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Psychometric properties of the smartphone use and distraction questionnaire in Spanish and Portuguese nursing students

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ABSTRACT

Background & Aim: Smartphone use in nursing education offers both learning benefits and risks of distraction, influenced by cultural and institutional norms. The Nursing Students' Smartphone Use and Distraction Questionnaire, originally developed in Spanish but never psychometrically validated, was formally validated among Spanish nursing students and simultaneously translated, culturally adapted, and validated for Portuguese nursing students.
Methods & Materials: A psychometric study was conducted among 543 Portuguese and 480 Spanish nursing students enrolled in their second year or higher. The questionnaire was translated and culturally adapted into Portuguese following International Society for Pharmacoeconomics and Outcomes Research guidelines. Psychometric evaluation included exploratory factor analysis with varimax rotation, Kaiser-Meyer-Olkin measure, Bartlett's test of sphericity, and internal consistency analysis using Cronbach's alpha, conducted with IBM SPSS Statistics version 29.
Results: The analysis extracted 26 items across six factors: Clinical Practice Use, Regulatory Policy, Unprofessional Personal Use, Observed Unprofessional Use, Student's Distraction, and Ethics, explaining 57.8% of the variance in Portugal and 61.8% in Spain. Kaiser-Meyer-Olkin values were 0.747 and 0.818, with Bartlett's test significant in both samples ($p < 0.001$). Cronbach's alpha coefficients for the total scale were 0.717 (Portugal) and 0.740 (Spain), with subscale values ranging from moderate to good reliability.
Conclusion: The Smartphone Use and Distraction Questionnaire showed valid structural properties and acceptable reliability in two distinct cultural settings. Its adaptability supports use across health professions and diverse countries and cultures, informing evidence-based policies that promote professional smartphone use and reduce distraction in clinical education.

Introduction

The integration of mobile technologies into healthcare and education has grown rapidly due to their ability to enhance access, efficiency, and interactivity. In clinical practice, smartphones allow healthcare providers to retrieve clinical guidelines, patient data, and drug references in real-time, supporting timely decision-making and improving patient outcomes (1,2). These tools facilitate communication among providers and expedite case management, reducing care delays and enhancing intervention accuracy (3).

In education, mobile learning has evolved from a supplementary aid to a core pedagogical component, particularly in nursing and medical training. Mobile apps provide interactive content, simulation tools, instructional videos, and platforms for peer collaboration across distances (4). During the COVID-19

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pandemic, such technologies were vital for maintaining continuity in education through remote modalities (5). Mobile learning fosters engagement and improves outcomes, empowering students to co-create content and engage in dynamic learning experiences (6). Professional use of smartphones among nursing students includes accessing drug information, university materials, and dosage calculations (7). These tools support point-of-care decision-making and communication within clinical teams, contributing to improved education and patient care (8,9).

Despite their benefits, smartphone use in clinical settings presents significant drawbacks. Personal use frequently overshadows professional purposes among nursing students, negatively affecting health, learning, and performance in academic and clinical environments (10). Zarandona and colleagues (7) found extensive smartphone use during practicums that was often non-clinical, emphasizing the need for educational strategies that promote professional, purposeful use. Recent qualitative evidence suggests that the use of personal cell phones by nurses can function as a barrier to effective nursing care, leading to emotional detachment, care neglect, and impaired professional behavior. Negarandeh et al. (2024) found that nursing staff, patients, and relatives perceived that smartphone use during work may jeopardize patient safety and erode the image of the nursing profession (11), urging the need for guidelines on smartphone use in hospitals.

Importantly, norms surrounding smartphones, particularly what is considered appropriate, professional, or distracting, are shaped by cultural expectations and institutional contexts (12). Transcultural nursing frameworks, such as Leininger's Theory of Culture Care Diversity and Universality, highlight how culturally congruent care requires awareness of how behavioral norms, including technology use, vary across populations (13). These differences can influence nursing education outcomes and clinical professionalism, especially in diverse or multicultural training environments.

