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Validation of the Psychometric Properties of the Practice Environment Scale of Nursing Work Index (PES-NWI) Questionnaire in the Context of Kenya's Nursing Organizational Work Culture

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ABSTRACT

Background: The global shortage of nurses is posing a significant threat to the provision and sustainability of quality health care services worldwide. The importance of nursing organizational culture and validated tools to accurately measure it, is of paramount importance in mitigation of this shortage, especially in Low- and middle-income-countries like Kenya.

Methodology: This was a cross-sectional online validation survey among 212 nursing personnel working in various healthcare facilities across Kenya. The aim of the study was to assess the validity and reliability of the psychometric properties of the Practice Environment Scale of Nursing Work Index within the framework of nursing organizational culture in Kenya and determine how Kenyan nurses rate their organizational culture. Data was analyzed using SPSS version 28. Cronbach's alpha was used to determine reliability while Exploratory Factor Analysis and Confirmatory Factor Analysis were used to test validity.

Results: The 5-structure of Lake's PES-NWI was unsupported by confirmatory factor analysis and a new 7-Factor Kenyan PES-NWI version was created. The new tool was reliable and with acceptable fit. Participants showed a mixed rating of their organizational culture with overall organizational culture largely rated neutral (M = 2.51, SD = 1.01).

Conclusion: The Kenyan PES-NWI is a valid and reliable tool that could be used to assess organizational culture. The study highlighted the critical need to further develop context-specific tools to accurately measure nursing organizational culture work environments particularly in Low and-Middle-Income countries like Kenya facing significant nursing shortages. As nursing becomes increasingly dynamic and complex, it is essential for nursing and healthcare researchers to re-validate research tools to continuously improve them.

1. Introduction

Amidst a severe global shortage of healthcare workers, including nurses, the current top priority in global healthcare settings is the race to attract and retain the healthcare workforce (de Vries et al., 2023). The world's shortage of nurses, estimated to be 7.07 million in 2020, with 89 % concentrated in Low- and Middle-income countries, including Kenya (WHO, 2020), is projected to rise to about 12.9 million by 2035 (Adams et al., 2021). This shortage is further compounded and complicated by factors such as the increasing world's ageing nursing workforce(Stimpfel et al., 2020), reduced uptake of nursing as a career by younger generations (Guo & Hau, 2023), shortage of faculty members to train new nurses and above all high nurses' turnover due toxic organizational culture(Buchan, 2023; Lee & Jang, 2020; Shirey, 2009). The pressure of the shortage of nurses and other healthcare workforce is an alarming worldwide catastrophe. The World Health Organization has

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warned European countries and the whole globe that this shortage of nurses is a "ticking timebomb" if action is not taken(Michel et al., 2023).

Scholars have opined that organizational culture, work environment and leadership are critical elements in mitigating the healthcare workforce crisis(Chong et al., 2018; Fallatah et al., 2017; Shirey, 2009). Organizational Culture (O.C.) is defined as the shared values, beliefs, behaviours, and perceptions held by employees within a workplace (Banaszak-Holl et al., 2015; Choi & Kim, 2020; Schein, 2018) or simply as "the way things are done around here", (Eskola N S et al., 2016). O.C. is a powerful management tool and leadership, and O.C. is often referred to as two sides of the same coin(Chong et al., 2018; Schein, 2018). O.C. acts as the fabric and glue that binds workers together(Körner et al., 2015). It dictates how employees view and perceive their organization, leadership, and workplace. O.C plays a pivotal role in influencing the attraction and retention of nurses within the healthcare industry. It also determines various aspects of nurses' professional lives, including job satisfaction(Widodo et al., 2021), work engagement(Goyal & Kaur, 2023), nurses' resilience(Cao & Chen, 2021), work-related stress and burnout(Labrague et al., 2017; Lee & Jang, 2020), organizational cynicism(Munir et al., 2018), workplace communication(Alsufyani et al., 2021; Siket Ujváriné et al., 2020), and nurses' turnover(Arslan Yürümezoğlu et al., 2019; Castle & Engberg, 2006; Donoghue & Castle, 2007; Hwang & Chang, 2009; Lee & Jang, 2020; Park & Kim, 2009).

