

Development, Validity and Reliability of the School Nurse Assessment of Practice (SNAP) Instrument: A Cross-Sectional Study in Greece

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Research Article

Keywords: School nursing, professional practice, instrument development, health promotion

Posted Date: September 17th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10537868/v1>

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Additional Declarations: No competing interests reported.

Abstract

Background.

School nursing practice is widely recognised as an essential component of primary and secondary public education. However, no validated instrument currently exists to evaluate school nursing practice in terms of responsibilities, duties, and health promotion proficiencies. This study aimed to develop and assess the validity and reliability of the School Nurse Assessment of Practice (SNAP) instrument.

Methods.

A cross-sectional study was conducted during the 2022–2023 school year using a convenience sample of 189 registered school nurses in Greece. Instrument development was based on school nursing core competencies, derived from the Greek Gov. Gazette Issue 2038/B'/2018. Content validity was established through expert review, and a pilot study ($n = 45$) was conducted to assess clarity and feasibility. Structural validity was examined using Exploratory Factor Analysis (EFA) with principal component extraction and Varimax rotation. The Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity were also applied. Internal consistency was assessed using Cronbach's alpha coefficients.

Results.

The SNAP instrument consisted of 40 items divided into two subscales. EFA supported a four-factor structure for Subscale 1 (practice performance), explaining 57.3% of the total variance ($KMO = 0.87$; Bartlett's test $p < .001$). The identified factors were: responsibilities for general duties ($M = 8.02$), responsibilities for updating the school environment on health and protection issues ($M = 7.08$), collaboration with medical staff ($M = 5.57$), and administrative duties ($M = 7.50$). Internal consistency coefficients for the four factors of Subscale 1 ranged from 0.79 to 0.94. Subscale 2 assessed collaboration with teachers and school leadership and demonstrated a single-factor structure ($KMO = 0.81$; Bartlett's test $p < .001$). The mean score for Subscale 2 was 3.29, and Cronbach's alpha for the initial three-item scale was 0.67.

Conclusions.

The SNAP instrument showed satisfactory validity and reliability among Greek school nurses for school nursing practice evaluation. It provides a valuable resource for identifying self-assessment, professional development and service evaluation.

1. Background

School nursing is a specialised field of practice positioned at the intersection of health and education. Internationally, school nurses provide school-based primary care, manage acute and chronic health conditions, coordinate individualised healthcare plans, and ensure continuity of care between families, schools, and community health services [1]. In addition, they contribute to health promotion, disease prevention, screening programmes, and emergency preparedness within school settings [2]. Evidence indicates that school nursing services are associated with improved student attendance, academic outcomes, and more equitable access to healthcare [3].

Importantly, students frequently experience health-related and educational challenges requiring coordinated professional support. It has been demonstrated that chronic physical conditions, acute health incidents during school hours, mental health difficulties, psychosocial stressors, and learning-related barriers may adversely affect participation, well-being, and academic performance [4]. In addition, increasing student diversity and the expansion of inclusive education have further intensified the need for accessible and continuous health support within schools [5]. Accordingly, school nurses play a critical role in supporting student well-being and maintaining safe school environments.

Most importantly, contemporary conceptual frameworks describe school nursing as a multidimensional practice encompassing clinical care, health promotion, care coordination, interprofessional collaboration, and organisational responsibilities [6]. Thus, effective school nursing practice requires not only clinical competence but also the consistent implementation of professional responsibilities in collaboration with teachers, school administrators, families, and community services [7,5]. Besides, as evidence of a recent systematic review, further emphasises the contribution of school nurses to prevention and health promotion interventions, including health education, counselling, and screening activities [8]. However, several aspects of school nursing practice remain context-dependent, contributing to variability in role implementation across settings [9]. These challenges highlight the need for clearly defined professional standards and measurable indicators of practice implementation. Existing evidence also highlights challenges related to interprofessional communication, role ambiguity, and coordination between school-based and external healthcare services, which may hinder consistent role implementation across educational settings [10].

Despite the recognised importance of school nursing services, systematic tools for assessing the self-reported implementation of professional responsibilities remain limited. Existing instruments primarily assess perceived competence, knowledge, attitudes, or scope of practice rather than the implementation of professional responsibilities in routine school settings [11]. For example, the Scope of School Nursing Practice Tool evaluates perceived scope rather than enactment of professional responsibilities [12], while competency-based frameworks focus primarily on self-perceived preparedness rather than day-to-day practice implementation [13]. Additionally, qualitative evidence highlights role ambiguity and organisational barriers that may hinder consistent implementation of school nursing responsibilities across educational settings [14,15]. Hence, the development of a self-reported instrument assessing the professional responsibilities through measurable professional behaviours will highlight the importance of role clarification, workforce evaluation, and quality improvement in school health services [16].