Distraction is a primary concern. Smartphones can impair cognitive performance, task execution, and situational awareness (14). Even their passive presence divides attention (15). These distractions can lead to medical errors during critical tasks such as medication administration (16). In line with these findings, McBride and LeVasseur (17) also noted that personal device use disrupts clinical workflows and threatens patient safety.

This duality underscores the need for culturally validated tools and frameworks that balance benefits and risks and reflect the sociocultural norms shaping professional behavior in clinical education. The "Nursing Students' Smartphone Use and Distraction Questionnaire" (SUDQ) was developed by Zarandona and colleagues (7) was developed to assess how smartphones contribute to distraction in clinical education.

In this context, the SUDQ, originally developed in Spanish, represents the only instrument specifically designed to measure the multifaceted construct of smartphone use and distraction in nursing education. The tool comprises sections addressing professional smartphone use in clinical practice, unprofessional personal use during training, observed unprofessional behaviors, perceptions of institutional policies, distraction related to both self and others, and ethical considerations. This multidimensional scope enables a comprehensive assessment of how smartphones both support and hinder clinical learning. Other available instruments, such as the Smartphone Distraction Scale (18) and smartphone addiction or nomophobia questionnaires (19,20), provide valuable insights into general distraction or addiction, but they do not address the professional, ethical, or policy dimensions relevant to clinical practice. Likewise, Cho and Lee's questionnaire (21), focused on distraction and opinions about restriction policies but lacked a validated multidimensional structure. By contrast, the SUDQ was developed specifically for nursing education, making it the most comprehensive and context-appropriate instrument for validation.

Despite its relevance, the original authors did not conduct a psychometric validation of the Spanish version, limiting its scientific robustness and applicability. Our study, therefore, provides the first formal validation of the SUDQ in Spanish nursing students, while also conducting a translation, cultural adaptation, and validation for

Portuguese students. By addressing both linguistic and cultural aspects, this work ensures the tool's reliability and expands its applicability across two distinct contexts. This dual validation strengthens confidence in the instrument's transferability and positions it as a culturally adaptable resource for broader use in health professions education within nursing programs, with a particular focus on Spanish- and Portuguese-speaking contexts, an area that has received comparatively less attention in existing literature (22,23). This study contributes to standardizing assessment instruments and developing interventions that balance the benefits and drawbacks of mobile technology use and support the creation of informed educational policies and curricular strategies for integrating mobile technology into nursing education safely and effectively.

The objective of this study was twofold: first, to conduct the first psychometric validation of the original Spanish version of the SUDQ among nursing students; and second, to carry out the translation, cultural adaptation, and psychometric validation of the instrument in Portuguese nursing students.

Methods

Design

This study was conducted to assess the psychometric properties of the original Spanish version of the SUDQ and to adapt and validate a Portuguese version.

Psychometric validation was conducted in sequential steps. First, linguistic and cultural adaptation of the Spanish version of the SUDQ into to Portuguese language was performed according to the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) guidelines (24). Second, the construct validity of the instrument was tested through exploratory factor analysis (EFA) and hypothesis testing validity. Third, internal consistency reliability was assessed using Cronbach's alpha for the overall scale and each subscale.

Smartphone use & distraction questionnaire

The SUDQ was originally developed in Spain by Zarandona et al. in 2021 for use among nursing students (7). The full questionnaire comprised five sections, but for this study, only sections three to five (a total of 26 items covering professional use, distraction, and institutional policy) were analyzed for psychometric validation. The first section gathered sociodemographic and academic information, including sex and age. The second section consisted of general items related to the personal use of mobile devices. While these items may offer valuable contextual or descriptive information, they were not subjected to reliability analysis or construct validity testing due to their descriptive nature. This decision was based on the conceptual distinction between personal behaviors and the latent constructs the instrument was designed to measure, such as attitudes during clinical practicum, professional conduct, and observed behaviors in clinical settings. Section three contains 14 items evaluating professional smartphone use during clinical placements. Section four includes nine items assessing distraction caused by smartphone use in clinical settings. Section five has four items on perceptions of institutional smartphone policies. Items in sections three and four use a 5-point Likert scale ranging from "never" (1) to "always" (5); section five uses a Likert scale from "strongly disagree" (1) to "strongly agree" (5). Higher scores reflect stronger agreement with the described behaviors or perceptions. The instrument is self-administered and was originally delivered in paper and online formats.

