure) and F2 (Confidence in reporting error):** A correlation of -0.29, suggesting that a greater perception of responsibility to disclose errors may be inversely associated with lower confidence in reporting them. This may indicate a dilemma or a perceived risk associated with reporting.
- **F6 (Responsibility for disclosure) and F9 (Importance of patient safety in the curriculum):** A correlation of -0.36.
- **F4 (Inevitability of error) and F5 (Professional incompetence as a cause of error):** A correlation of -0.38, suggesting that the belief in the inevitability of error may be associated with a lower perception of professional incompetence as a primary cause of errors.

Very Low or Absent Correlations:

- Some pairs of factors, such as F3 and F2 (0.00), showed correlations close to zero, indicating no significant linear relationship between these dimensions. This may mean that they operate relatively independently in the context of students' attitudes.

These findings are crucial for understanding the network of relationships between students' attitudes toward patient safety, providing insights into where educational interventions might be most effective and where more targeted approaches are needed.

4.3 COMPARISON OF THE APSQ-III BETWEEN GROUPS

The comparison of APSQ-III factor scores between sexes was performed using the Mann-Whitney test, as the data did not show a normal distribution. Table 8 presents the results of this analysis.

Table 8

Comparative analysis of APSQ-III factors by sex. FAMERP, São José do Rio Preto-SP, 2024

FACTOR	GROUP	N	MEDIAN [MIN, MAX]	W	P-VALUE	R-BISERIAL [95% CI]
F1	Female	281	5.20 [1.00; 6.84]	18531.00	0.23	-0.07 [-0.19; 0.05]
	Male	142	5.28 [1.69; 7.00]			
F2	Female	281	5.03 [1.00; 7.00]	17495.00	**0.04**	-0.12 [-0.24; -0.01]
	Male	142	5.17 [2.23; 6.82]			
F3	Female	281	5.98 [1.33; 7.00]	19317.00	0.59	-0.03 [-0.15; 0.08]
	Male	142	6.05 [1.37; 6.81]			
F4	Female	281	6.10 [3.00; 7.00]	18738.00	0.31	-0.06 [-0.18; 0.06]
	Male	142	6.12 [3.54; 6.68]			
F5	Female	281	3.25 [1.14; 6.66]	19595.00	0.76	-0.02 [-0.13; 0.10]
	Male	142	3.31 [1.00; 6.75]			
F6	Female	281	2.49 [1.00; 6.33]	20350.00	0.74	0.02 [-0.10; 0.14]
	Male	142	2.54 [1.05; 5.95]			
F7	Female	281	6.32 [2.50; 6.89]	18054.00	0.11	-0.10 [-0.21; 0.02]
	Male	142	6.35 [2.68; 7.00]			
F8	Female	281	5.38 [1.00; 6.84]	18721.00	0.30	-0.06 [-0.18; 0.05]
	Male	142	5.47 [1.85; 7.00]			
F9	Female	281	6.30 [1.25; 6.87]	18322.00	0.17	-0.08 [-0.20; 0.03]
	Male	142	6.38 [3.09; 7.00]			

Source: Adapted from Menezes (2024)
Note: min: Minimum; max: Maximum; N: Sample Size; F1: Received patient safety training; F2: Confidence in reporting error; F3: Working hours as a cause of error; F4: Inevitability of error; F5: Professional incompetence as a cause of error; F6: Responsibility for disclosure; F7: Team functioning; F8: Patient involvement in error reduction; F9: Importance of patient safety in the curriculum.

As observed in Table 8, a statistically significant difference was found only in factor F2: "Confidence in reporting error" ($p = 0.04$). Men presented a median of 5.17 [2.23; 6.82], while women had a median of 5.03 [1.00; 7.00]. This suggests that, in the studied sample, male students demonstrate greater confidence in reporting errors compared to female students.

However, the effect size (r-biserial) for this difference was -0.12, indicating a small effect. This implies that, although the difference is statistically detectable, its magnitude is limited and may have little practical relevance in clinical or educational contexts.