Organizational culture is a complex terminology that has been the subject of many definitions by researchers, and different assessment instruments have been created to measure organizational culture (Gershon et al., 2004; Hsiung et al., 2020; Scott et al., 2003). Among these tools is The Practice Environment Scale of Nursing Work Index (PES-NWI) (Lake, 2002).

The Practice Environment Scale of Nursing Work Index (PES-NWI) (Lake, 2002) was the first nursing-specific questionnaire to be developed for measuring nursing organizational culture. Initially, it was developed from the Nursing Work Index study of 14 magnet hospitals in the United States of America(Schmalenberg & Kramer, 2008). "Magnet Hospitals" were successful health facilities in attracting and retaining nurses amid the acute shortage in the USA in the early 1980 s because they had "forces of magnetism", which were positive hospital cultural values. The hospitals possessed 14 powerful "magnetic forces", which characterized their "magnetic nursing culture". These forces encompassed quality leadership, a well-established organizational structure, effective leadership and management, favourable personnel policies and programs, professional models of care, high standards for quality care, continuous quality improvement, comprehensive consultation and resource availability, professional autonomy for nurses, fostering community and hospital connections, recognizing nurses as educators, maintaining a positive image of nursing, fostering interdisciplinary relationships and collaboration, and prioritizing continuous professional development (Beal & Riley, 2019; Buffington et al., 2012; Haller et al., 2018).

Originally intended to assess workplace culture, the PES-NWI was developed based on the 14 "magnetic forces" that attracted and retained nurses. However, because of its outstanding quality, its use has surpassed the initial goal and expanded to assess several facets of nursing, such as the nursing work environment, organizational climate, and quality of nursing care.

The PES-NWI measures hospital environment culture in 5 main subscales with 31 items as follows:

Nurse participation in hospital affairs (items 1–9): –This sub-scale evaluates the degree to which nurses experience empowerment and involvement in hospital decision-making.

Nursing foundations for quality of care (items 10–19): – The sub-scale evaluates the presence of a solid basis for delivering high-quality nursing care in the healthcare system.

Manager ability, leadership, and support of nurses (items 20–24): –This sub-scale measures the leadership attributes of nurse managers and leaders. It assesses how well they can encourage a pleasant work environment for nurses by offering tools, support, leadership, and direction.

Staffing and resource adequacy of resources (items 25–28): – Assesses if staffing levels and resources are sufficient for nurses to carry out their responsibilities efficiently. It covers things like workload, nurse-to-patient ratios, and the accessibility of equipment and supplies.

Collegial nurse-physician relations (items 29–31): –This sub-scale evaluates the quality of the healthcare system's relationship between nurses and physicians. It assesses collaboration, cooperation, unity, mutual respect, and effective communication between these two groups, which is vital for effective quality patient care.

2. Validity and reliability

Validity is defined as the ability of an instrument or scale to measure what it is supposed to measure(Zamanzadeh et al., 2015), while reliability is the ability of the instrument to yield the same results each time it is used on repetitive occasions. The subjective assessment of a scale's context appropriateness and the item's relevance to the assessed construct is known as content validity(Mainz et al., 2015). Within the international scholarly and scientific community, knowledge sharing between developed and developing countries has been essential to advancing science(Smith et al., 2017). However, there is a fundamental imbalance in this relationship, especially in low- and Middle-Income countries (LMICs), including Kenya, depending on research instruments and tools that their developed counterparts have validated without receiving sufficient validation in their own environments(Green et al., 2018). This dependency presents several difficulties and moral dilemmas that must be carefully considered, and the instruments revalidated in the developing country's contexts. For example, social conventions, cultural differences, linguistic diversity, and differing socioeconomic backgrounds significantly impact how people view and react to research tools. In a different cultural environment, a survey or questionnaire that works well in one social situation may not connect with the target audience in another social background. This discrepancy may provide false or misleading conclusions, compromising the validity and dependability of the study's conclusions. Therefore, validation is necessary to confirm these research tools' accuracy, consistency, trustworthiness, credibility, and acceptability in LMIC countries like Kenya. Validation allows for comparisons between studies and makes the tool more acceptable ethically in academic and practical applications.