Translation & adaptation of the Spanish version into to Portuguese language

Two independent forward translations were synthesized into a single version, which was then back-translated by a third translator to assess semantic equivalence. Discrepancies were reviewed by a bilingual expert panel composed of nursing educators and clinical practitioners. This step ensured content validity of the Portuguese version. During the translation and adaptation process, one item referring to tutors encouraging students to text peers or email patient information was excluded because semantic equivalence could not be ensured across Spanish and Portuguese versions, and expert review indicated potential ambiguity in interpretation. To maintain

conceptual clarity and cultural comparability, this item was removed prior to psychometric analyses. The final version analyzed, therefore, consisted of 26 items.

To ensure cultural relevance, and not only linguistic accuracy, the research team evaluated each item for conceptual and contextual alignment with the clinical and educational environments in Portugal. This step was guided by principles from transcultural nursing theory, particularly the emphasis on culturally congruent assessment tools (25). Cognitive debriefing interviews were conducted with 10 Portuguese nursing students to assess clarity, acceptability, and cultural appropriateness, thereby supporting face validity. Based on their feedback, minor modifications were made to enhance local applicability without altering item intent. The responses obtained during the cognitive debriefing step were used solely to assess item clarity and cultural relevance and were therefore not included in the psychometric validation analyses.

Participants

The study included nursing students enrolled in their second year or higher during the 2023/24 academic year, with at least two completed clinical placements. Exclusion criteria were being on academic leave during data collection or incomplete responses to the questionnaire that prevented psychometric analysis. In Portugal, students were recruited from two private and one public nursing school, and in Spain, recruitment occurred at two public nursing schools. A total of 543 Portuguese and 480 Spanish nursing students participated. Sampling was conducted through a convenience approach, recruiting students from nursing schools that agreed to participate. The sample size in each country exceeded the minimum threshold recommended for exploratory factor analysis, while COSMIN guidelines suggest a minimum of 100 participants (26). Our larger samples (Portugal: 543; Spain: 480) enhance the stability and generalizability of the factor structure.

Data collection procedures

The questionnaire was administered through an online platform. Data collection took place between January and April 2024, after students had completed their clinical placements. During scheduled class sessions, the researchers met with the students to present the study aims, explain the ethical procedures, and emphasize the voluntary nature of participation. Following this briefing, students received a link to the online survey, and those who consented completed it independently in their own time. Scheduling data collection immediately after clinical placements allowed students to reflect on recent experiences, while conducting the briefing in face-to-face classes helped ensure high participation and response relevance.

Data analysis

Descriptive statistics were used to characterize the sample, including absolute and relative frequencies for categorical variables, and means and standard deviations for continuous variables. To assess construct validity, we used exploratory factor analysis separately for the Portuguese and Spanish datasets.

Construct validity was evaluated using exploratory factor analysis, a recommended method for examining the underlying factor structure of psychometric instruments (27). Internal consistency reliability was assessed through Cronbach's alpha. These procedures are consistent with established standards for psychometric validation and are widely accepted in nursing and health research.

Because the original Spanish version of the SUDQ had not been psychometrically validated, no established measurement model was available for confirmatory analysis. For this reason, exploratory factor analysis (EFA) was selected as the most appropriate method to examine the latent structure of the instrument in both Spanish and Portuguese nursing students. This step was essential before future studies could apply confirmatory factor analysis to test model fit in independent samples.