For all other factors (F1, F3, F4, F5, F6, F7, F8, and F9), there were no statistically significant differences between sexes, with p-values ranging from 0.11 to 0.76. The median scores for men and women in these factors were very close, and the effect sizes were equally very small, close to zero.

These results suggest that, in general, attitudes towards patient safety are quite similar between male and female students in this sample, with the singular exception of confidence in reporting errors, which is slightly higher in men. It is crucial to emphasize that the interpretation of statistical significance must be weighed against the effect size, especially in larger samples, where small differences can reach statistical significance without necessarily representing a substantial impact.

5 DISCUSSION

The cross-cultural adaptation and validation of the Attitudes to Patient Safety Questionnaire III (APSQ-III) for the Brazilian context represent a significant advance in the availability of robust tools for evaluating the attitudes of health students regarding patient safety. This study not only provides a validated version of the instrument but also offers important insights into the psychometric properties and perceptions of these future professionals in the national scenario.

The cross-cultural adaptation process, which involved independent translations, back-translations, synthesis, and evaluation by an expert committee, ensured excellent semantic, idiomatic, experiential, and cultural equivalence of the Brazilian version with the original instrument (Beaton et al., 2000; Epstein et al., 2015). The consensus expressed by the expert committee, along with the clarity and relevance perceived by pre-test participants, reinforces the suitability of the Brazilian version for the studied population. This systematic approach is crucial because cross-cultural adaptation goes far beyond mere linguistic translation, seeking to ensure that the instrument's concepts and language are understood and interpreted in the same way across different cultures (Sousa & Rojjanasrirat, 2011; Chen, 2008). Similar results have been observed in other instrument adaptation studies related to patient safety in Brazil and other countries (de Carvalho & Cassiani, 2012; Menezes et al., 2020; Alfaqawi et al., 2020).

Confirmatory Factor Analysis (CFA) was fundamental for evaluating the construct validity of the APSQ-III. Initially, the 30-item model, although showing an acceptable fit,

revealed weaknesses in terms of low factor loadings and inverse behavior of some items. This finding is not uncommon in adaptation studies, where cultural and educational particularities can influence how items are understood and responded to (Damásio & Borsa, 2017). Previous studies adapting the APSQ in countries like Saudi Arabia, Singapore, and Hong Kong also found the need for item adjustments for better suitability to their respective contexts (Alshahrani et al., 2021; Leung & Patil, 2010; Al-Sawalha et al., 2023).

The exclusion of four items and the reanalysis of the model with 26 items resulted in a satisfactory fit, corroborating the 9-factor structure of the original APSQ-III version. Factor loadings, mostly high, indicated good convergent validity. However, the persistence of low reliability in the factors "Inevitability of error" (F4) and "Importance of patient safety in the curriculum" (F9) in the final 26-item model is a point that deserves reflection. This fragility suggests that these constructs may be complex or that the items composing them do not entirely consistently capture the perceptions of Brazilian students. It is possible that the inevitability of error is viewed ambivalently or that the actual importance of patient safety in the curriculum is not yet fully consolidated or is perceived in diverse ways by students. These findings, although partially consistent with studies that found similar factorial structures of the APSQ (Al-Sawalha et al., 2023; Atwa et al., 2023), highlight the importance of cultural contextualization in the evaluation of psychometric instruments.

Correlations between latent factors provided valuable insights into the interrelationship of student attitudes. The strong positive correlation between "Team functioning" (F7) and "Importance of patient safety in the curriculum" (F9) underlines the interdependence between the perception of a collaborative work environment and the valuing of safety education. This reinforces the notion that a robust safety culture in practice depends on training that integrates these aspects. The positive correlation between "Patient safety training" (F1) and "Confidence in reporting error" (F2) suggests that good training increases self-confidence for reporting adverse events. On the other hand, the negative correlation between "Responsibility for disclosure" (F6) and "Confidence in reporting error" (F2) is intriguing. It could indicate that, although students recognize the responsibility to disclose errors, confidence in doing so may be lower, perhaps due to fear of punishment or stigmatization, a well-documented challenge in safety culture (Kiesewetter et al., 2014; Nabilou et al., 2015). These interrelationships highlight the complexity of attitudes and the need for educational approaches that consider multiple factors.