In Greece, school nursing practice has been explored mainly in relation to the multidimensional role of school nurses within the educational system [17] and on the challenges and barriers to the school inclusion of students with chronic health conditions [18], yet the evaluation of school nursing practice in terms of responsibilities and duties remains underexplored. In addition, to the best of our knowledge, there are no competence-related tools available to assess the efficiency of supportive school nurses' roles in their daily practice. Given that school nurses were formally reintroduced into public primary and secondary education in 2018, they would benefit from information regarding the evaluation of school nursing practice and academic performance, and to further comprehend whether school nurses might benefit from coordinated professional support. Within a framework, the development of an appropriate instrument will help in developing targeted interventions to enhance students' safety and academic success by bridging healthcare and education learning outcomes and ensuring health promotion.

This study was aimed, therefore, to develop and validate an instrument in Greece to measure school nursing practice, aligned with the Greek governmental legal framework.

2. Study design

This study followed a cross-sectional design.

2.1 Instrument development

The SNAP instrument was developed based on systematic mapping of statutory duties of school nurses defined in Gov. Gazette 2038/B'/2018 [19]. The initial item pool consisted of 55 items reflecting observable professional practice behaviours. The development process incorporated expert review, pilot testing, and statistical evaluation of structural validity and internal consistency reliability. The SNAP instrument was developed specifically for the present study and has not been previously published. An English-language version of the final instrument is provided as Supplementary File 1 (S1).

Among the practice-related items, 37 were rated using an 11-point Likert-type scale ranging from 0 ("not at all") to 10 ("to a very great extent"). Three additional items assessed perceived collaboration using a four-point ordinal response scale ("Poor", "Fair", "Good", "Excellent"). Given the small number of items and distinct response scaling, findings related to the collaboration subscale should be interpreted cautiously. The process of operationalising legislative duties into measurable behavioural indicators, including item refinement procedures, is presented in Fig. 1 (graphical abstract).

2.2 Content validity

Content relevance, clarity, and comprehensiveness were evaluated by a three-member expert panel (academic expert in nursing research and psychometrics, experienced school nurse, and a school principal). All panel members had more than five years of professional experience and held postgraduate qualifications relevant to their field. Feedback from the panel resulted in minor linguistic and conceptual revisions to improve item clarity and alignment with school nursing practice. Although the expert review

process supported the relevance and clarity of the items, formal content validity indices were not estimated and should be examined in future validation studies. In addition, pilot testing was conducted with 45 school nurses to evaluate clarity, comprehensibility and feasibility. Internal consistency reliability was high for the implementation subscale ($\alpha = 0.987$) and acceptable for the collaboration subscale ($\alpha = 0.766$), potentially reflecting overlap among conceptually related items during preliminary testing. Minor wording revisions were made prior to full data collection.

2.3 Exploratory Factor Analysis (EFA)

Structural validity was assessed using Exploratory Factor Analysis (EFA) with principal component extraction and Varimax rotation. Following established recommendations for scale development, EFA was performed to examine whether the 40 SNAP items clustered into distinct dimensions reflecting the core domains of school nursing practice and to identify the underlying factor structure of the instrument [20,21].

2.4 Participants and sampling

Eligible participants were registered nurses employed as school nurses in primary and secondary education across Greece. Inclusion criteria required at least one year of professional experience in school nursing practice. Nurses on long-term leave or not actively employed during the data collection period were excluded.

A non-probability convenience sampling strategy was used due to feasibility constraints and COVID-19-related restrictions affecting face-to-face recruitment procedures. Participants were recruited through a professionally verified online network of Greek school nurses. This approach facilitated access to a geographically dispersed professional population while ensuring participant eligibility during the pandemic period. A minimum sample size of 125 participants was estimated using G*Power. The final sample consisted of 189 school nurses recruited from diverse geographical regions and educational settings across Greece, exceeding recommended thresholds for exploratory factor analysis.

2.5 Data collection procedures

Data collection was conducted during the 2022–2023 school year using an online Google Forms questionnaire due to COVID-19-related restrictions on in-person data collection. The questionnaire link was distributed through the closed professional online network described above. Participation was voluntary and anonymous. Before questionnaire completion, participants received information regarding the study objectives, procedures, confidentiality measures, and their right to withdraw at any stage without consequences. No personally identifiable information was collected.

2.6 Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki and complied with the General Data Protection Regulation (GDPR). Ethical approval was obtained from the Ethics and Deontology Committee of the University of Patras (IRB Protocol No. 12654/23-1-2022).

Electronic informed consent was obtained from all participants prior to participation. Anonymity and confidentiality were maintained throughout all stages of the study. The study additionally adhered to the ethical principles outlined in the ICN Code of Ethics for Nurses [22].

2.7 Statistical analysis

Sampling adequacy was assessed using the Kaiser–Meyer–Olkin (KMO) measure and Bartlett’s test of sphericity. Factors with eigenvalues > 1.0 were retained, and factor loadings ≥ 0.40 were considered meaningful.

Internal consistency reliability was assessed using Cronbach’s alpha for each factor and for the total instrument. Corrected item–total correlations and alpha-if-item-deleted statistics were examined to identify items with weak contribution to subscale consistency. Associations between subscale scores and demographic or professional variables were analysed using Pearson or Spearman correlation coefficients, as appropriate. Linear regression analyses were conducted to explore factors associated with practice performance and collaboration. All analyses were performed using IBM SPSS Statistics version 28.