Prior to factor extraction, we evaluated the suitability of the data using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity. A KMO value above 0.70 was considered acceptable, and significance below 0.001 on Bartlett's test confirmed factorability of the data. The factor extraction method employed

was principal component analysis with varimax rotation. Factors with eigenvalues greater than 1.0 were retained based on the Kaiser criterion. The number of factors retained and the interpretability of factor loadings were used to confirm structural validity. Item loadings of 0.40 or higher were considered meaningful. (28). To examine hypothesis-testing validity, we compared factor scores by age and sex within each country using independent samples t-tests. These comparisons assessed whether the instrument could differentiate between groups as expected based on prior literature.

Internal consistency reliability was evaluated using Cronbach's alpha for each identified factor. A value between 0.70 and 0.80 was considered acceptable, while values above 0.80 were deemed good. Additionally, corrected item-total correlations were computed to assess how well each item correlated with its respective scale. Correlations below 0.30 were interpreted as weak, 0.30–0.50 as moderate, and above 0.50 as strong (27,29,30).

All statistical analyses were performed using IBM SPSS Statistics version 29, with a significance threshold set at $p < 0.05$.

Ethical considerations

Ethical approval was obtained from the Portuguese Red Cross Nursing School (011/2023) and the Institutional Ethics Board of the University of the Basque Country (UPV/EHU) (CODE M10/2023/309). Directors of participating schools also approved the study. Informed consent was obtained from all participants. Permission to use and adapt the SUDQ was obtained from the original developers of the instrument.

Results

The results are presented according to the main steps of the validation process: (1) linguistic and cultural adaptation for the Portuguese version, (2) construct (structural) validity through exploratory factor analysis, and (3) internal consistency reliability.

Translation and cultural adaptation of the Spanish version into Portuguese

The Portuguese version of the SUDQ (SUDQ-PT) was obtained through forward translation, expert review, back-translation, and cognitive debriefing with nursing students. This process confirmed semantic, conceptual, and cultural equivalence between the original Spanish version and the adapted Portuguese version, with only minor wording adjustments required. For example, terms referring to "mobile phone" were replaced with "smartphone" to reflect current usage, and certain verbs were adjusted to match common expressions used by Portuguese nursing students. No changes were made to the conceptual meaning of the items. As a result of the cultural adaptation process, one item was excluded due to insufficient semantic equivalence across languages, resulting in a final version of 26 items subjected to exploratory factor analysis.

Psychometric testing of the Spanish (SUDQ-SP) and SUDQ-PT versions

Data collection occurred between January and April 2024. A total of 1,023 nursing students participated, 543 from Portugal (response rate: 53.1%) and 480 from Spain (response rate: 42.7%). Most participants were female (Portugal: 84.3%; Spain: 80.8%) and under the age of 25 (Portugal: 91.3%; Spain: 92.8%). Detailed demographic characteristics are presented in Table 1.

Table 1. Participants sociodemographic data for Portugal (n=543) and Spain (n=480)

Variable	Value	Portugal		Spain	
		N	%	N	%
Sex	Women	458	84.3%	388	80.8%
	Men	80	14.7%	91	19.0%
	n/A	5	0.9%	1	0.2%
Age	Min-Max	19-47		18-50	
	Mean ± SD	22.1 ± 4.2		21.6 ± 4.1	

n/A did not answer

Construct validity

Exploratory factor analysis was conducted separately for the Portuguese and Spanish samples. The KMO measure and Bartlett's test confirmed the adequacy of the data. Six consistent factors emerged in both countries, encompassing 26 retained items and corresponding to Clinical Practice Use, Regulatory Policy, Unprofessional Personal Use, Observed Unprofessional Use, Student's Distraction, and Ethics. These six factors explained 57.8% of the variance in Portugal and 61.8% in Spain. Exploratory factor analysis supported the construct validity of the SUDQ by confirming a six-factor structure consistent across Portuguese and Spanish samples. The factors were named according to the content and thematic focus of the items loading on each factor, in line with terminology used in previous studies.