The comparison between groups by sex revealed a statistically significant difference only in the "Confidence in reporting error" (F2) factor, with men showing slightly greater confidence than women. Although this difference is statistically significant ($p < 0.05$), the

small effect size (r-biserial = -0.12) suggests that the practical relevance of this difference may be limited. Gender differences in risk perception, communication, and propensity to report errors have been explored in the literature (Kiesewetter et al., 2014), but the magnitude of the effect found here indicates that general attitudes towards patient safety are largely similar between sexes in this student sample.

The results of this study, therefore, reinforce the importance of an integrated approach to patient safety in health curricula. It is fundamental that education covers not only technical aspects but also the development of teamwork skills, effective error communication, and active patient involvement in their own care. Innovative teaching methods, such as simulations, case studies, and discussions about error, can be valuable for promoting interprofessional learning and developing essential competencies for safe practice (Nora et al., 2022; Sherwood & Barnsteiner, 2022). The Brazilian version of the APSQ-III emerges as a valuable tool for monitoring the impact of these interventions and for identifying areas that require greater attention.

5.1 SOCIODEMOGRAPHIC AND ACADEMIC CHARACTERIZATION OF PARTICIPANTS

The characterization of the sociodemographic and academic profile of the students who participated in this study provides an essential background for interpreting the validity and reliability results of the APSQ-III. This section describes the main characteristics of the sample, which consisted of 292 first-year students from Medicine, Nursing, and Psychology courses at a Brazilian public university.

The sample was composed of first-year students, meaning that their attitudes toward patient safety are largely a reflection of their pre-academic experiences, general knowledge, and the initial influence of the university environment. The inclusion of multiple health courses (Medicine, Nursing, and Psychology) allowed for capturing a diversity of perspectives and backgrounds that, although converging toward health, have distinct training and approaches.

Regarding sex distribution, the sample was predominantly female, reflecting the typical demographic composition of many health courses, especially nursing and psychology. This distribution is relevant for interpreting the observed differences in the "Confidence in reporting error" factor, where men showed slightly greater confidence, albeit with a small effect size. The more detailed analysis of sociodemographic variables, which included gender identity, sexual orientation, age, marital status, number of children, income, religion, previous schooling, and employment status, allowed for an in-depth understanding of the participants' profile.

For example, information about previous schooling (elementary and secondary education in public or private schools) can influence students' knowledge base and critical thinking skills, which in turn can impact their perception of patient safety. Employment status (working in the course-related area, in a different area, or not working) can expose students to different realities and pressures, shaping their attitudes even before a deep immersion in specific patient safety content during undergraduate studies. Personal or family income can be associated with different levels of access to information and educational resources, which may also play a role in initial attitudes toward complex topics such as safety.

Data on admission to FAMERP (vestibular option, such as broad competition or affirmative actions, and enrollment call) can indicate the socioeconomic and educational diversity of the sample. This heterogeneity, although challenging for some analyses, enriches the representativeness of the sample regarding the profile of Brazilian university health students.

The participants' age, distributed in ranges (e.g., 20 years, 21-30 years, 31-40 years, >40 years), allowed for analyzing whether maturity or previous life experience influenced how students perceived safety aspects. The diversity of age groups suggests that the study captured both students entering directly after high school and those pursuing a second degree or returning to studies after a period of work.

The detailed sociodemographic and academic characterization not only contextualizes the results of the psychometric validation of the APSQ-III but also serves as a basis for future research seeking to understand how these variables may interact with patient safety attitudes and, consequently, with the effectiveness of educational interventions. It underscores the complexity of the target audience and the importance of considering multiple factors when planning strategies for improving health education.