Questionnaire's validity is considered excellent if it has a Cronbach's alpha coefficient of 0.8–0.9, acceptable if it is 0.7–0.8, exceptional if it has 0.9 or higher Cronbach's alpha coefficient and deemed poor if it has less than 0.7 (Flo et al., 2018; Mainz et al., 2015).

PES-NWI has widely been translated and validated in many countries and languages, including Australian(Parker et al., 2010), Persian(Elmi et al., 2017), Brazilian (Gasparino & Guirardello, 2017), Dutch(Mainz et al., 2015), Chinese(Chiang & Lin, 2009), Cypriot(Efstathiou et al., 2018), Icelandic(Gunnarsdóttir et al., 2009), Polish(Brzyski et al., 2016), Korean(Cho et al., 2011), Japanese(Ogata et al., 2018), French (McCusker et al., 2004), Spanish(Fuentelsaz-Gallego et al., 2013) and Portuguese (Lucas et al., 2021). All these validations have been done in developed countries, and no study has examined PES-NWI-31 validity and reliability in the context of developing countries, especially in Africa, including Kenya. Furthermore, there is a lack of research addressing the necessary adjustments required for the instrument's applicability in diverse situations and across nations within developing countries. This study aimed to fill this gap and will act as a baseline for further adjustments to PES-NWI 31 to fit developing countries' contexts.

3. Research aims and objectives.

This research aimed to assess the reliability of the psychometric characteristics of the Practice Environment Scale of Nursing Work Index (PES-NWI) within the framework of nursing organizational culture in Kenya with the following key objectives:

i. To determine the Cronbach's alpha coefficient reliability of the Kenyan version of PES-NWI
ii. To assess the validity of the Kenyan version of PES-NWI through confirmatory factor analysis
iii. Determine how Kenyan nurses rate their organizational culture.

4. Research questions

i. What is the Cronbach's alpha coefficient reliability of the Kenyan version of PES-NWI?
ii. Is the Kenyan version of PES-NWI a valid tool to measure organizational work culture in the Kenyan context?
iii. How are nurses' ratings of their nursing organizational cultures and work environments in Kenya?

5. Methodology

5.1. Research design

A cross-sectional study design was used in this research since it was deemed appropriate for collecting data through the online validation survey. The goal was to validate the Practice Environment Scale of the Nursing Work Index's psychometric qualities among Kenyan nursing staff members, with a focus on their perceptions about the organizational cultures within Kenya's hospitals.

5.2. Study area

The investigation was conducted in medical facilities located in Kenya. Kenya is a middle-income nation on Africa's eastern coast that is part of Sub-Saharan Africa. Tanzania borders it to the south, Somalia to the east, Uganda to the west, and South Sudan on the northwest. Ethiopia borders Kenya to the north. A vast network of healthcare facilities-more than 9,696 nationwide, according to the Kenya Ministry of Health's (Kenya Master Health Facility List 2020) provides health services. These healthcare facilities come in several levels: national referral hospitals, county hospitals, sub-county hospitals, and health centers. Nurses working in these facilities hold different educational qualifications, including certificates, diplomas, degrees, master's degrees, and PhDs. Nurses with master's and PhD degrees are primarily assigned their duties in level six and five health facilities, which are referral hospitals and county hospitals in the country. The country has an estimated nursing workforce of about 76,878 nurses, per the Nursing Council of Kenya 2023.

5.3. Study population

This research was done among all nursing staff across various levels of healthcare facilities in Kenya, encompassing county hospitals, national referral hospitals and some major private hospitals.