In Portugal, the Kaiser-Meyer-Olkin (KMO) measure was 0.747 (interpreted as good), while in Spain it was 0.818 (also good). Bartlett's test of sphericity was significant in both samples (p<0.001), confirming suitability for factor analysis. Principal component analysis with varimax rotation identified six factors in both datasets, explaining 57.8% of the total variance in the Portuguese sample and 61.8% in the Spanish sample. These factors were interpreted as: (1) Clinical Practice Use – reflects smartphone use during clinical practice for communication, research, and student duties; (2) Regulatory Policy–captures perceptions about rules governing smartphone use and its role in efficiency; (3) Unprofessional Personal Use–pertains to inappropriate use during patient care, training sessions, or internships; (4) Observed Unprofessional Use– includes observations of misuse by others, such as tutors or healthcare staff; (5) Student's Distraction– indicates instances where students were distracted, either by themselves or others; and (6) Ethics – includes awareness and training regarding professional conduct, confidentiality, and responsible smartphone use. A detailed breakdown is provided in Table 2.

Table 2. Item loadings from the rotated component matrix for Portugal and Spain

Factor	Item	1		2		3		4		5		6	
		PT	**SP**	**PT**	**SP**	**PT**	**SP**	**PT**	**SP**	**PT**	**SP**	**PT**	**SP**
1	5	0.813	0.791										
	2	0.781	0.778										
	3	0.701	0.771										
	4	0.664	0.750										
	1	0.660	0.571										
	6	0.620	0.730										
	7	0.568	0.700										
2	26			0.860	0.858								
	24			0.850	0.881								
	25			0.850	0.855								
	23			0.842	0.843								
	17			-0.447	-0.473								
3	13					0.720	0.757						
	8					0.745	0.693						
	10					0.562	0.618						
	12					0.449	0.473						
4	22							0.778	0.524				
	21							0.749	0.572				
	9							0.734	0.729				
	11							0.722	0.824				
5	19									0.808	0.660		
	18									0.747	0.712		
	20									0.701	0.746		
6	14											0.815	0.820
	15											0.782	0.806
	16											0.386	0.420
Eigenvalues		4.417	5.648	3.388	3.710	2.814	2.332	1.792	1.857	1.537	1.531	1.388	1.446
% of Variance		13.5	15.4	12.3	13.3	9.4	9.8	8.4	8.5	7.3	8.3	5.9	5.9

PT: Portugal; SP: Spain

Factor structures were highly consistent across countries. Mean factor scores ranged from 2.01 to 4.62 across samples. In the Portuguese cohort, mean scores (±SD) for the six factors were: Clinical Practice Use (3.17±0.87), Regulatory Policy (2.48 ± 0.79), Unprofessional Personal Use (4.59±0.50), Observed Unprofessional Use (3.31±0.89), Student's Distraction (4.51± 0.64), and Ethics (3.68± 0.86). Scores were based on responses from 543 students, with ranges between 1.00 and 5.00.

In the Spanish cohort, mean scores were: Clinical Practice Use (2.01±0.73), Regulatory Policy (2.69 ± 0.77), Unprofessional Personal Use (4.62±0.44), Observed Unprofessional Use (3.59 ± 0.75), Student's Distraction (4.49±0.56), and Ethics (3.53±0.86). Scores were derived from 477–480 respondents, depending on the factor, with ranges generally between 1.00 and 5.00, except for Student's Distraction (1.33–5.00). Full factor loading matrices and detailed item loadings are included in the Supplementary Material.