6 CONCLUSION

The cross-cultural adaptation and validation of the Attitudes to Patient Safety Questionnaire III (APSQ-III) for the Brazilian context were conducted with methodological rigor, culminating in the availability of a promising instrument for assessing the attitudes of health students regarding patient safety.

The cross-cultural adaptation process, which involved independent translations, back-translations, synthesis, and evaluation by an expert committee, ensured excellent semantic, idiomatic, experiential, and cultural equivalence of the Brazilian version with the original instrument. The pre-test confirmed that the adapted version is understandable and applicable

to the Brazilian academic context, with minor punctual adjustments further enhancing its clarity.

Confirmatory Factor Analysis (CFA) demonstrated that the final 26-item, 9-factor model of the Brazilian APSQ-III showed a satisfactory fit to the data. Factor loadings were, on average, high, indicating good construct validity. However, it is fundamental to highlight that the factors "Inevitability of error" (F4) and "Importance of patient safety in the curriculum" (F9) exhibited low reliability (McDonald's omega and composite reliability values below 0.60). This finding suggests that, although the factorial structure is confirmed, the internal consistency of these specific constructs may be weaker in the Brazilian context, warranting attention and possible reformulations in future investigations.

Correlations between factors revealed significant associations that corroborate the complexity of patient safety attitudes. The strong relationship between "Team functioning" and "Importance of patient safety in the curriculum" highlights the relevance of training that integrates dimensions of collaboration and safety culture. The correlations also pointed to potential challenges, such as the inverse relationship between "Responsibility for disclosure" and "Confidence in reporting error," which may indicate cultural or institutional barriers to reporting.

The comparison between groups by sex indicated a statistically significant difference only in the "Confidence in reporting error" (F2) factor, with men showing greater confidence than women. However, the small effect size (r-biserial = -0.12) suggests that this difference, although present, has limited magnitude and may not translate into a substantial practical impact. For other factors, patient safety attitudes were similar between genders in the studied sample.

In summary, this study provides a valid and reliable instrument (with reservations for factors F4 and F9) to assess the attitudes of health students regarding patient safety in Brazil. The Brazilian APSQ-III can be a valuable tool for:

- Identifying specific gaps in academic training.
- Supporting the development and implementation of more targeted and effective educational interventions.
- Monitoring changes in students' attitudes over time and in response to teaching programs.
- Contributing to the promotion of a proactive safety culture in health services, from initial training.

The results reinforce the imperative that health curricula comprehensively address patient safety, with special emphasis on developing teamwork skills, open communication

about errors, and active patient engagement. By doing so, we train professionals who are more conscious and committed to quality and safety in care, benefiting society as a whole.

7 LIMITATIONS

This study, although robust in its methodology of cross-cultural adaptation and psychometric validation, presents some inherent limitations in its design and execution that deserve consideration in the interpretation of results and in the planning of future research.

Convenience Sample and Generalization: The use of a convenience sample, composed of students from a single Brazilian public higher education institution, restricts the generalization of the results. Students' attitudes and perceptions can vary significantly among different institutions (public and private), geographic regions, and socioeconomic profiles. Thus, the findings may not be fully representative of all health students in Brazil.

Cross-sectional Design: The cross-sectional nature of the study, with data collection at a single point in time, prevents causal inferences. It is not possible to determine whether the observed attitudes are directly influenced by specific curriculum aspects or by previous experiences. Furthermore, it does not allow for evaluating the temporal stability of the instrument (test-retest reliability, although foreseen in the specific objectives, was not reported in the presented results, indicating a limitation in its execution).

Low Reliability of Specific Factors: The identification of low reliability (McDonald's Omega and composite reliability below 0.60) in the factors "Inevitability of error" (F4) and "Importance of patient safety in the curriculum" (F9) represents a significant limitation. Although the overall fit of the 26-item model was satisfactory, the fragility of these factors compromises confidence in the specific measures of these constructs. This suggests that the current version of the items may not ideally capture these concepts for the Brazilian population, requiring revision or recontextualization.

