



## ORIGINALES

### Cross-cultural adaptation and validation of the PIEPER-ZULKOWSKI PRESSURE ULCER KNOWLEDGE TEST (PZ-PUKT V2) into galician

Adaptación transcultural y validación del PIEPER-ZULKOWSKI PRESSURE ULCER KNOWLEDGE TEST (PZ-PUKT V2) al gallego

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#### ABSTRACT:

**Aim.** Transculturally adapt the Pieper-Zulkowski Pressure Ulcer Knowledge Test V2 to the healthcare context of pressure injuries in Galicia and determine the psychometric properties of the questionnaire adapted to Galician.

**Methods.** Cross-cultural adaptation of the questionnaire following the steps of the International Society for Pharmacoeconomics and Outcomes Research, estimating face and content validity and cross-sectional observational study with descriptive, bivariate and psychometric analysis: Rasch, reliability, stability of the self-administered questionnaire PZ-PUKT 72 adapted to Galician.

#### Results.

The Galician PZ-PKUT has good conceptual-semantic equivalence to the original questionnaire, as well as very good face validity and content validity ( $\bar{x}$ : 0.96; R: 0.87–1). A total of 121 health professionals participated, with a mean age of 44.6 years and 104 were women (86%). The total average score was 72.7%, with statistically significant differences between the score and sociodemographic variables. The items have a good fit of the Rasch model and a wide range of difficulty (R: -37.32–2.55). Cronbach's alpha 0.809. Intraclass Correlation Coefficient was 0.906 and the stability represented by the Bland-Altman diagram was acceptable.

**Discussion.** The Galician PZ-PUKT 72 has good face and content validity relate the original version, showing appropriate psychometric characteristics: good reliability if administered completely, temporal stability and construct validity. It requires studies that evaluate its properties in other samples and the possibility of dividing the instrument into 3 subscales. Although its feasibility is limited by being a long questionnaire, it is a valid and reliable instrument to measure knowledge about Pressure Injuries.

**Keywords:** Pressure Ulcer; Knowledge Bases; Surveys and Questionnaires; Translating; Validation Study.

## RESUMEN:

**Objetivo:** Adaptar transculturalmente el *Pieper-Zulkowski Pressure Ulcer Knowledge Test V2* al contexto asistencial de las lesiones por presión en Galicia y determinar las propiedades psicométricas del cuestionario adaptado al gallego.

**Método:** Adaptación transcultural del cuestionario siguiendo las etapas de la *Internacional Society for Pharmacoeconomics and Outcomes Research*, estimando validez aparente y de contenido y estudio observacional transversal con análisis descriptivo, bivalente y psicométrico: Rasch, fiabilidad, estabilidad del cuestionario autoadministrado PZ-PUKT 72 adaptado al gallego.

**Resultados:** El PZ-PUKT gallego tiene buena equivalencia semántico-conceptual con el cuestionario original, así como muy buena validez aparente y validez de contenido ( $\bar{x}$ : 0,96; R: 0,87–1). Participaron 121 sanitarios, con una media de 44,6 años y 104 mujeres (86%). La puntuación promedio total fue del 72,7%, con diferencias estadísticamente significativas entre puntuación y variables sociodemográficas. Los ítems tienen un buen ajuste del modelo de Rasch y un amplio rango de dificultad (R: -37,32–2,55). Alfa de Cronbach 0,809 (0,604 prevención, 0,522 categorización y 0,674 descripción de heridas). Coeficiente de Correlación Intraclase 0,906 y la estabilidad representada con el diagrama de Bland-Altman aceptable.

**Conclusiones:** El PZ-PUKT 72 gallego tiene buena validez aparente y de contenido con respecto a la versión original, mostrando unas características psicométricas apropiadas: buena fiabilidad si se administra completo, estabilidad temporal y validez de constructo. Precisa de estudios que evalúen sus propiedades en otras muestras y la posibilidad de dividir el instrumento en 3 subescalas. Aunque su viabilidad está limitada por ser un cuestionario largo, es un instrumento válido y fiable para medir el conocimiento sobre LPP.

**Palabras Clave:** Úlcera por Presión; Bases del Conocimiento; Encuestas y Cuestionarios; Traducción; Estudio de Validación.

## INTRODUCTION

In 2016, the National Pressure Ulcer Advisory Panel (NPUAP) proposed a change in the nomenclature from Pressure Ulcer (PU) to Pressure Injury (PI), defined as "Damage caused to the skin and/or underlying soft tissues. Generally located over bony prominences or associated with the use of medical devices or other artifacts. It can present as intact skin or as an open ulcer and may be painful. It occurs as a result of intense and/or prolonged pressure or pressure combined with shear force. The tolerance of soft tissues to pressure and shear may be affected by microclimate, nutrition, blood perfusion, comorbidities, and the condition of soft tissues."

The classification of PIs was also reviewed, establishing four categories based on the depth of tissue involvement (from Non-blanchable Erythema to Full-Thickness Tissue Loss), and adding two new categories, Unstageable PI and Deep Tissue PI<sup>(1)</sup>.

PIs are included among the pressure-related skin injuries (PRSI)<sup>(2)</sup>. They have a significant prevalence, 7% in Spanish hospitals, 4.03% in socio-sanitary centers, and 4.79% in community care<sup>(3–5)</sup>. They have a high socio-health cost and are considered an indicator of healthcare quality<sup>(6,7)</sup>. They can affect individuals of any age, including neonates and children. The greatest risk occurs in individuals with impaired mobility

and/or altered sensitivity: bedridden individuals, wheelchair users, etc. They represent a significant workload for nursing professionals, who are primarily involved in the assessment, prevention, and treatment of PIs.

Scientific literature indicates that the level of knowledge among healthcare personnel regarding PIs is low<sup>(8,9)</sup>. Analyzing the knowledge of professionals attending to individuals with active PIs or at risk of developing them contributes to improving their theoretical and practical training, implementing care based on the best available scientific evidence, reducing variability in clinical practice, and enhancing patient care quality and safety<sup>(8,10,11)</sup>.