Hypothesis testing validity

To further assess construct validity, we tested hypotheses regarding the impact of demographic variables, specifically sex and age, on factor scores. Overall, patterns were consistent across the two countries with no major divergences in direction or strength. In the Spanish cohort, female students reported significantly higher scores for Clinical Practice Use than their male counterparts (p = 0.018), suggesting greater engagement with professional smartphone use. Conversely, in the Portuguese cohort, female students reported significantly higher levels of distraction compared to male students (p<0.001), indicating a heightened susceptibility to smartphone-related distractions. Age differences were also analyzed. Older Spanish students reported more frequent smartphone use, particularly for professional purposes. In contrast, older Portuguese students reported higher distraction scores compared to their younger peers. Although these differences were statistically significant, effect sizes were generally small, indicating limited practical implications. Results supporting these findings are detailed in Tables 3 and 4.

Table 3. SUDQ total scores for different levels of sex

	Country	Value	n	mean	sd	t	P-value
F1: Clinical practice use	PT	Female	458	3.15	0.87	0.676	0.502
		Male	80	3.23	0.92		
	SP	Female	388	2.01	0.77	2.372	0.018*
		Male	91	2.00	0.82		
F2: Regulatory policy	PT	Female	458	2.46	0.47	1.317	0.188
		Male	80	2.56	0.55		
	SP	Female	387	2.71	0.89	1.063	0.288
		Male	91	2.57	0.83		
F3: Unprofessional personal use	PT	Female	458	4.59	0.63	0.587	0.557
		Male	80	4.62	0.69		
	SP	Female	388	4.63	0.85	1.281	0.201
		Male	91	4.57	0.89		
F4: Observed unprofessional use	PT	Female	458	3.31	0.73	0.579	0.563
		Male	80	3.28	0.70		
	SP	Female	388	3.57	0.76	1.117	0.264
		Male	91	3.68	0.76		
F5: Distraction	PT	Female	458	4.52	0.45	3.934	<.001*
		Male	80	4.45	0.42		
	SP	Female	388	4.50	0.76	0.305	0.760
		Male	91	4.48	0.70		
F6: Ethics	PT	Female	458	3.68	0.58	0.287	0.774
		Male	80	3.69	0.46		
	SP	Female	386	3.52	0.85	0.424	0.155
		Male	90	3.55	0.89		

* Indicates statistically significant difference

Reliability

Cronbach's alpha coefficients for the total instrument were 0.717 (Portugal) and 0.740 (Spain), indicating acceptable internal consistency. Factor-specific alpha values ranged from 0.502 to 0.814. Some factors, such as Ethics and Unprofessional Personal Use, showed lower alpha values, suggesting a need for refinement. Nevertheless, item-total correlations were strong, supporting the coherence of items within their respective factors. Details are provided in Table 5.

Table 4. SUDQ total scores for different levels of age

	Country	Value	N	Mean	SD	T	P-value
F1: Clinical Practice Use	PT	≤ 25	496	3.18	0.86	0.788	0.431
		> 25	47	3.08	1.03		
	SP	≤ 25	441	1.98	0.71	2.372	0.018*
		> 25	34	2.29	0.84		
F2: Regulatory Policy	PT	≤ 25	496	2.47	0.77	1.317	0.188
		> 25	47	2.62	0.83		
	SP	≤ 25	440	2.67	0.75	1.063	0.288
		> 25	34	2.82	0.90		
F3: Unprofessional Personal Use	PT	≤ 25	496	4.59	0.51	0.587	0.557
		> 25	47	4.63	0.39		
	SP	≤ 25	441	4.61	0.44	1.281	0.201
		> 25	34	4.71	0.54		
F4: Observed Unprofessional Use	PT	≤ 25	496	3.31	0.88	0.579	0.563
		> 25	47	3.23	1.00		
	SP	≤ 25	441	3.60	0.74	1.117	0.264
		> 25	34	3.45	0.81		
F5: Distraction	PT	≤ 25	496	4.49	0.65	3.934	<0.001*
		> 25	47	4.74	0.39		
	SP	≤ 25	441	4.49	0.57	0.305	0.760
		> 25	34	4.46	0.44		
F6: Ethics	PT	≤ 25	496	3.68	0.84	0.287	0.774
		> 25	47	3.72	0.99		
	SP	≤ 25	438	3.51	0.86	1.424	0.155
		> 25	34	3.73	0.80		