Assumption of Scalar Invariance: The material impossibility of verifying measurement invariance between sexes (due to missing responses in some categories) led to the assumption of scalar invariance. This was a pragmatic decision, but it introduces an assumption without empirical confirmation, which may influence the validity of comparisons between groups. In an ideal scenario, invariance should be rigorously tested.

Nature of Attitude Measurement: Self-report instruments, such as Likert-scale questionnaires, are susceptible to response biases, such as social desirability. Participants may tend to provide answers they consider more socially acceptable or "correct" rather than their genuine attitudes, especially on sensitive topics like errors and responsibility.

Challenges in Cultural Adaptation of Inverse Items: The need to reverse the scoring of several items (beyond those initially planned) and the low factor loading of some of them (items 13, 15, and 28) indicate that the understanding and structure of these items may be particularly challenging in the Brazilian cultural context. The formulation of inverse items can sometimes generate ambiguity or be interpreted in ways distinct from the original intention.

These limitations do not invalidate the obtained results but contextualize the applicability of the instrument and guide future research directions, aiming to improve the Brazilian version of the APSQ-III.

8 RECOMMENDATIONS FOR FUTURE RESEARCH

Based on the findings and limitations of this study on the adaptation and validation of the APSQ-III for the Brazilian context, several recommendations can be formulated for future research. These suggestions aim to deepen the understanding of patient safety attitudes among health students and improve the instrument.

Expand and Diversify the Sample: Future studies should seek to replicate this work with larger and more diversified samples, encompassing multiple higher education institutions (public and private) in different geographical regions of Brazil. This would increase the generalizability of the results and allow for a more robust analysis of possible regional or institutional differences in students' attitudes.

Revision and Improvement of Factors with Low Reliability: The factors "Inevitability of error" (F4) and "Importance of patient safety in the curriculum" (F9), which showed low reliability, demand in-depth investigation. Researchers could conduct qualitative studies (such as focus groups or cognitive interviews) to understand how Brazilian students interpret the items in these factors. Based on these insights, items can be reformulated, added, or removed to increase their clarity and internal consistency, seeking a better representation of the constructs in the cultural context.

Longitudinal Studies: The implementation of longitudinal studies is crucial to evaluate the temporal stability of student attitudes and how they evolve throughout their academic training and initial clinical experiences. Such a design would allow investigating the impact of specific curricular interventions and of exposure to practice environments on modifying attitudes toward patient safety.

Investigation of Measurement Invariance: It is fundamental that future studies conduct a rigorous analysis of measurement invariance between different groups (e.g., sex,

course, academic period, institution type) to ensure that comparisons are valid. The inability to do so in this study suggests a methodological gap to be filled.

Convergent and Discriminant Validity with Other Constructs: Future research could explore the convergent and discriminant validity of the Brazilian APSQ-III, correlating it with other instruments that measure related constructs (such as empathy, resilience, stress perception, organizational culture) or theoretically distinct constructs. This would enrich the validity framework of the instrument.

Association with Clinical or Behavioral Outcomes: Although challenging, it would be valuable to investigate the relationship between attitudes measured by the APSQ-III and more objective outcomes, such as the participation in patient safety training, the notification of adverse events in clinical practice (when applicable), or the observation of safe behaviors in simulated environments.

Exploration of Interdisciplinary Differences: The inclusion of medicine, nursing, and psychology students opens doors for more in-depth investigations into differences and similarities in patient safety attitudes among different health professions. Understanding these nuances can support the creation of more effective interprofessional education programs.

Contextualization of Sociodemographic Variables: Deepen the analysis of the influence of sociodemographic and academic variables (such as income, parental education, previous work experiences) on patient safety attitudes. This can reveal groups with specific educational needs or factors protective/of risk for the development of a safety culture.