Constructing a questionnaire for assessing knowledge about PIs requires a considerable amount of time, human resources, and financial investment. Therefore, the most efficient approach is to use established questionnaires such as the Pieper-Zulkowski Pressure Ulcer Knowledge Test<sup>®</sup> (PZ-PUKT)<sup>(12)</sup>, the most widely used internationally<sup>(13,14)</sup>, and the most transculturally adapted to other languages: Portuguese<sup>(15)</sup>, Chinese<sup>(16)</sup>, Iranian<sup>(17)</sup> and Spanish<sup>(18)</sup>.

The most updated version, the PZ-PUKT V2<sup>®</sup>, is in the English language. To apply it in our context, it is necessary to adapt this questionnaire to Galician, the co-official language of the Autonomous Community of Galicia, Spain. Therefore, the objectives of this study are: 1) To transculturally adapt the Pieper-Zulkowski Pressure Ulcer Knowledge Test V2 into Galician and 2) To determine the psychometric properties of the adapted PZ-PUKT V2<sup>®</sup> questionnaire into Galician.

## **METHOD**

### **Study type**

Psychometric, analytical, and correlational study conducted in two phases. Phase 1: Cross-cultural adaptation of the PZ-PUKT V2<sup>®</sup> questionnaire. Phase 2: Observational study.

### **Context and study period**

Primary care, specialized care, and socio-sanitary care in the Health Area of A Coruña and Cee.

Both phases of this study were conducted between October 2020 and June 2021.

### **Phase 1: Cross-Cultural Adaptation**

The translation and adaptation of a questionnaire to another culture, known as cross-cultural adaptation, aim to maintain the conceptual content validity of the instrument, making it possible to assume that a translated questionnaire is equivalent to the original<sup>(19)</sup>. This phase was carried out following the guidelines of the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) working group<sup>(20)</sup>, which conducted a review of existing guidelines that follow the translation-back-translation method used in this study. A significant variability in adaptation methodologies was identified, including different terminology to refer to identical

aspects and ad hoc guidelines. This state of affairs made it challenging to achieve consistent studies and compare results across them. Therefore, a synthesis of the broad spectrum of published methods was performed to ensure methodological quality in the cross-cultural adaptations across 10 stages (Figure 1).

**FIGURE 1: Steps of the Cross-Cultural Translation and Adaptation Process**

- 1. Preparation**
- 2. Forward Translation**
- 3. Reconciliation**
- 4. Backward Translation**
- 5. Backward Translation Review**
- 6. Harmonization**
- 7. Cognitive Debriefing**
- 8. Review of Cognitive Debriefing Results**
- 9. Proofreading**
- 10. Final Report**

International Society for Pharmacoeconomics and Outcomes Research (ISPOR)<sup>(20)</sup>

After obtaining authorization from the authors to carry out the cross-cultural adaptation, a meticulous review of the questionnaire was conducted. The original version of the PZ-PUKT V2<sup>®</sup> was independently translated from English to Galician by two certified translators, both native Galician speakers—one from the healthcare field and the other not. They focused on the conceptual meaning and assessed the translation difficulty of each item on a scale from 1 to 10.

After resolving discrepancies through consensus, the two Galician translations were reconciled into a single version. This version was then independently translated into English by two certified bilingual experts, one from the healthcare field and the other not. They also focused on the conceptual meaning and rated the translation difficulty of each item on a scale from 1 to 10.

The consensus version obtained in the back-translation was compared with the original questionnaire to ensure semantic and conceptual equivalence of the translation. An attempt was made to compare the Galician version with the cross-cultural adaptation of the PZ-PUKT into Portuguese (Brazil) <sup>(15)</sup>.

The next stage, cognitive interviews, is a qualitative research method used to assess the understanding and relevance of a questionnaire. The results are used to modify and refine the questionnaire to ensure its comprehension and relevance. It was

conducted at a health center for one hour with a multidisciplinary group of 9 professionals experienced in caring for individuals with PI. The version of the questionnaire obtained after the back-translation was applied following the signing of informed consent. At the end, each participant assessed the clarity and relevance of each of the 72 items. Finally, a recorded exploratory semi-structured group interview was conducted to inquire about the format, understanding of the questionnaire, the appearance of item content, and completion time.

In the next stage, the results of the cognitive interview were evaluated to incorporate relevant contributions in order to improve the final translation and ensure semantic, conceptual, and cultural equivalence of the Galician version. Subsequently, corrections were made to the final version, and the final report was prepared.

### **Description of the developed methodology**

Face and content validity were assessed using the Delphi method in two rounds via email. The questionnaire was sent via email to a group of 4 experts in PI who, in the first round, evaluated the overall appearance and content of each item using a negative Likert scale. Subsequently, the responses obtained were analyzed, and relevant modifications were made. The questionnaire was then resent to gather opinions on the modifications in the first round, considering both appearance (rated from 1 "very poor" to 5 "very good") and content (rated from 1 "not at all relevant" to 5 "very relevant"). With these data, the apparent validity was determined, and the Content Validity Index (CVI) was calculated—a ratio where the numerator represented the number of experts scoring 4–5, and the denominator was the total number of experts. An IVC  $\geq 0.75$  was considered adequate for 4 experts.

### **Phase 2: Observational Study**

#### **Design**

Multicenter Cross-Sectional Study with Non-Probabilistic Sampling and Self-Administered PZ-PUKT V2<sup>®</sup> Questionnaire Adapted to Galician.