5.4. The sample size determination

The desired minimum sample size for this study was calculated based on (Yurdugül, 2008), which states that "In the literature on Cronbach alpha reliability validation, the required minimum sample size for the acceptable 0.70 coefficient alpha is often given as 200, 300, or 500″. Rule of thumb for structural equation modelling of "having at least 200 sample size or having 5–10 participants per parameter" was also applied. For this study, the sample size was accordingly set at 200 nurses working in Kenya's county, sub-county, and national referral hospitals.

5.5. Sampling technique and procedure

A multi-stage sampling method was employed in this study to ensure a representative sample of nursing organizational work culture. The first stage was the selection of the hospitals for the study. We divided Kenya into eight regions following the former provincial administrative units i. e Central, Coast, Eastern, Nairobi, Northeastern, Nyanza, Rift valley and Western provinces: Nairobi and Central as well as Western and Nyanza province were further merged to form one region. Then, using simple random sampling by computer random number generator, two regions were randomly selected due to the fastness of the country and to make the research more focused and visible. Thus, Central/Nairobi and western regions were selected for this study. Secondly, stratification of health facilities was done based on the facility level (National Referral Hospitals, County hospitals, and major private hospitals); hence, there were three strata. At each stratum, a list was generated reflecting county referral hospitals, national referral hospitals and the major private hospitals separately. Then, using each list as the sampling frame, simple random sampling was done only for private hospitals but for county and national referrals, all county hospitals (16) and 5 national referral hospitals together with 15 private hospitals within our study areas formed the study sites. From these facilities, a total of 300 nurses were recruited for the study through convenience sampling. A Link to an online survey and a request to participate in the research was shared with the nurses whose emails were obtained from their managers.

5.6. Inclusion criteria

All nurses who worked in the selected hospitals for at least 12 uninterrupted months.

All nurses licensed by the Nursing Council of Kenya and with valid practicing licenses.

5.7. Exclusion criteria

All nurses who did not consent to participate were excluded from this study.

All nurses and intern nurses were excluded from this study.

6. Data collection instruments and measurements (PES-NWI)

The data collection was done between December 1, 2023, and January 31, 2024. An online google form of Practice Environment Scale of the Nursing Work Index (PES-NWI) (31-item scale) (Lake, 2002) questionnaire was created for this study. The tool has five sub-scales and 31 questions, typically requiring about 15 to 20 min to complete. The PES-NWI questions are answered on a 4-point Likert scale, ranging from 1 = strongly disagree to 4 = strongly agree. Scoring is done on categories: 1 = strongly disagree, 2 = disagree, 3 = Agree, 4 = strongly Agree. An average score was computed for each subscale and the overall scale. A higher score above the midpoint of 2.5 represents a favourable nursing practice environment culture (Lake, 2002), otherwise classified in this study as magnet/positive nursing organizational culture, and a lower score below the midpoint of 2.5 represents an unfavourable nursing environment culture classified as non-magnet/negative nursing organizational culture. By magnet culture, we mean a culture where there is high nursing professional autonomy, nurses' involvement in hospital affairs, nurses are listened to, a culture of continued medical education, nurses are consulted on day-to-day activities, a culture of equality, nursing is based on quality of care, cohesive, supportive leadership, adequate resources with high collegial nurse-physician relationships including collaboration, teamwork, and inter-professional collaboration. By negative organizational culture, we mean the converse.

6.1. Modification of the instrument

The wording of individual items was adjusted to reflect this study better. The adjustment did not affect the stem of the question. There was no translation of the tool as Kenya is an English-speaking country.