Integration with Mixed Methods: The combination of quantitative and qualitative methods could provide a richer understanding of student attitudes. Semi-structured interviews or focus groups could explore in depth the reasons behind certain attitudes or the perceived barriers to safe practice, complementing questionnaire data.

Applications in Educational Interventions: Use the validated version of the APSQ-III as an impact assessment tool for educational interventions (for example, courses, simulations, workshops) focused on patient safety. This would allow demonstrating the effectiveness of different pedagogical approaches in modifying student attitudes.

By following these recommendations, the Brazilian academic community will not only be able to strengthen the APSQ-III tool but also contribute more substantially to the training of engaged and competent health professionals in promoting patient safety.

REFERENCES

Al-Sawalha, I., Jaloudi, N., Zaben, S., Hamamreh, R., Awamleh, H., & Al-Abbadi, S. (2023). Attitudes of undergraduate medical students toward patient safety in Jordan: A multi-center cross-sectional study. BMC Medical Education, 23(1), 695.

Alfaqawi, M., Böttcher, B., Abuowda, Y., Alaloul, E., Elnajjar, I., Elhout, S., et al. (2020). Treating patients in a safe environment: A cross-sectional study of patient safety attitudes among doctors in the Gaza Strip, Palestine. BMC Health Services Research, 20(1), 388.

Almaramhy, H., Al-Shobaili, H., El-Hadary, K., & Dandash, K. (2011). Knowledge and attitude towards patient safety among undergraduate medical students in Saudi Arabia. International Journal of Health Sciences, 5(1), 59–67.

Alser, M., Böttcher, B., Alfaqawi, M., Jlambo, A., Abuzubaida, W., & Abu-El-Noor, N. (2020). Undergraduate medical students' attitudes towards medical errors and patient safety. BMC Medical Education, 20(1), 447.

Alshahrani, S., Alswaidan, A., Alkharaan, A., Alfawzan, A., Alshahrani, A., Masuadi, E., et al. (2021). Medical students' insights towards patient safety. Sultan Qaboos University Medical Journal, 21(2), e253–e259.

Alwhaibi, M., AlRuthia, Y., Almalag, H., Alkofide, H., Balkhi, B., Almejel, A., et al. (2020). Pharmacy students' attitudes toward patient safety in Saudi Arabia. BMC Medical Education, 20(1), 1–8.

Atwa, H., Alfadani, A., Damanhori, J., Seifalyazal, M., Shehata, M., & Abdel Nasser, A. (2023). Healthcare practitioners' attitudes toward patient safety in hospital settings in Saudi Arabia. Arab Gulf Journal of Scientific Research.

Beaton, D. E., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. Spine, 25(24), 3186–3191.

Bohomol, E., Freitas, M. A. de O., & Cunha, I. C. K. O. (2016). Ensino da segurança do paciente na graduação em saúde. Interface – Comunicação, Saúde, Educação, 20(58), 727–741.

Brown, T. A. (2006). Confirmatory factor analysis for applied research. Guilford Press.

Cangur, S., & Ercan, I. (2015). Comparison of model fit indices used in structural equation modeling. Journal of Modern Applied Statistical Methods, 14(1), 152–167.

Carruthers, S., Lawton, R., Sandars, J., Howe, A., & Perry, M. (2009). Attitudes to patient safety amongst medical students and tutors. Medical Teacher, 31(8), e370–e376.

Chen, F. F. (2008). What happens if we compare chopsticks with forks? Journal of Personality and Social Psychology, 95(5), 1005–1018.

Conselho Nacional de Educação. (2018). Resolução nº 7, de 18 de dezembro de 2018.

Damásio, B. F., & Borsa, J. C. (2017). Manual de desenvolvimento de instrumentos psicológicos. Vetor.

de Carvalho, R. E. F. L., & Cassiani, S. H. D. B. (2012). Adaptação transcultural do safety attitudes questionnaire. Revista Latino-Americana de Enfermagem, 20(3), 575–582.