#### **Participants and Study Setting**

The study was conducted in the Healthcare Area of A Coruña and Cee, which has a population of 547,645 inhabitants. The questionnaire was provided to healthcare professionals working in three out of the five hospitals in the area with high incidence and prevalence of PI (Critical Care, Palliative Care, Home Hospitalization, Spinal Cord Care, Internal Medicine, and Traumatology), in 28 out of the 52 Primary Care Services, and in 2 public Socio-Health Centers. The heads of each service invited potential participants: 383 doctors, 565 nurses, and 200 nursing auxiliary technicians (NATs). The inclusion criterion was that these professionals had attended or were attending patients with PI.

The recruitment of the subsample of 33 professionals for analyzing test-retest reliability was conducted through convenience sampling. The second completion of the self-administered questionnaire took place after 3 weeks from the first administration, redistributing alphanumeric-coded questionnaires that linked the responses in both



periods. The heads of each service kept the completed questionnaires until they were handed over to the research team.

### **Instrument**

In 1995, the Pieper Pressure Ulcer Knowledge® (P-PUKT)<sup>(20)</sup> was developed with 47 items based on the 1992 Pressure Ulcers in Adult Prediction and Prevention Guide. In 2012, this led to the PZ-PUKT with 72 items developed by experts based on the 2009 National Pressure Ulcer Advisory Panel and European Pressure Ulcer Advisory Panel<sup>(21)</sup>. In 2016, an updated version with the same number of items was created, referred to by the authors as PZ-PUKT V2®.

The Pieper-Zulkowski Galician Pressure Ulcer Knowledge Test (PZ-GPUKT 72) questionnaire consists of 2 parts. The first part includes 11 items to collect sociodemographic data. The second part has 72 items to assess knowledge about Pressure Ulcers and can be divided into 3 subscales: prevention (20 items), categorization (25 items), and wounds (27 items). The score is based on the response to the 72 items in the second part, with 42 items having the correct option "True" and 30 items having the correct option "False," with response options being "True," "False," and "I don't know."

### **Data Collection**

An open envelope containing the study's objective, the sociodemographic questionnaire, and the PZ-GPUKT 72 was provided to the responsible individuals of each service for each participant. In each service, the documentation was handed over in that order, based on availability and working hours. The self-administered questionnaires, completed without personal data, were submitted in a sealed envelope to the responsible parties for safekeeping until collected by the research team, ensuring anonymity at all times.

The recruitment of the subsample of 30 professionals for analyzing test-retest reliability was conducted through convenience sampling; the retest was carried out after a period of 3 weeks from the initial test. In this case, the questionnaires were alphanumeric coded, thus linking the responses in both periods.

### **Variables**

The score for knowledge about Pressure Ulcers (PI) is based on the response to the 72 items in the PZ-GPUKT 72 questionnaire. Each correct response adds 1 point, and each incorrect response adds 0 points, considering blank items or those with the response "I don't know" as incorrect. The score is expressed as a percentage, ranging from 0 to 100, calculated by summing all correct responses, dividing by the total number of items (72), and multiplying the result by 100.

The sociodemographic variables included:

1. Age (years)
2. Gender (sex)
3. Occupation (workplace)
4. Professional category (health profession)

5. Experience (years of work)
6. Education (academic degree)
7. Specialty (specialized health training)
8. Expertise (postgraduate in wounds)
9. Continuing education (wound care training course)
10. Reading habits (review of guidelines, articles, or books on wounds)
11. Internet usage (searching for information online about wounds)
12. Guideline familiarity (reading Pressure Ulcers guidelines)
13. Time (self-reporting of start and end times)
14. Expertise in Pressure Ulcers (postgraduate in Pressure Ulcers and/or wound expert)
15. Novice (non-expert)

### **Statistical Analysis**

The study data were analyzed using the statistical software IBM SPSS® 26 and JAMOVI® 2.2.5.

### **Descriptive Analysis**

IBM SPSS® 26 was employed to calculate observed frequencies with percentages (%) for qualitative variables and mean ( $\bar{x}$ ), range (R), and standard deviation (SD) for quantitative variables.

### **Bivariate Analysis**

IBM SPSS® 26 was used to check data distribution with the Kolmogorov-Smirnov test (K-S) and perform inferential statistics with parametric tests: Student's t-test (t), analysis of variance (ANOVA), and Pearson correlation coefficient (r). Significance level: 0.05.

### **Psychometric Analysis**

*Item Response Theory.* JAMOVI® 2.2.5 was used for classical item analysis, complemented by Rasch analysis<sup>(22)</sup> to obtain information about item and person performance independently, calculating the measured latent score, highly useful for analyzing questionnaires. Parameter estimation utilized the joint maximum likelihood estimation method. Independence among items was tested with residual correlations below 0.3 for Yen's Q3. Person reliability was interpreted using ranges of values employed in classical methods. Discrimination index was calculated using point-biserial correlation to demonstrate the ability to discriminate between individuals with high and low scores for each item. The corrected difficulty index was calculated using upper and lower quartiles of participants to show the proportion of individuals who answered each item correctly. The Rasch difficulty indicated which values represented higher (positive) and lower (negative) difficulty levels, assuming the random response parameter is 0 and discrimination is constant. Model fit was estimated with weighted mean square (INFIT) and sensitive to outliers (OUTFIT), where indices have a good fit with values between 0.8–1.2 and acceptable fit between 0.5–1.5. Finally, a Wright map was created to display the dispersion of scores for items and individuals.

*Reliability.* JAMOVI® 2.2.5 was used to estimate internal consistency using Cronbach's alpha coefficients ( $\alpha$ ) and McDonald's omega ( $\omega$ ) for the total and the 3 subcategories of the questionnaire.

*Temporal Stability or Test-Retest Reliability.* IBM SPSS® 26 was utilized to check the intraclass correlation coefficient (ICC) and construct a Bland-Altman plot with a significance level of 0.05.

### **Ethical Considerations**

The study adheres to all criteria of the Declaration of Helsinki and regulations regarding the protection of personal data under Regulation (EU) 2016/679 of the European Parliament and the Council of April 27, 2016 (GDPR); and Organic Law 3/2018, of December 5, on the Protection of Personal Data and Guarantee of Digital Rights. Prior to conducting this study, approval was obtained from the Ethics Committee for Research in A Coruña-Ferrol (Reference 2020/590) and was authorized by the Health Area Management.