* Indicates statistically significant difference

Table 5. Mean and standard deviation for each factor score for Portugal and Spain

Factor	# of items	Portugal		Spain	
		Cronbach's α	Item-Total	Cronbach's α	Item-Total
F1: Clinical Practice Use	7	0.814	0.647 to 0.783	0.866	0.628 to 0.807
F2: Regulatory Policy	5	0.671	0.813 to 0.855	0.705	0.825 to 0.878
F3: Unprofessional Personal Use	4	0.586	-0.746 to -0.558	0.643	-0.776 to -0.623
F4: Observed Unprofessional Use	4	0.774	-0.822 to -0.730	0.693	-0.750 to -0.692
F5: Students' Distraction	3	0.679	-0.810 to -0.757	0.677	-0.835 to -0.734
F6: Ethics	3	0.502	0.505 to 0.795	0.529	0.548 to 0.810

Discussion

The present validation of the SUDQ-PT in Portuguese and the SUDQ-SP offers a structured approach to understanding patterns of smartphone use and distraction in nursing education and clinical training. The results support the structural validity and internal consistency of the instrument, suggesting its capacity to assess behavioral patterns related to smartphone use among nursing students across diverse cultural settings.

Our findings are consistent with established recommendations for psychometric validation, which emphasize a stepwise approach including linguistic adaptation, construct validity testing, and reliability assessment (27,31). In line with this framework, the cultural adaptation phase confirmed conceptual equivalence between the Spanish and Portuguese versions,

similar to other cross-cultural adaptations of educational instruments in nursing (32). Regarding construct validity, the six-factor structure identified in both samples parallels findings from validation studies of smartphone addiction and nomophobia questionnaires in university populations, which also reported multidimensional structures (19, 20). Finally, the internal consistency values observed in our study fall within the acceptable range commonly reported in psychometric research, further supporting the reliability of the instrument across cultural contexts.

The consistent identification of six factors across both language groups suggests the SUDQ-PT and SUDQ-SP capture dimensions of smartphone use that are relevant in both Portuguese and Spanish nursing education contexts. Such dimensions are relevant within health education, where contextual and cultural factors influence how students engage with mobile technologies during clinical placements (23). The identified structure reflects various facets of smartphone use within healthcare education, encompassing both beneficial and potentially disruptive aspects. This is consistent with previous findings that describe smartphones as serving instructional and distracting roles (4,15). These results may also be situated within broader pedagogical approaches in health professions education that emphasize experiential and interactive learning formats. For example, tools such as educational escape rooms are under review for their applicability in developing student engagement, teamwork, and problem-solving skills in clinical education settings (33).

The internal consistency of the instrument falls within acceptable ranges for use in educational research (27). While two subscales showed comparatively lower reliability, item-total correlations remained robust. The analysis of item variability suggests that perceptions of smartphone-induced distraction are relatively consistent among respondents. This is consistent with other research noting the effects of device presence on attention and cognitive performance (15,16). The SUDQ-PT and the SUDQ-SP may also serve as a resource for identifying behaviors in clinical learning environments that could impact patient care. Previous research has linked device-related distraction to safety risks such as medication errors (16,17). Capturing both self-perceived and observed smartphone behaviors could assist in developing educational content and policies that address these concerns more systematically.

In the educational domain, the instrument may be used to support efforts aimed at defining appropriate and ethical use of technology in clinical education. Prior studies have indicated that students frequently use smartphones for non-professional activities during training (7), underlining the importance of guidance on responsible use. Although the Ethics dimension requires further development, it may provide a starting point for such initiatives.