6.2. Data management and analysis

From online, the Excel data was downloaded. It was then imported into Statistical Package for the Social Science (SPSS) version 28 for analysis. Descriptive statistics, such as frequencies, percentages, means, and standard deviations, were used to assess the demographic parameters. The Cronbach alpha (α) test was used to assess the reliability of the Kenyan version of the PES-NWI 31-item questionnaire with values more than 0.7 indicating acceptable Cronbach alpha (Flo et al., 2018; Mainz et al., 2015).The findings were also compared with those of the original scale. To assess validity, first, Exploratory Factor Analysis (EFA), then followed by Confirmatory Factor Analysis (CFA) using AMOS software (version 28.0) were done. First, CFA was conducted to confirm the underlying factor structure of the Kenyan PES-NWI 31 to confirm whether it will display a structure similar to the original 5-factor model PES-NWI (Lake, 2002) as well as to see whether the results were fit to conduct CFA. To perform this, we used SPSS's dimension reduction-Factor analysis using two main tests i.e the Kaiser–Meyer–Olkin (KMO) and Bartlett's test of sphericity. These two tests show whether the data is appropriate for factorial analysis. Principal Component Analysis (PCA) and Varimax rotation method were used to extract the main components with extract based on Eigenvalues greater than 1. Absolute values less than 0.4 were excluded. Confirmatory Factor Analysis was done on the resultant 7 factor PES-NWI-30 structure that was found in our Kenyan sample to validate it. The goodness-of-fit index (GFI), normed fit index (NFI), comparative fit index (CFI) with scores higher than 0.90 indicating a good model fit. The Root-Mean-Square Error of Approximation (RMSEA) (values between 0.05 and 0.08) being acceptable scores together with analysis of factor loadings and latent covariance were used to evaluate the model's fitness.

7. Results

7.1. Demographic characteristics of the participants

A total of 212 (42.5 % male and 57.5 % female) nurses actively took part in this online survey, providing responses to the Kenyan version of the PES-NWI 31. This was a response rate of 70.7 %. The average age of the participants was 30 ± 8.53 years, and notably, most of the nurses, comprising 171 individuals (80.7 %), fell within the age range of 21 to 40 years. The vast majority of the respondents, 71.7 %, were married, and (n = 207) identified their religion as Christianity. The participants exhibited varying levels of professional experience, with the largest proportion, 48.1 %(n = 102), having work experience between 6–15 years. Regarding the highest educational level, the majority of the nurses were either diploma holders, 47.6 %(n = 101) or degree holders (n = 65), with the rest being holders of certificates in nursing, with one respondent having a PhD. About sixty per cent (n = 127) of the nurses worked on permanent and pensionable employment terms, while 40 % worked under fixed term contracts or part-time (**See** Table 1**. *Demographic Characteristics of the respondents).***

Table 1
Demographic Characteristics of the Respondents (n = 212).

Variables		Frequency n (%)
Gender	Male	90(42.5)
	Female	122(57.5)
Marital Status	Married	152(71.7)
	Single	57(26.9)
	Widow/Widower	3(1.4)
Age	21–30	76(35.8)
	31–40	95(44.8)
	41–50	28(13.2)
	51–60	13(6.1)
Years of Experience	≤5 yrs	71(33.5)
	6-15yrs	102(48.1)
	16-25yrs	25(11.8)
	≥26yrs	14(6.6)
Religion	Christian	207(97.6)
	Muslim	4(1.9)
	Others	1(0.5)
Highest Education	Certificate in Nursing	15(7.1)
	Diploma in Nursing	101(47.6)
	BScN	65(30.7)
	Masters	30(14.2)
	PhD	1(0.5)
Type of employment	Permanent & pensionable	127(59.9)
	Fixed term Contract	64(30.2)
	Part-time job	21(9.9)
Designations	Nurse supervisor/manager	45(21.2)
	The nurse ward head/Nursing in-charge	38(17.9)
	General nursing Staff	120(56.6)
	Student nurse/ Intern	8(3.8)
Ward	Outpatient department (including outpatient special clinics)	43(20.3)
	Maternity ward/Gynecology ward/postnatal ward	38(17.9)
	Medical wards (Male/Female)	22(10.4)
	Surgical wards (Male/Female)	10(4.7)
	Intensive Care Unit/Renal unit/Theatre"	12(5.7)
	Paediatrics ward/ Newborn Unit	12(5.7)
	Others	75(35.4)