## **RESULTS**

### **Phase 1: Cross-Cultural Adaptation**

Difficult-to-translate items were identified in the translation into Galician and the back-translation into English (Table 1). After being reviewed by translators and the research team, discrepancies were resolved through consensus.

Harmonization with the PZ-PUKT adapted into Portuguese could not be carried out due to the unavailability of the version of that adaptation.

The cognitive interview confirmed the suitability of the questionnaire format and readability, with a completion time ( $\bar{x}$ : 18.78 minutes; R: 13–27; SD:  $\pm$  3.7) perceived as lengthy. Probe questions reported 15 items as "unclear" in assessing clarity and 19 as "needing improvement" in assessing relevance.

The research team verified the quality of translations and responses to probe questions, made changes to improve semantic-conceptual equivalence, modified 7 items for improved comprehension and interpretation, confirmed with the original authors the correct adaptation of 2 items, and finalized the version of PZ-GPUKT 72. Regarding content validity, clarifications related to routine clinical practice that could cause confusion were incorporated, ultimately achieving very good apparent and content validity (CVR;  $\bar{x}$ : 0.96; R: 0.87–1).



**TABLE 1: Summary of the cross-cultural adaptation of PZ-GPUKT 72**

Independent translation into Galician		
Translator	Items	Words (difficulty)
Bilingual Healthcare Expert	14	Hemodynamically unstable (2), malleolus (3), climate (4), hydrocolloid and film dressings (4), non-sting skin prep (4), eschar (5), slough (5), draining (6), drainage (6), granulation tissue (7), shear (7), undermining (7), break down (8) y biofilm (8).
Bilingual Non-Healthcare Expert	10	Hemodynamically unstable (3), hydrocolloid and film dressings (3), malleolus (3), slough (5), eschar (5), climate (5), undermining (5), granulation tissue (7), shear (7) y biofilm (8)
Independent back-translation into English		
Translator	Items	Words (difficulty)
Bilingual Healthcare Expert	13	Cama de rotación lateral (2), exsudativas (2), apósitos de espuma (3), tecido de granulación (3), branqueamento (3), apósitos de alxinato (3), apósitos hidrocoloides (4), maléolo/nocello (4), eritema non branqueable (5), cizallamento (6), esfácelo (8), éscara (8) y socavamento (8).
Bilingual Non-Healthcare Expert	6	Leito (4), cizallamento (4), esfácelo (8), éscara (8), maléolo/nocello (8) y socavamento (8).

## Fase 2: Observational Study

### Descriptive Analysis

The demographic, professional, and academic-formative characteristics of the 121 participants are presented in Table 2. The average completion time of the questionnaire was  $\bar{x}$ : 25.64 minutes; (Range: 7–90; SD:  $\pm 13.9$ ).

The average score was 72.7% (Range: 31.9–93.1; SD:  $\pm 9.9$ ) and was distributed ( $-1\sigma$ – $+1\sigma$ ) across 4 levels: 18 (14.88%) achieved a "low level" with  $\leq 63\%$  correct answers, 32 (26.45%) a "regular level" with 64%–73%, 55 (45.45%) an "adequate level" with 74%–83%, and 16 (13.22%) an "excellent level" with  $>84\%$ .

### Bivariate Analysis

The normal distribution of data was confirmed through the Kolmogorov-Smirnov test, and parametric tests revealed statistically significant differences between the obtained score and activity, professional category, academic background, specialized healthcare training, training in PI, reading guidelines on PI, internet search on PI, and age (Table 2).

**TABLE 2: Frequency Table and Statistical Significance Tests**

ANOVA	FREQUENCIES n (%)	TOTAL SCORE	
		mean $\pm$ DT	p
<b>ACTIVIDAD</b>			
Hospital	41 (33,9)	(a) 75,7 $\pm$ 6,10	,048
Health and Social Care Center	10 (8,3)	(a-b) 73,3 $\pm$ 12,8	
Primary/Home Health Care	70 (57,9)	(b) 70,9 $\pm$ 10,9	
<b>CATEGORY</b>			
Management positions	6 (5)	(a-b) 74,3 $\pm$ 9,28	,000
Physician	19 (15,7)	(b) 64,4 $\pm$ 9,14	
Nurse	87 (71,9)	(a) 75,4 $\pm$ 7,29	
NATs	9 (7,4)	(b) 62,9 $\pm$ 17,5	
<b>EXPERIENCE</b>			
Less than 1 year	5 (4,1)	(a) 72,7 $\pm$ 6,55	

Between 1 and 5 years	18 (14,9)	(a) 73,0 ± 9,54	
Between 5 and 9 years	13 (10,7)	(a) 76,8 ± 8,37	,691
Between 10 and 14 years	13 (10,7)	(a) 71,6 ± 10,9	
Between 15 and 19 years	15 (12,4)	(a) 70,5 ± 13,0	
20 years or more	57 (47,1)	(a) 72,5 ± 9,56	
<b>EDUCATION</b>			
Undergraduate degree	8 (6,6)	(a) 64,0 ± 18,4	
University degree	96 (79,3)	(b) 73,5 ± 8,90	,031
Postgraduate degree	17 (14,0)	(a-b) 72,1 ± 8,77	
<b>SPECIALIZATION</b>			
None	105 (86,8)	(a) 73,5 ± 9,80	
Family Nursing	4 (3,3)	(a-b) 70,1 ± 6,15	
Family Medicine	8 (6,6)	(b) 61,1 ± 7,04	,009
Geriatric Nursing	2 (1,7)	(a-b) 79,1 ± 7,85	
Geriatric Medicine	2 (1,7)	(a-b) 77,0 ± 0,98	
<b>EDUCATION ON PI</b>			
1 year or less ago	20 (16,5)	(a) 78,8 ± 5,30	
More than 1 but less than 2 years ago	18 (14,9)	(a-b) 75,1 ± 6,78	
2 or 3 years ago	21 (17,4)	(a-b) 74,2 ± 7,30	,001
4 years or more ago	40 (33,1)	(a-b) 71,0 ± 11,9	
Never	22 (18,2)	(b) 66,9 ± 9,92	
<b>READING GUIDELINES FOR PI</b>			
1 year or less ago	72 (59,5)	(a) 75,8 ± 7,06	
More than 1 but less than 2 years ago	10 (8,3)	(a) 73,6 ± 9,25	
2 or 3 years ago	16 (13,2)	(a-b) 70,8 ± 7,59	,000
4 years or more ago s	20 (16,5)	(b) 65,3 ± 14,1	
Never	3 (2,5)	(b) 55,0 ± 5,61	