3 Results

3.1 Participant Characteristics

The demographic and professional characteristics of the participants are presented in Table 1. Most participants were female (83.6%), worked in primary schools (65.1%), held a Master's degree (60.8%), and were employed on a contract basis (91.0%). Participants had a mean age of 34.44 years (SD = 6.95), a mean school nursing experience of 4.41 years (SD = 3.29), and worked an average of 25.19 hours per week (SD = 6.23).

Table 1
Sample Characteristics (N = 189)

Characteristic	Categories	<i>n</i>	%
Gender	Male	31	16.4
	Female	158	83.6
School level	Preschool	25	13.2
	Primary	123	65.1
	Secondary	41	21.7
Degree	Bachelor	60	31.8
	MSc	115	60.8
	PhD	14	7.4
Employment	Contract employee	172	91.0
	Permanent	17	9.0
Age (years)	M = 34.44, SD = 6.95	24–58	
Working experience as school nurse (years)	M = 4.41, SD = 3.29	1–25	
Working hours (weekly)	M = 25.19, SD = 6.23	18–32	
Note. <i>n</i> = number of participants in each category; %=percentage; M = mean; SD = standard deviation.			

3.2 Descriptive Statistics of the SNAP Instrument

Participants' responses across the SNAP items and subscales are presented in Table 2. Among the four factors of Subscale 1 (practice performance), the highest mean score was observed for responsibilities for general duties (M = 8.02, SD = 1.29), whereas the lowest mean score was observed for collaboration with medical staff (M = 5.57, SD = 3.37). The mean scores for administrative duties and responsibilities for updating the school environment on health and protection issues were 7.50 (SD = 2.00) and 7.08 (SD = 1.96), respectively. For Subscale 2, participants reported a mean perceived collaboration score of 3.29 (SD = 0.60) on the 4-point ordinal scale.

Table 2

Distribution of Participants' Responses Across Items and Subscales (N = 189)

Subscale 1. Practice performance (0–10 Likert scale, percentages of participants per response).

Item	0	1	2	3	4	5	6	7	8	9	10	M
<i>Factor 1. Responsibilities for general duties</i>												
Item 1	2.1	1.1	0.5	0.5	1.1	4.3	5.3	7.9	19.6	20.6	37.0	8.29
Item 2	0.5	1.1	0.0	1.1	0.0	2.1	0.0	9.5	14.8	16.4	54.5	8.93
Item 3	36.1	6.9	7.4	4.2	7.4	7.4	4.2	5.8	11.1	6.3	3.2	3.45
Item 4	0.5	1.6	0.0	0.5	2.6	2.6	4.8	9.0	25.4	18.0	35.0	8.33
Item 5	0.5	1.6	0.5	0.0	1.2	2.6	4.2	10.1	15.3	18.5	45.5	8.60
Item 8	15.9	2.6	1.6	5.3	3.7	9.0	6.9	6.3	13.8	18.0	16.9	6.08
Item 9	1.1	2.1	0.5	0.5	4.2	7.4	2.6	12.2	22.2	16.4	30.8	8.42
Item 14	1.1	3.5	0.0	0.0	1.1	4.2	2.1	6.5	19.7	19.0	42.8	7.92
Item 15	2.6	1.1	1.6	0.5	0.0	3.2	3.7	4.8	15.9	12.6	54.0	8.58
Item 16	3.2	2.1	1.6	0.5	1.6	2.1	3.7	6.3	14.4	15.3	49.2	8.35
Item 19	2.6	0.0	0.5	2.6	0.5	5.3	4.2	9.7	24.9	19.0	30.7	8.07
Item 20	3.2	1.1	1.6	1.1	1.6	4.8	3.2	10.6	24.3	19.0	29.5	7.93
Item 25	3.2	0.0	0.0	2.1	1.1	0.5	3.2	5.3	21.7	14.8	48.1	8.58
Item 26	1.6	0.0	0.5	4.2	1.6	3.7	5.3	5.3	23.3	21.7	32.8	8.17
Item 28	0.5	0.0	0.5	0.0	1.6	1.6	1.1	2.6	12.2	6.4	73.5	9.30
Item 29	0.5	0.0	0.5	0.0	1.6	0.0	0.0	5.8	13.8	6.3	71.5	9.30
<i>Factor 2. Responsibilities for updating the school environment on health and protection issues</i>												
Item 10	2.1	3.2	2.1	2.1	3.2	14.3	6.9	11.6	23.3	16.9	14.3	7.02
Item 11	2.6	2.1	2.6	1.6	5.3	5.3	5.8	11.6	27.5	14.3	21.3	7.37
Item 12	2.6	0.5	1.1	1.6	3.2	7.4	8.5	11.6	26.5	12.7	24.3	7.59
Item 13	6.3	2.1	2.1	3.7	4.2	10.1	9.5	9.5	26.5	9.5	16.5	6.70
Item 17	1.6	0.0	1.1	2.1	1.1	4.2	5.8	9.0	21.7	15.9	37.5	8.24
Item 30	3.2	1.1	1.6	1.6	2.6	7.4	7.4	13.2	23.3	13.2	25.4	7.53
Item 31	5.3	1.6	3.9	2.6	2.6	10.6	5.8	13.2	28.0	9.5	16.9	6.87
Item 32	11.1	4.8	7.9	3.2	4.8	7.9	5.3	11.6	21.7	7.4	14.3	5.85
Item 33	3.2	2.6	4.2	0.5	1.6	7.9	9.5	12.2	28.0	14.4	15.9	7.13
Item 34	7.9	4.8	4.2	2.6	2.1	8.5	6.3	7.4	26.5	11.2	18.5	6.59