DiStefano, C., Liu, J., Jiang, N., & Shi, D. (2018). Examination of the WRMR. Structural Equation Modeling, 25(3), 453–466.

DiStefano, C., McDaniel, H. L., Zhang, L., Shi, D., & Jiang, Z. (2019). Fitting large factor analysis models with ordinal data. Educational and Psychological Measurement, 79(3), 417–436.

DiStefano, C., Zhu, M., & Mindrila, D. (2009). Understanding and using factor scores. Practical Assessment, Research & Evaluation, 14(1), 20.

Epstein, J., Santo, R. M., & Guillemin, F. (2015). Cross-cultural adaptation of questionnaires. Journal of Clinical Epidemiology, 68(4), 435–441.

Green, S. B., & Lai, K. (2016). The problem with having two watches. Multivariate Behavioral Research, 51(2–3), 220–239.

Grice, J. W. (2001). Computing and evaluating factor scores. Psychological Methods, 6(4), 430–450.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). Multivariate data analysis (8th ed.). Cengage.

Jorgensen, T. D., Pornprasertmanit, S., Schoemann, A., & Rosseel, Y. (2019). semTools: Useful tools for structural equation modeling (R package).

Kiesewetter, J., Kager, M., Lux, R., Zwissler, B., Fischer, M. R., & Dietz, I. (2014). Students' attitudes regarding medical errors. Medical Teacher, 36(6), 505–510.

Kline, R. B. (2023). Principles and practice of structural equation modeling (5th ed.). Guilford Press.

Kohn, L. T., Corrigan, J. M., & Donaldson, M. S. (Eds.). (1999). To err is human. National Academies Press.

Leung, G. K. K., & Patil, N. G. (2010). Patient safety in the undergraduate curriculum. Hong Kong Medical Journal, 16(2), 101–105.

Logan, J. A. R., Jiang, H., Helsabeck, N., & Yeomans-Maldonado, G. (2022). Factor score extraction. Quality & Quantity, 56(4), 2107–2131.

Manzanera, R., et al. (2018). Patient safety measures. International Journal of Environmental Research and Public Health, 15(8), 1568.

Menezes, A. C., et al. (2020). Cross-cultural adaptation of patient safety questionnaire. Revista Brasileira de Enfermagem, 73(suppl 6).

Ministério da Saúde. (2013). Portaria nº 529, de 1º de abril de 2013.

Nabilou, B., Feizi, A., & Seyedin, H. (2015). Patient safety in medical education. PLoS One, 10(8), e0135610.

Nora, C. R. D., et al. (2022). Ética e segurança do paciente. Revista Bioética, 30(3), 619–627.

Pasquali, L. (2010). Instrumentação psicológica. Casa do Psicólogo.

Patil, I. (2021). ggstatsplot approach. Journal of Open Source Software, 6(61), 3167.

Perneger, T. V., Staines, A., & Kundig, F. (2014). Hospital safety culture. BMJ Quality & Safety, 23(5), 389–397.

Putnick, D. L., & Bornstein, M. H. (2016). Measurement invariance. Developmental Review, 41, 71–90.

R Core Team. (2016). R: A language and environment for statistical computing.

Rosseel, Y. (2012). lavaan package. Journal of Statistical Software, 48(2).

Sherwood, G., & Barnsteiner, J. H. (2022). Quality and safety in nursing.

Sousa, V. D., & Rojjanasrirat, W. (2011). Cross-cultural adaptation guidelines. Journal of Evaluation in Clinical Practice, 17(2), 268–274.

Stefanek, F., et al. (2023). Polish adaptation of questionnaires. Psychological Reports, 126(1), 527–550.

Viladrich, C., Angulo-Brunet, A., & Doval, E. (2024). Estimativa de confiabilidade. Anales de Psicología, 40(3).

Wickham, H. (2016). ggplot2: Elegant graphics for data analysis. Springer.

Zhang, Z., & Yuan, K.-H. (2016). Robust coefficients alpha and omega. Educational and Psychological Measurement, 76(3), 387–411.