T-STUDENT	FREQUENCIES n (%)	TOTAL SCORE	
		mean ± DT	p
<b>GENDER</b>			
Female	104 (86)	73,2 ± 10,0	
Male	17 (14)	69,7 ± 8,81	(a) ,183
<b>SPECIALIZATION</b>			
No	105 (86,8)	73,5 ± 9,76	
Yes	16 (13,2)	67,0 ± 9,45	(a) ,017
<b>EXPERTO EN PI</b>			
No	119 (98,3)	72,7 ± 9,90	
Yes	2 (1,7)	72,2 ± 15,7	(a) ,940
<b>INTERNET SEARCH</b>			
No	8 (6,6)	57,8 ± 13,7	
Yes	113 (93,4)	73,8 ± 8,75	(b) ,013
<b>READING PI GUIDELINES</b>			
No	28 (23,1)	64,7 ± 11,6	
Yes	93 (76,9)	75,1 ± 7,93	(b) ,000

PEARSON	FREQUENCIES	TOTAL SCORE	
	N; mean ± DT	Pearson	p
AGE	121; 44,6 ± 12,6	-,204*	,025
COMPLETION TIME	106; 25,6 ± 13,9	,114	,243

ANOVA. Scheffé test: as group sizes are not equal, the harmonic mean of group sizes is used.

a, b, c. Column means comparison: each letter indicates a subset whose means do not differ significantly from each other at the 0.05 level.

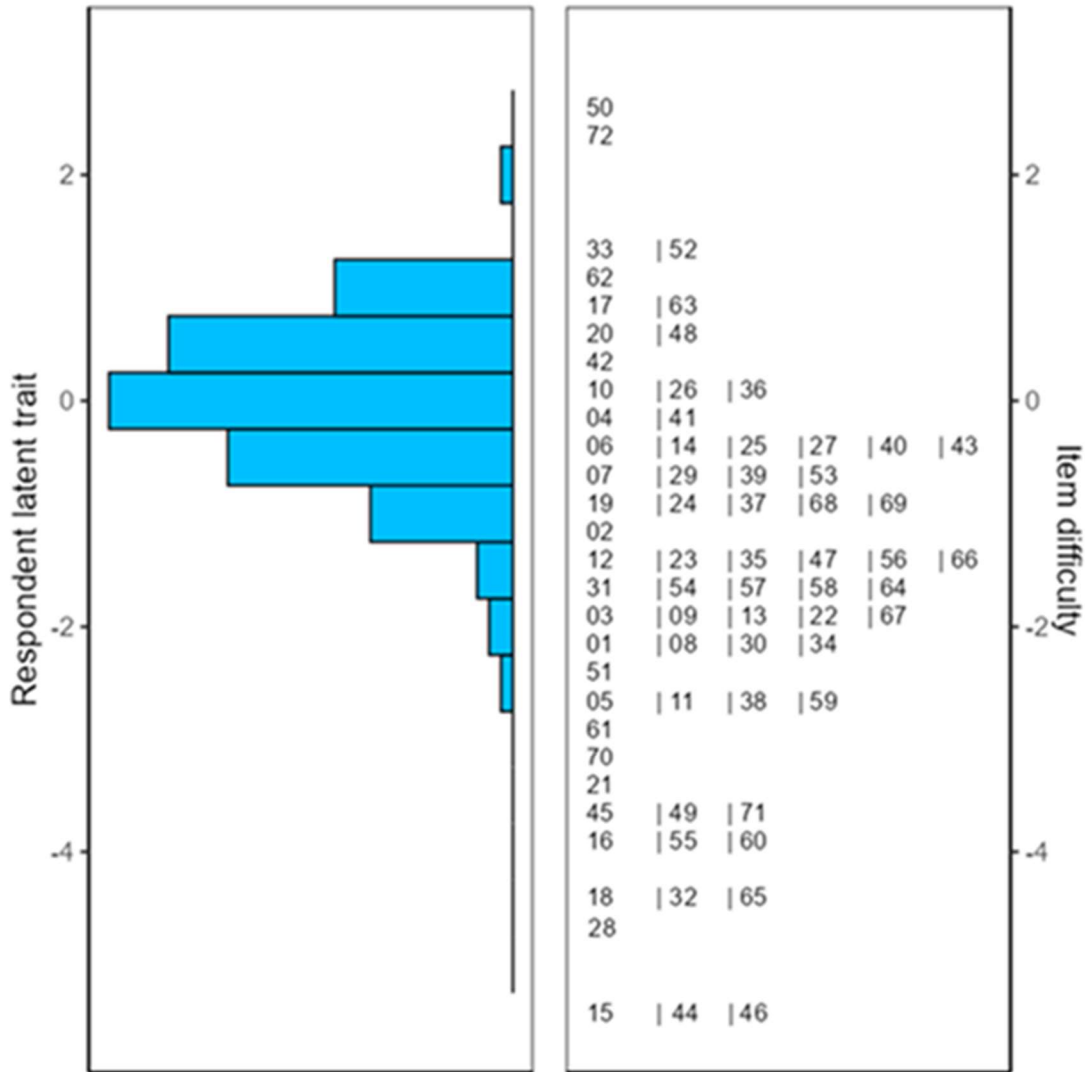
T-STUDENT: Levene test. a, equal variances assumed; b, equal variances not assumed.