Item	0	1	2	3	4	5	6	7	8	9	10	M
Item 35	10.6	1.1	5.3	3.2	3.7	8.5	1.6	9.5	21.7	13.2	21.6	6.64
Item 36	6.3	2.1	1.1	1.1	3.7	13.2	10.1	15.8	21.2	10.6	14.8	6.72
Item 37	2.1	1.1	0.5	3.2	0.5	6.9	4.8	10.6	29.1	18.0	23.2	7.78
<i>Factor 3. Collaboration with medical staff</i>												
Item 6	15.3	2.6	5.8	4.2	4.2	10.6	4.2	10.6	15.5	8.0	19.0	5.81
Item 7	24.3	4.2	6.3	0.5	1.6	11.6	4.9	9.5	13.8	5.3	18.0	5.16
Item 18	14.8	3.7	4.2	5.8	2.1	12.8	3.7	10.6	16.9	13.2	12.2	5.74
<i>Factor 4. Administrative duties</i>												
Item 21	3.2	2.1	1.1	0.5	5.3	4.8	2.6	4.2	22.8	13.8	39.6	7.99
Item 22	2.1	3.2	1.1	0.5	1.6	1.1	2.6	10.6	15.9	15.9	45.4	8.33
Item 23	6.3	4.2	1.1	2.6	2.1	3.7	6.9	11.2	21.7	9.5	30.7	7.26
Item 24	3.2	2.6	2.6	4.8	2.1	6.9	3.2	16.9	21.7	15.4	20.6	7.21
Item 27	0.0	8.5	3.7	6.9	5.3	9.5	3.2	11.1	17.4	14.3	20.1	6.71

Subscale 2. Collaboration between the school nurse and teachers, parents, and school leadership (4-point ordinal scale, percentages of participants).

Item	Poor	Fair	Good	Excellent
Item 38	0.5	7.9	49.3	42.3
Item 39	1.0	10.1	45.0	43.9
Item 40	0.5	11.1	50.3	38.1

Note. Values represent percentages of participants per response category. M = mean. Subscale 1 was rated on an 11-point Likert scale (0–10); Subscale 2 was rated on a 4-point ordinal scale (Poor, Fair, Good, Excellent).

3.3 Structural Validity

The suitability of the data for Exploratory Factor Analysis (EFA) was confirmed by the Kaiser–Meyer–Olkin (KMO) measure and Bartlett’s test of sphericity (Table 3). For Subscale 1, the KMO value was 0.87, and Bartlett’s test was significant ($\chi^2 = 5469.45$, $df = 666$, $p < .001$), indicating adequate sampling adequacy and factorability of the correlation matrix. For Subscale 2, the KMO value was 0.81, with a significant Bartlett’s test ($\chi^2 = 571.62$, $df = 1$, $p < .001$).

Table 3
Kaiser–Meyer–Olkin Measure and Bartlett’s Test of Sphericity for the SNAP Subscales

Subscale	KMO measure	χ^2	df	p
Subscale 1	0.87	5469.45	666	< .001
Subscale 2	0.81	571.62	1	< .001
Note. KMO = Kaiser–Meyer–Olkin measure of sampling adequacy; χ^2 = Bartlett’s test of sphericity; df = degrees of freedom.				

The EFA with principal component extraction and Varimax rotation identified a four-factor structure for Subscale 1, explaining 57.3% of the total variance (Table 4). The identified factors were: (a) responsibilities for general duties, (b) responsibilities for updating the school environment on health and protection issues, (c) collaboration with medical staff, and (d) administrative duties. Factor loadings ranged from 0.432 to 0.922, with communalities ranging from 0.289 to 0.867. For Subscale 2, EFA resulted in a single-factor structure consisting of two items (Items 39 and 40), with factor loadings of 0.89 and communalities of 0.78.

Table 4

Factor Loadings and Communalities of the SNAP Instrument Based on Exploratory Factor Analysis

Subscale 1.

Item	Factor 1	Factor 2	Factor 3	Factor 4	h^2
Item 1	0.602				0.450
Item 2	0.665				0.450
Item 3	-0.511				0.461
Item 4	0.733				0.571
Item 5	0.746				0.578
Item 6			0.896		0.816
Item 7			0.922		0.867
Item 8	0.451				0.423
Item 9	0.492				0.462
Item 10		0.645			0.637
Item 11		0.544			0.567
Item 12		0.433			0.571
Item 13		0.674			0.648
Item 14	0.484				0.341
Item 15	0.520				0.475
Item 16	0.432				0.434
Item 17		0.538			0.440
Item 18			0.869		0.832
Item 19	0.480				0.458
Item 20	0.506				0.484
Item 21				0.883	0.800
Item 22				0.838	0.760
Item 23				0.870	0.795
Item 24				0.520	0.505
Item 25	0.450				0.397
Item 26	0.435				0.530
Item 27				0.535	0.289
Item 28	0.787				0.807

Item	Factor 1	Factor 2	Factor 3	Factor 4	h^2
Item 29	0.831				0.820
Item 30		0.716			0.665
Item 31		0.603			0.574
Item 32		0.599			0.528
Item 33		0.683			0.654
Item 34		0.556			0.453
Item 35		0.512			0.485
Item 36		0.619			0.568
Item 37		0.575			0.605

Subscale 2.