7.2. Reliability of the Kenya's PES-NWI

The overall Cronbach's alpha was found to be 0.941, indicating a solid internal consistency and reliability for Kenya's PES-NWI tool. This outcome suggests that the instrument is highly effective in assessing nursing organizational culture, demonstrating exceptional reliability. The sub-scale Cronbach's alphas for specific dimensions were as follows: nurse participation in hospital affairs (0.856), nursing foundations for quality of care (0.869), nurse manager ability, leadership, and support of nurses (0.834), staffing and resource adequacy (0.834), and collegial nurse–physician relations (0.898). All sub-scale Cronbach's alphas were excellent, affirming the high reliability and validity of the instrument *(See* Table 2 *below).*

7.3. Validity

The Kenyan version of PES-NWI-31 through EFA analysis produced 7 latent factors based on scree plot on Kaiser Criterion regarding Eigenvalues greater than 1. This model explained 65.12 % of the variance as shown in Table 3 below.

The structure and the loading factors are as shown in Table 4. Based on analysis of this new structure and each item composition, it became clearer that F1 was made up of the original items of sub-scale 2(*Nursing Foundations for Quality of Care***)** of the Lake's PES-NWI with the last 3 items (17,18 and 19) removed. This subscale was therefore retained and named *Nursing Foundations for Quality of Care* as it was originally. F2 was made up of clustered items originally from sub-scale 3 (Nurse *Manager Ability, Leadership, and Support of Nursing*) with one item (20) removed and replaced with item 7 originally from sub-scale 1. The name of this sub-scale was thus retained as well. F3 and F5 were perfectly made up of all items originally from sub-scale 4 *(Staffing and Resource Adequacy)* and sub-scale 5(*Collegial Nurse-Physician Relations*) in original Lake's tool respectively hence their renaming was also retained see Table 4 **below**.

Items from the original Lake's sub-scale 1 (*Nurse Participation in Hospital Affairs)* split mainly into two with items. F4 was comprised of items 2 (Staff nurses at this hospital participate in policy decisions that affect day-to-day work in this hospital), 1(Staff nurses are involved in the internal governance of this hospital) and 8(Staff nurses have opportunity to serve on hospital and nursing department committees). F7 was made up of Items 6 (opportunity for Career development/clinical ladder rise for nurses), item 3(opportunities for advancement of nursing personnel) and item 4(an administration which listens to and responds

Table 2
Kenya's PES-NWI 31-Item Sub-Scales and composite score with Cronbach's alpha for Sub-Scales and the overall tool Compared to Original Lakes 2002 Scale.