PEARSON: \* The correlation is significant at the 0.05 level (two-tailed).

## Psychometric Analysis

*Item Response Theory.* The results of classical and Rasch analysis are presented in Table 3. Local independence among items is confirmed with a Yen's Q3 value <0.3 for all items. The reliability for individuals was 0.787. The average discrimination index was 0.31, and the average corrected difficulty index was 0.62. Items exhibit a wide range of difficulty (Range: -37.32–2.55), and all have values between 0.5 and 1.5 in INFIT–OUTFIT, except for items 15, 44, and 46, which have higher values. The Wright Map is depicted in Figure 2.

**FIGURE 2: Wright Map of the PZ-GPUKT 72 Model**

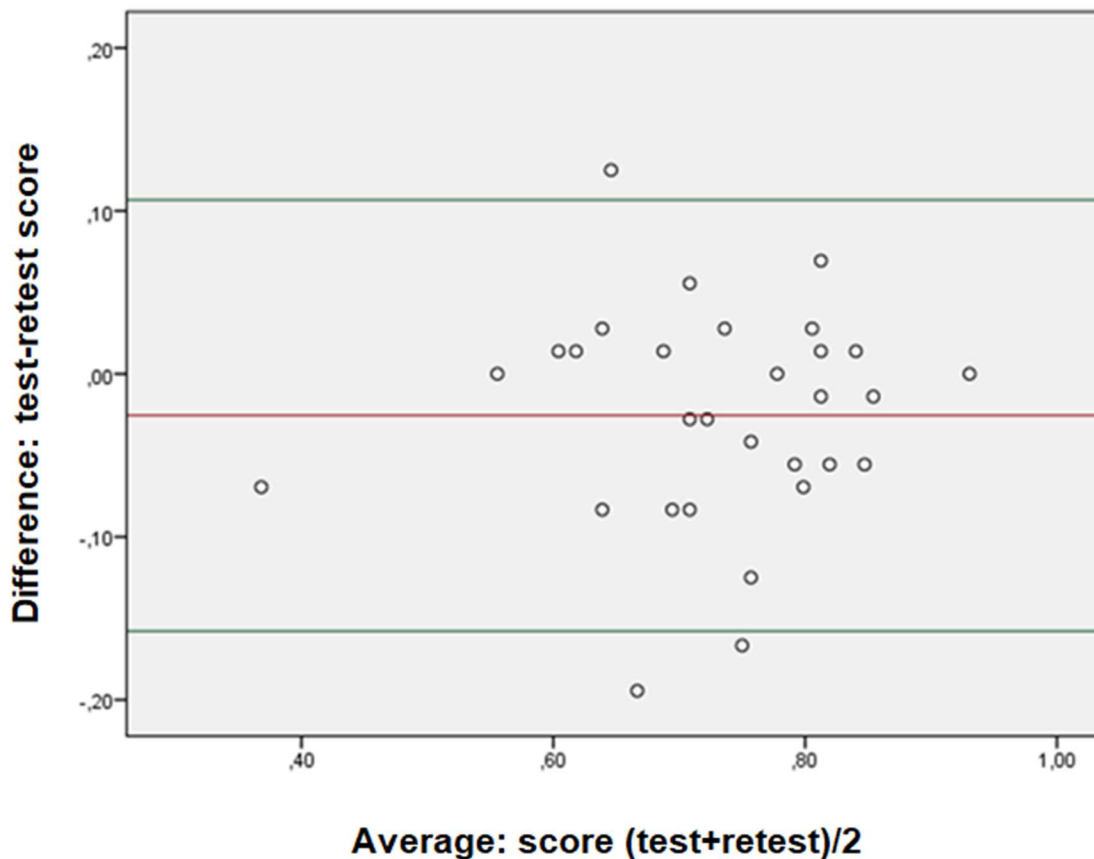


Note: Excluding items 15, 44, and 46 due to being out of range (Rasch Difficulty -37.3230)

**Reliability.** The Cronbach's  $\alpha$  for the overall scale was 0.809, 0.604 for prevention, 0.522 for categorization, and 0.674 for wound description. McDonald's  $\omega$  was 0.818, 0.570, 0.573, and 0.719, respectively.

**Test-retest Temporal Stability or Reliability.** The Intraclass Correlation Coefficient (ICC) was 0.906, and Figure 3 illustrates stability with the Bland-Altman plot.