Item	Factor 1. Collaboration with teachers and school principal	h^2
Item 39	0.89	0.78
Item 40	0.89	0.78

Note. h^2 = communalities. Loadings < .40 are not displayed.

3.4 Internal Consistency Reliability of the SNAP Instrument

The internal consistency reliability of the SNAP instrument is presented in Table 5. For Subscale 1 (practice performance), Cronbach's α coefficients were 0.86 for responsibilities for general duties, 0.93 for responsibilities for updating the school environment on health and protection issues, 0.94 for collaboration with medical staff, and 0.79 for administrative duties. The corrected item-total correlations for the items included in Subscale 1 ranged from 0.414 to 0.889. For Subscale 2 (perceived collaboration), Cronbach's α was 0.67 for the initial three-item scale and increased to 0.75 after the removal of Item 38. The final version of Subscale 2 consisted of two items assessing collaboration with teachers and school leadership, with corrected item-total correlations ranging from 0.631 to 0.661.

Table 5
Internal Consistency Reliability of the SNAP Instrument

Scale / Item	M (SD)	Range	α	ITC	α if deleted
<i>Scale 1. Practice performance (0–10 Likert)</i>					
Responsibilities for general duties (M = 8.02, SD = 1.29; range 0–10)			0.86		
Item 1	8.29 (2.16)	0–10		0.565	0.842
Item 2	8.93 (1.71)	0–10		0.500	0.847
Item 3	3.45 (3.43)	0–10		0.219	0.882
Item 4	8.33 (1.92)	0–10		0.608	0.841
Item 5	8.60 (1.91)	0–10		0.561	0.843
Item 8	6.08 (3.51)	0–10		0.414	0.855
Item 9	7.92 (2.24)	0–10		0.550	0.843
Item 14	8.42 (2.22)	0–10		0.476	0.847
Item 15	8.58 (2.32)	0–10		0.532	0.844
Item 16	8.35 (2.54)	0–10		0.488	0.846
Item 19	8.07 (2.19)	0–10		0.581	0.842
Item 20	7.93 (2.39)	0–10		0.628	0.839
Item 25	8.58 (2.17)	0–10		0.538	0.844
Item 26	8.17 (2.15)	0–10		0.612	0.840
<i>Note.</i> M = mean; SD = standard deviation; α = Cronbach's alpha; ITC = corrected item-total correlation. Item 38 was removed from the final version of Subscale 2 because its deletion improved internal consistency.					

Scale / Item	M (SD)	Range	α	ITC	α if deleted
Item 28	9.30 (1.52)	0–10		0.613	0.843
Item 29	9.30 (1.45)	0–10		0.615	0.844
Updating school environment on health/protection issues (M = 7.08, SD = 1.96; range 0–10)			0.93		
Item 10	7.02 (2.49)	0–10		0.758	0.918
Item 11	7.37 (2.52)	0–10		0.694	0.920
Item 12	7.59 (2.31)	0–10		0.670	0.921
Item 13	6.70 (2.82)	0–10		0.772	0.917
Item 17	8.24 (2.10)	0–10		0.465	0.927
Item 30	7.53 (2.45)	0–10		0.740	0.919
Item 31	6.87 (2.73)	0–10		0.707	0.920
Item 32	5.85 (3.31)	0–10		0.669	0.922
Item 33	7.13 (2.55)	0–10		0.736	0.919
Item 34	6.59 (3.15)	0–10		0.609	0.924
Item 35	6.64 (3.27)	0–10		0.631	0.923
Item 36	6.72 (2.68)	0–10		0.682	0.921
Item 37	7.78 (2.22)	0–10		0.724	0.920
Collaboration with medical staff (M = 5.57, SD = 3.37; range 0–10)			0.94		
Note. M = mean; SD = standard deviation; α = Cronbach's alpha; ITC = corrected item-total correlation. Item 38 was removed from the final version of Subscale 2 because its deletion improved internal consistency.					

Scale / Item	M (SD)	Range	α	ITC	α if deleted
Item 6	5.81 (3.50)	0–10		0.889	0.900
Item 7	5.16 (3.80)	0–10		0.878	0.911
Item 18	5.74 (3.40)	0–10		0.861	0.923
Administrative duties (M = 7.50, SD = 2.00; range 0.20–10)			0.79		
Item 21	7.99 (2.60)	0–10		0.662	0.713
Item 22	8.33 (2.43)	0–10		0.601	0.735
Item 23	7.26 (3.01)	0–10		0.724	0.684
Item 24	7.21 (2.67)	0–10		0.669	0.709
Item 27	6.71 (2.91)	0–10		0.426	0.853
<i>Scale 2. Perceived collaboration (4-point ordinal)</i>					
Collaboration with teachers, parents, and school leadership (M = 3.29, SD = 0.60; range 1–4)			0.67		
Item 38	3.33 (0.64)	1–4		0.323	0.751
Item 39	3.32 (0.70)	1–4		0.661	0.452
Item 40	3.26 (0.67)	1–4		0.631	0.498
<i>Note.</i> M = mean; SD = standard deviation; α = Cronbach's alpha; ITC = corrected item-total correlation. Item 38 was removed from the final version of Subscale 2 because its deletion improved internal consistency.					