Moreover, the cross-cultural validation of the SUDQ-PT and SUDQ-SP reinforces its relevance for culturally congruent nursing education. By capturing culturally influenced behaviors, the instrument enables educators to design interventions that respect local values while promoting global standards. These insights align with Leininger's model of culturally congruent care, which emphasizes the need to tailor educational strategies to the cultural realities of learners. As nursing education becomes increasingly diverse and transnational, the SUDQ-PT and the SUDQ-SP may serve as a practical tool for supporting culturally competent digital professionalism across clinical training environments.

These findings strengthen the value of the SUDQ as a comprehensive, multidimensional tool for nursing education, offering broader coverage than existing instruments such as the Smartphone Distraction Scale (18) or questionnaires focused narrowly on distraction or restriction policies (21).

Conducting the validation in two countries with shared linguistic and cultural ties broadens the potential for the SUDQ-PT and the SUDQ-SP to be applied in comparable settings. Observed differences between groups highlight the relevance of tailoring strategies to specific educational contexts. The availability of comparable data may also facilitate future collaborative efforts aimed at exploring the role

of mobile technologies in health professions education internationally.

Validation in Portugal and Spain strengthens external validity, offering a standardized tool to assess smartphone-related behaviors in nursing education and highlighting cross-country differences in distraction, use, and policy. These differences underscore the importance of context-specific educational strategies and highlight the value of culturally sensitive assessment tools (1). This broader relevance may support adaptation and future use in fields such as medicine, allied health, or midwifery education. The cross-national approach taken here may serve as a preliminary step toward international benchmarking efforts, which could enable comparisons across countries and educational systems. In a globalized healthcare landscape, where students and professionals increasingly engage in cross-border mobility, having tools that facilitate such comparisons can inform the development of training frameworks that are both adaptable and attentive to patient safety priorities.

This study has limitations that warrant consideration. The use of convenience sampling, while practical, may introduce selection bias and limit generalizability. The cross-sectional design provides only a single-time snapshot and does not capture potential changes in behavior over time. Convergent and discriminant validity were not assessed, and test–retest reliability using intraclass correlation coefficients was not conducted. Some subscales exhibited lower internal consistency, which suggests a need for item refinement and further psychometric evaluation, such as confirmatory factor analysis. Further research could explore how the SUDQ-PT and the SUDQ-SP relate to objective indicators, including academic performance, clinical error rates, or evaluations conducted by supervisors, as a means of examining their criterion validity. Establishing such associations would help clarify whether the patterns of smartphone use and distraction measured by the instrument correspond with measurable educational or clinical outcomes. In addition, the use of qualitative methodologies may provide deeper insight into the subjective and contextual dimensions of smartphone use in training environments. These approaches can help capture the nuanced experiences of students and educators, including attitudes, perceived benefits, and challenges associated with mobile technology. Insights derived from qualitative data may be especially helpful in informing the design of interventions that are both relevant to learners' needs and feasible within the constraints of educational and clinical settings.

Conclusion

This study validated the SUDQ-PT and the SUDQ-SP, confirming their structural validity and internal consistency among nursing students. The instrument demonstrated robust psychometric properties, with consistent factor structures across both versions and acceptable reliability indices.

Beyond its immediate application in nursing education, the SUDQ-PT and the SUDQ-SP demonstrate robust psychometric performance across two distinct linguistic and cultural settings. This cross-cultural validation supports its adaptability for other health professions, such as medicine, physiotherapy, and allied health disciplines, and also for use in a wide range of countries and cultural contexts. By capturing multiple dimensions of smartphone use and distraction, the instrument can inform evidence-based policies and targeted interventions that promote digital professionalism and reduce distraction-related risks in diverse clinical learning environments. Its demonstrated reliability in culturally different contexts increases confidence in its transferability to educational systems worldwide, facilitating meaningful comparisons across regions and supporting culturally responsive educational strategies.

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Conflict of interest

The authors declare no financial or non-financial interests, either directly or indirectly related to this work, to disclose.

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