**FIGURE 3: Bland-Altman plot obtained with total scores from the test-retest using the PZ-GPUKT 72**



Mean difference: -0.0255 (SD: 0.0674), 95% CI: -0.1578 to -0.1067

**Table 3. Key characteristics of the items**

ITEM	Response rates			Questionnaire indices			Model adjustment	
	Right	Wrong	Don't know	Biserial difficulty	Discrimination	Rasch difficulty	Infit	Outfit
1 (T)	0.8760	0.107	0.017	Very easy	Poor	-2.1217	0.992	0.971
2 (F)	0.7603	0.165	0.074	Easy	Moderate	-1.2636	0.953	0.960
3 (F)	0.8430	0.017	0.140	Very easy	Poor	-1.8293	0.878	0.791
4 (T)	0.5124	0.438	0.050	Difficult / Very difficult	Adequate	-0.0578	1.105	1.105
5 (T)	0.9256	0.058	0.017	Very easy	Very poor	-2.7165	1.123	1.556
6 (F)	0.5702	0.364	0.066	Difficult	Excellent	-0.3131	0.956	0.945
7 (F)	0.6612	0.174	0.165	Normal	Adequate	-0.7349	0.890	0.876
8 (T)	0.8678	0.107	0.025	Very easy	Moderate	-2.0432	0.976	0.814
9 (T)	0.8512	0.058	0.091	Very easy	Moderate	-1.8974	0.925	0.909
10 (F)	0.4711	0.388	0.140	Very difficult	Moderate	0.1231	1.008	0.995
11 (F)	0.9174	0.041	0.041	Very easy	Very poor	-2.5970	0.941	0.751
12 (T)	0.7769	0.132	0.091	Easy	Excellent	-1.3641	0.914	0.863
13 (F)	0.8430	0.124	0.033	Very easy	Poor	-1.8293	1.042	0.997
14 (F)	0.6033	0.331	0.066	Difficult	Poor	-0.4624	1.000	1.004
15 (T)	1.0000	0.000	0.000	Very easy	Very poor	-37.3230	2.640	1.882
16 (T)	0.9752	0.017	0.008	Very easy	Poor	-3.9011	0.992	0.747
17 (T)	0.2893	0.157	0.554	Very difficult	Adequate	0.9724	1.047	1.053

18 (T)	0.9835	0.017	0.983	Very easy	Poor	-4.3213	1.029	1.334
19 (T)	0.7025	0.091	0.207	Easy	Moderate	-0.9429	0.978	0.997
20 (F)	0.3802	0.488	0.132	Very difficult	Adequate	0.5294	1.058	1.085
21 (T)	0.9587	0.025	0.017	Very easy	Very poor	-3.3611	0.929	0.778
22 (T)	0.8595	0.107	0.033	Very easy	Poor	-1.9686	1.091	1.241
23 (T)	0.8017	0.025	0.174	Easy	Excellent	-1.5250	0.968	0.873
24 (F)	0.6860	0.025	0.289	Normal	Excellent	-0.8580	0.840	0.789
25 (F)	0.5950	0.331	0.074	Difficult	Excellent	-0.4248	0.861	0.835
26 (F)	0.4959	0.479	0.025	Difficult	Poor	0.0146	1.053	1.130
27 (T)	0.6116	0.215	0.174	Difficult	Excellent	-0.5003	1.033	1.037
28 (T)	0.9917	0.008	0.000	Very easy	Very poor	-5.0294	1.006	0.708
29 (T)	0.6612	0.132	0.207	Normal	Adequate	-0.7349	0.991	0.987
30 (T)	0.8760	0.041	0.083	Very easy	Moderate	-2.1217	1.050	1.060
31 (T)	0.8099	0.025	0.165	Easy	Moderate	-1.5818	1.062	1.122
32 (F)	0.9835	0.017	0.000	Very easy	Very poor	-4.3213	1.012	0.792
33 (F)	0.2231	0.719	0.058	Very difficult	Poor	1.3447	1.117	1.276
34 (T)	0.8843	0.058	0.058	Very easy	Poor	-2.2046	1.107	1.176
35 (F)	0.7851	0.066	0.149	Easy	Moderate	-1.4163	0.949	0.897
36 (T)	0.4628	0.405	0.132	Very difficult	Adequate	0.1594	1.083	1.117
37 (F)	0.7107	0.289	0.711	Easy	Adequate	-0.9863	1.057	1.058
38 (F)	0.9256	0.017	0.058	Very easy	Very poor	-2.7165	1.014	1.084
39 (T)	0.6612	0.256	0.083	Normal	Adequate	-0.7349	1.120	1.150
40 (T)	0.5702	0.248	0.182	Difficult	Excellent	-0.3131	1.044	1.075
41 (T)	0.5455	0.380	0.074	Difficult	Excellent	-0.2030	0.972	0.955
42 (T)	0.3967	0.413	0.190	Very difficult	Excellent	0.4538	1.010	1.094
43 (F)	0.6116	0.347	0.041	Difficult	Adequate	-0.5003	0.935	0.918
44 (T)	1.0000	0.000	0.000	Very easy	Very poor	-37.3230	2.641	1.882
45 (T)	0.9669	0.017	0.017	Very easy	Very poor	-3.5988	1.010	1.075
46 (T)	1.0000	0.000	0.000	Very easy	Very poor	-37.3230	2.641	1.882
47 (T)	0.7851	0.107	0.107	Easy	Poor	-1.4163	1.018	0.988
48 (T)	0.3554	0.488	0.157	Very difficult	Adequate	0.6450	1.148	1.213
49 (T)	0.9669	0.025	0.008	Very easy	Very poor	-3.5988	1.006	1.096
50 (F)	0.0826	0.851	0.066	Very difficult	Poor	2.5562	1.000	1.284
51 (T)	0.9091	0.083	0.008	Very easy	Poor	-2.4877	1.003	1.100
52 (T)	0.2397	0.653	0.107	Very difficult	Excellent	1.2457	1.076	1.211
53 (F)	0.6612	0.215	0.124	Normal	Moderate	-0.7349	1.032	1.034
54 (F)	0.8099	0.041	0.149	Easy	Adequate	-1.5818	0.909	0.847
55 (F)	0.9752	0.025	0.975	Very easy	Very poor	-3.9011	0.982	0.853
56 (F)	0.7934	0.074	0.132	Easy	Excellent	-1.4699	0.905	0.810
57 (F)	0.8182	0.140	0.041	Easy	Poor	-1.6404	1.074	1.097
58 (T)	0.8182	0.074	0.107	Easy	Excellent	-1.6404	0.945	0.919
59 (T)	0.9256	0.025	0.050	Very easy	Poor	-2.7165	0.875	0.592
60 (T)	0.9752	0.025	0.000	Very easy	Poor	-3.9011	0.920	0.565
61 (T)	0.9339	0.041	0.025	Very easy	Pobre	-2.8483	1.041	0.952
62 (F)	0.2810	0.430	0.289	Very difficult	Excellent	1.0159	1.076	1.100
63 (T)	0.3140	0.488	0.198	Very difficult	Excellent	0.8457	1.089	1.135
64 (F)	0.8099	0.083	0.107	Easy	Moderate	-1.5818	0.922	0.833
65 (T)	0.9835	0.017	0.000	Very easy	Very poor	-4.3213	1.033	1.375