4 Discussion

The present study developed and evaluated the SNAP instrument, providing evidence regarding its structural validity and internal consistency among school nurses in Greece. Exploratory factor analysis supported a four-factor structure for the practice performance subscale, explaining 57.3% of the total variance, with the identified factors representing core domains of school nursing practice. The

instrument demonstrated strong internal consistency, with Cronbach's alpha coefficients ranging from 0.79 to 0.94 across the four practice domains. Descriptive findings indicated variation across domains of practice, with general professional responsibilities receiving higher scores, whereas collaboration with medical staff represented a comparatively lower-scoring area. In addition, the collaboration subscale highlighted the interdisciplinary nature of school nursing practice through interactions with teachers and school leadership.

Overall, these findings support the multidimensional structure of the SNAP instrument and indicate conceptual alignment with legislatively defined school nursing responsibilities and contemporary school nursing frameworks [6,7]. The SNAP may therefore provide a structured framework for assessing school nursing practice, identifying professional development needs, and supporting the evaluation of school health services.

The development process strengthened the conceptual coherence and content relevance of the instrument. Unlike existing instruments that primarily assess perceived competence, role perception, or scope of practice [10–12], the SNAP instrument was designed to assess self-reported implementation of legislatively defined professional responsibilities through observable practice indicators within routine school settings, addressing a gap in school nursing measurement research [7].

Descriptive findings indicated relatively high levels of self-reported implementation of general and administrative responsibilities, moderate engagement in health promotion activities, and comparatively lower levels of collaboration with external healthcare professionals. These findings align with international evidence indicating that school nurses frequently prioritise direct student care and immediate school-based responsibilities, whereas interprofessional collaboration with external services remains more limited [23,9,13]. Previous studies have similarly reported that implementation of health promotion and prevention activities may be constrained by organisational barriers, limited resources, and insufficient integration between educational and healthcare systems [8].

The comparatively lower scores observed for collaboration with healthcare professionals are particularly noteworthy. Existing qualitative evidence suggests that school nurses often experience fragmented communication pathways with primary care and specialist services despite their central role in coordinating care for students with chronic or complex health needs [14,15,18]. Within the Greek educational context, the absence of formalised collaboration mechanisms between schools and external healthcare services may further contribute to these challenges, particularly in settings where school nurses function as the sole healthcare professionals within the school environment. It is worth noting that the collaboration subscale was retained because collaboration constitutes a theoretically important dimension of school nursing practice; however, further refinement and validation are required.

Differences associated with educational level and professional experience were additionally observed. School nurses with postgraduate education and greater professional experience reported higher levels of engagement in professional responsibilities, collaboration activities, and health promotion practices. These findings are consistent with previous literature linking advanced education and continuing

professional development with enhanced leadership capacity, evidence-based practice, and expanded professional engagement in school nursing [12,16]. Recent reviews have also highlighted mental health support as an increasingly important dimension of school nursing practice requiring additional training and structured organisational support [24]. Together, these findings suggest that targeted continuing education and professional development initiatives may strengthen school nurses' implementation of collaborative and health promotion activities [25].

The development of a legislation-based instrument may have particular relevance for countries in which school nursing responsibilities are formally regulated through national policy frameworks. In the Greek context, where validated assessment tools for school nursing practice have been lacking, the SNAP instrument may support role clarification, quality improvement initiatives, workforce evaluation, and evidence-informed planning of school health services. Recent evidence also highlights variability in school nursing working conditions and organisational constraints affecting role implementation [26].

- Future implications

The SNAP instrument may have practical implications for school nursing practice, education, and policy development. As a structured self-report instrument, it may support reflective practice, continuing professional development, and identification of perceived strengths and gaps in school nursing practice [12]. In the context of emerging evaluation frameworks within Greek public education, the instrument may additionally contribute to more systematic approaches to professional evaluation and service monitoring.

By translating legislatively defined responsibilities into measurable dimensions of practice self-reported implementation, the SNAP instrument may also support quality improvement initiatives and workforce planning within school health services [7,15]. Future psychometric research should focus on confirmatory factor analysis, longitudinal validation, test–retest reliability, and examination of measurement invariance across educational settings and geographical regions.

- Limitations

Several limitations should be considered when interpreting the findings of the present study. First, the cross-sectional design does not allow evaluation of the temporal stability or responsiveness of the SNAP instrument. Longitudinal studies are needed to examine changes in scores over time and further establish the instrument's measurement properties.

Second, a non-probability convenience sampling strategy was used due to feasibility constraints and COVID-19-related restrictions affecting recruitment procedures. Although participants were recruited through a professionally verified online network of school nurses, this approach may have introduced selection bias by potentially underrepresenting nurses with lower professional engagement or limited participation in online professional communities. Therefore, the findings may not be fully generalisable to all school nurses in Greece.

Third, the use of self-reported data may have introduced social desirability and common method bias, as the SNAP instrument assesses perceived professional practice rather than objectively observed performance.

Fourth, although the sample size was adequate for exploratory factor analysis, further evaluation of the instrument's structural validity using confirmatory factor analysis in larger and independent samples is warranted. In addition, other psychometric properties, including test–retest reliability, criterion validity, responsiveness, and measurement invariance across subgroups, were not assessed and should be examined in future validation studies [20].

5 Conclusions

This study demonstrated that the SNAP instrument is valid and reliable. By operationalising legislatively defined responsibilities into measurable practice indicators, the instrument may support self-assessment, professional development, workforce evaluation, and quality improvement within school health services. Future research should use randomly sampled populations to achieve representative results about the psychometrics of this instrument and to strengthen its broader applicability across educational and regulatory settings.

Abbreviations

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Declarations

Supplementary Information: Graphical abstract, Tables, Questionnaire.

Acknowledgements. The authors would like to thank all school nurses who participated in this study and contributed their valuable time and professional experience to the development and evaluation of the SNAP instrument.

Authors' contributions. VS,CK,EP,NB conceptualised the study, developed the initial item pool from the regulatory framework, a major contributor in writing the manuscript. VS,CK,NB contributed to the methodological design, supervised the psychometric analyses, and critically revised the manuscript. VS,GD,SK contributed to content validity assessment, pilot testing, and methodological refinement, and reviewed the manuscript. VS,CK,SK,NB writing review and editing. EP,GD contributed to the operationalisation of statutory duties, data interpretation, and policy-related aspects of the discussion. NB supervised the overall research process, contributed to the methodological framework and statistical analyses, and critically revised the manuscript. All authors read and approved the final manuscript.

Funding. This study was supported by Princess Nourah bint Abdulrahman University Researchers Supporting Project number (PNURSP2023R 312), Princess Nourah bint Abdulrahman University, Riyadh,

Saudi Arabia.

Data availability. The datasets used and analysed during the current study are available from the corresponding author on request.

Ethics approval and consent to participate. The study complied with the General Data Protection Regulation (GDPR) and the Declaration of Helsinki. Approval was obtained from the Ethics and Deontology Committee of the University of Patras (IRB Pr. No. 12654/23-1-2022). All participants provided written informed consent prior to participation.

Consent for publication. Not applicable.

Competing interests. The authors declare no competing interests.

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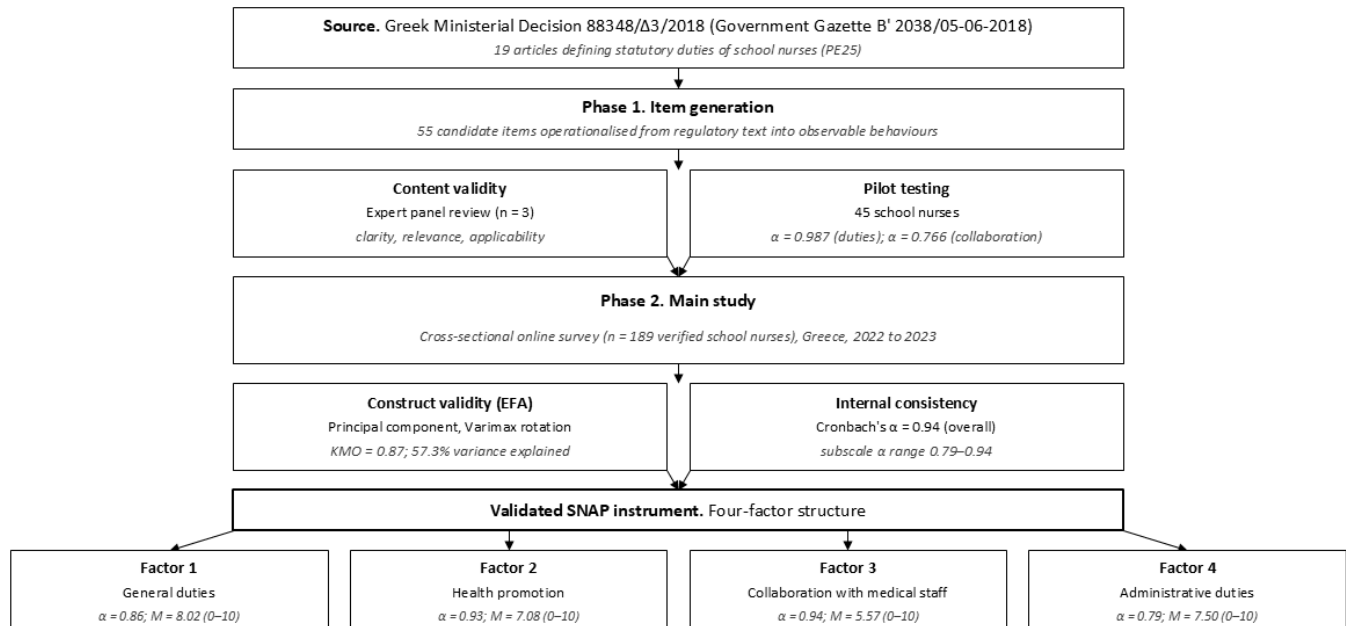
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Figures