66 (T)	0.7686	0.182	0.050	Easy	Moderate	-1.3133	0.972	0.957
67 (T)	0.8512	0.033	0.116	Very easy	Adequate	-1.8974	0.894	0.930
68 (F)	0.7107	0.091	0.198	Easy	Adequate	-0.9863	0.991	0.963
69 (F)	0.7025	0.050	0.248	Easy	Excellent	-0.9429	0.967	0.962
70 (T)	0.9504	0.008	0.041	Very easy	Poor	-3.1645	0.875	0.530
71 (F)	0.9669	0.008	0.025	Very easy	Moderate	-3.5988	0.900	0.498
72 (F)	0.1074	0.769	0.124	Very difficult	Moderate	2.2570	1.025	1.023

ITEM number. (T) = the correct answer is true; ITEM number. (F) = the correct answer is false.

DISCRIMINATION: excellent (>0.39), adequate (0.30-0.39), moderate (0.20-0.29), and poor (0.01-0.19).

DIFFICULTY: very easy (>0.75), easy (0.55-0.74), normal (0.45-0.54), difficult (0.25-0.44), and very difficult (<0.25).

RASCH DIFF. = negative values signify lower difficulty, and higher values signify higher difficulty.

INFIT / OUTFIT = Weighted Mean Squared Residual / Outfit Mean Square, sensitive to outliers.

## DISCUSSION

### Phase 1: Cross-Cultural Adaptation

Following the systematic and methodical process outlined by ISPOR<sup>(20)</sup>, the majority of items in the PZ-GPUKT 72 showed high equivalence with respect to the original version. The remaining items achieved moderate equivalence by including expressions that are used differently for the same concept, but the back-translation only minimally modified the original meaning. Therefore, the PZ-GPUKT 72 demonstrates good semantic-conceptual equivalence with the original questionnaire, making it considered adapted to the linguistic and cultural context of healthcare professionals in Galicia. Additionally, the questionnaire exhibits very good face and content validity.

With the exception of perceiving the instrument as a lengthy questionnaire, the feasibility of the PZ-GPUKT 72 is confirmed due to its ease of application, facilitated by the appropriateness of its format and the perceived good understanding and readability during cognitive interviews.

### Phase 2: Observational Study

The participant profile corresponds to professionals with an average age close to the midpoint of their professional career, predominantly female, and primary care nurses with extensive experience who frequently seek information on the internet, read articles, books, or guidelines about Pressure Injuries (PI).

The average score for knowledge about PI obtained with the PZ-GPUKT 72 is lower than that obtained in two studies<sup>(12,21)</sup> and higher than the rest of the studies<sup>(15-17,24,25)</sup> that used the PZ-PUKT. The authors do not establish cutoff scores for users to adjust them to the project's objectives<sup>(21,24,26,27)</sup>.

This study establishes four levels based on the observed distribution and difficulty.



Participants with training in the last year, those who sought information on the internet and/or read guidelines on PI, obtained higher scores, similar to the results of other studies<sup>(12,16,27)</sup>. The completion time is similar to that of other studies<sup>(11,12,15,25)</sup> and may limit the feasibility of the questionnaire due to the high number of items.

Similar to the study by Rocha et al.<sup>(28)</sup>, it is observed that as age increases, the percentage of correct answers decreases, which should be a subject of further study. Rasch analysis showed acceptable psychometric characteristics to validate the construct, assuming item unidimensionality and local independence. However, it does not fully support the fit in the studied sample, showing items with so little difficulty that they barely discriminate. At least, consideration should be given to excluding the 3 items (15, 44, and 46) that significantly exceed the established fit values.

Thus, the difficulty level is low for these professionals, and it should be confirmed whether the same occurs in other samples or if this wide range of difficulty facilitates identifying professionals with low and high levels of knowledge, as indicated by Moharramzadeh et al.<sup>(17)</sup>, who also notes that considering the response "I don't know" could improve the difficulty and discrimination indices of the questionnaire.

As in other studies, items with lower difficulty (15, 44, and 46) address aspects of prevention<sup>(11,12,15,25)</sup>, and those with higher difficulty (17, 33, 52, 62, 72) address the three themes of the questionnaire<sup>(25,29)</sup>: prevention, categorization, and description of the wound.

The PZ-GPUKT 72 has good internal consistency, with no items whose removal substantially increases these values. The consistency is similar to studies of similar size<sup>(11,12,15,25,30)</sup> and lower than that obtained with larger samples<sup>(16,17,25)</sup>, suggesting an increase in larger studies. The agreement of the ratings obtained in determining test-retest reliability with the ICC is excellent, improving the observed values<sup>(17)</sup>; the agreement represented by the Bland-Altman diagram is good. This good internal consistency and temporal stability allow us to affirm that the PZ-GPUKT 72 is a reliable instrument for measuring knowledge about PI.

The PZ-GPUKT 72 requires further studies to determine the consistency of its subscales more clearly.

### **Limitations**

Conducting cognitive interviews in a primary healthcare center may have limited the identification of problems. There is a possibility of self-selection bias, as motivated professionals may have participated, leading to a distortion of results towards higher knowledge levels. Non-probabilistic sampling makes descriptive accuracy not representative, and categorical conclusions may be limited. The differential validity through a known-group technique was not performed due to the small number (2) of expert group participants.

Considering the very good face and content validity compared to the original version and the demonstrated appropriate psychometric characteristics—good reliability when administered in full, stability, construct validity—the PZ-GPUKT 72 is a reliable and valid instrument for assessing knowledge about Pressure Injuries for use by healthcare professionals in Galicia.

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