Figure 1. Graphical abstract

Development and psychometric evaluation of the School Nurse Assessment of Practice (SNAP) instrument



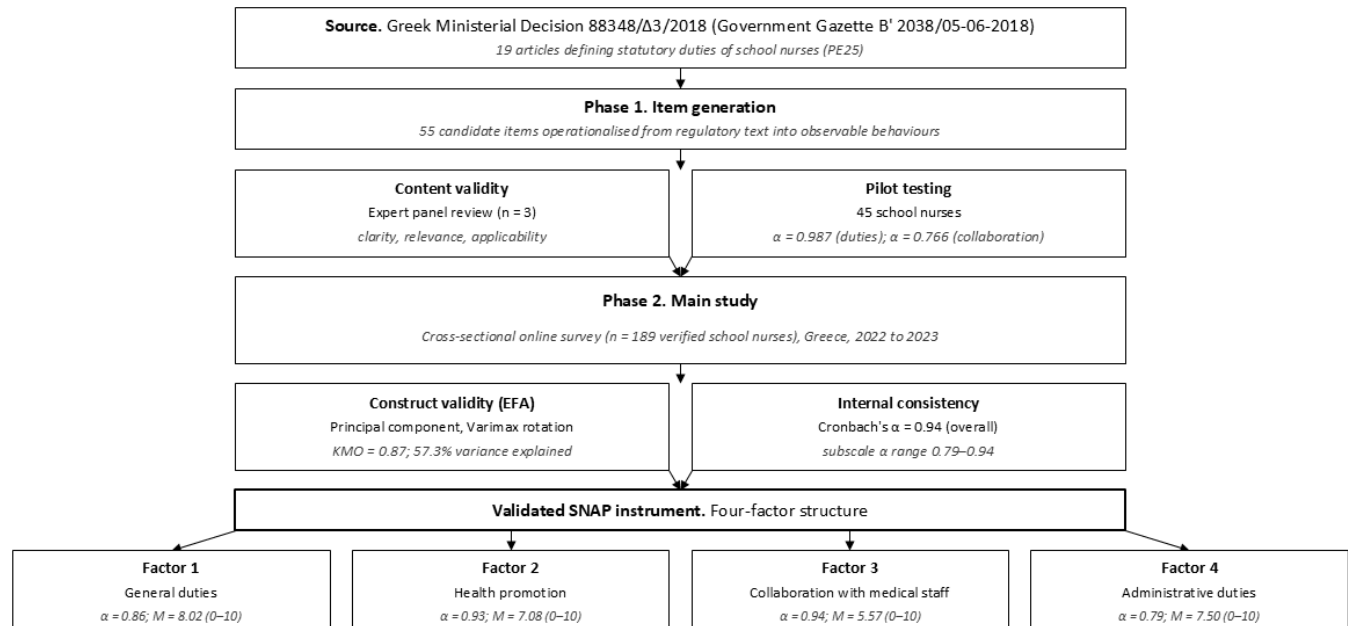
Note. SNAP, School Nurse Assessment of Practice; EFA, exploratory factor analysis; KMO, Kaiser–Meyer–Olkin measure of sampling adequacy; α, Cronbach's alpha; M, mean.

Figure 1

Graphical abstract illustrating the development and the assessment of the validity and reliability of the School Nurse Assessment of Practice (SNAP) instrument. The instrument was developed in two phases. In Phase 1, an initial pool of 55 candidate items was generated by operationalising statutory duties of school nurses, as defined in the 19 articles of Greek Gov. Gazette 2038/B'/2018, into observable professional behaviours. Content relevance and clarity were evaluated by a three-member expert panel (one academic, one experienced school nurse, and one school principal), followed by pilot testing with 45 school nurses (Cronbach's $\alpha = 0.987$ for the duties subscale and 0.766 for the collaboration subscale). In Phase 2, the refined instrument was administered to 189 registered school nurses working in primary and secondary education across Greece via a cross-sectional online survey conducted during the 2022–2023 school year. Structural validity was examined through exploratory factor analysis (principal component extraction with Varimax rotation), yielding a Kaiser–Meyer–Olkin measure of 0.87 and explaining 57.3% of the total variance. Internal consistency was good to excellent (Cronbach's $\alpha = 0.79$ –0.94). The final SNAP instrument comprises four factors: general duties ($\alpha = 0.86$; $M = 8.02$), updating the school environment on health and protection issues ($\alpha = 0.93$; $M = 7.08$), collaboration with medical staff ($\alpha = 0.94$; $M = 5.57$), and administrative duties ($\alpha = 0.79$; $M = 7.50$). SNAP = School Nurse Assessment of Practice; EFA = Exploratory Factor Analysis; KMO = Kaiser–Meyer–Olkin measure of sampling adequacy; α = Cronbach's alpha; M = mean.

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