Sn	Items and Sub-Scales	Mean (S.D.)	Cronbach's α for Sub-Scales	Original Scale Cronbach's
	Sub-scale 1: Nurse Participation in Hospital Affairs	**2.45 (1.03)**		
1.	Staff nurses are involved in the internal governance of this hospital	2.39 (1.06)	**0.856**	**0.830**
2.	Staff nurses at this hospital participate in policy decisions that affect day-to-day work in this hospital	2.37 (1.08)		
3.	Opportunities for advancement of nursing personnel	2.36 (1.08)		
4.	An administration which listens to and responds to employees' concerns.	2.36 (1.04)		
5.	The director/head of the nursing department is highly visible and accessible.	2.96 (0.92)		
6.	Opportunity for Career development/clinical ladder rise for nurses	2.22 (1.05)		
7.	Nurse administrators/ managers consult with nurses over problems arising in the day-to-day working routine procedures.	2.62 (1.02)		
8.	Staff nurses have opportunity to serve on hospital and nursing department committees	2.53 (1.03)		
9.	Chief nursing executives or nurse managers have equal power and authority as other top-level hospital executives.	2.20 (1.03)		
	Sub-scale 2: Nursing Foundations for Quality of Care	**2.64 (1.01)**		
10.	Nursing diagnoses is seriously considered important in the management of patients	2.61 (1.05)	**0.869**	**0.800**
11.	There is an active quality assurance program to ensure high-quality nursing care	2.59 (1.01)		
12.	In this hospital, there is a preceptor program for newcomers to welcome, brief and give them the support needed to settle, e.g. orientation and some training.	2.62 (1.06)		
13.	Nursing care in this hospital is based on a nursing model rather than a medical model.	2.46 (1.06)		
14.	Patient care assignment fosters or promotes continuity of care	2.38 (1.07)		
15.	There exists a common, well-defined nursing philosophy in place that pervades the patient care environment	2.53 (1.00)		
16.	Written, up-to-date nursing care plans for all patients	2.21 (1.08)		
17.	High standards of nursing care are expected by the administration or managers	3.16 (0.92)		
18.	There is an active in-service/ continuing education program for nurses.	2.52 (1.03)		
19.	I am working with clinically competent nurses.	3.27 (0.83)		
	Sub-scale 3: Nurse Manager Ability, Leadership, and Support of Nursing	**2.63 (1.00)**	**0.834**	**0.840**
20.	The head nurse is a good manager and leader.	3.07 (0.93)		
21.	The head nurse/supervisor backs up the nursing staff in decision-making, even if the conflict is with a physician.	2.70 (1.01)		
22.	Head nurses or Supervisors use mistakes and errors made by juniors as learning opportunities, not criticism.	2.48 (1.04)		
23.	Supervisors/ supervisory team that is supportive of nurses	2.58 (0.98)		
24.	The management gives praise and recognition for a job well done by nurses.	2.32 (1.02)		
	Sub-scale 4: Staffing and Resource Adequacy	**2.11 (1.06)**		
25.	There are enough staff and personnel to get the work done.	1.83 (1.00)	**0.834**	**0.800**
26.	There are enough number of qualified nurses to provide quality patient care.	2.02 (1.09)		
27.	There are adequate support services to allow me to spend time with patients	2.19 (1.06)		
28.	I get enough time and opportunity to discuss patient care problems with other nurses.	2.39 (1.08)		
	Sub-scale 5: Collegial Nurse–Physician Relations	**2.67 (0.92)**		
29.	In this hospital, there is a lot of teamwork between nurses and doctors.	2.68 (0.93)	**0.898**	**0.774**
30.	In this hospital, physicians and nurses have good working relationships.	2.70 (0.91)		
31.	In this hospital, there is a Functional collaboration (joint practice) between nurses and physicians.	2.64 (0.93)		
	Overall/Composite Cronbach's α for the tool (the five sub-scales)	**2.51 (1.01)**	**0.941**	**0.820**

Table 3
Factor analysis of the PES-NWI Rotated version.

Factor	Eigenvalue	Weight	% of the accumulated variance
1	11.400	3.864	36.775
2	2.118	2.954	43.607
3	1.717	2.949	49.146
4	1.569	2.793	54.208
5	1.195	2.793	58.062
6	1.117	2.531	61.666
7	1.071	2.305	65.120

to employees' concerns). A new item 18 (There is an active in-service/ continuing education program for nurses) originally from subscale 2 also clustered with this group of items. Following deeper theme analysis and professional nurses' engagement in Kenya to re-name these two new sub-scale, F4 was named *Nurse involvement in Hospital Affairs* while F7 was named *Nurse Professional Development and Opportunities.*

F6 was also a new sub-scale made up of items from different original Lake's tool. These were items 19(I am working with clinically competent

Table 4
Kenya's PES-NWI-31 Components.

Rotated Component Matrix[a]							
	Component						
	F1	F2	F3	F4	F5	F6	F7
13	0.726						
11	0.724						
16	0.700						
10	0.674						
15	0.517						
12	0.510						
14	0.419						
21		0.795					
22		0.716					
23		0.703					
24		0.464					
7		0.406					
26			0.825				
25			0.769				
27			0.753				
28			0.556				
2				0.833			
1				0.812			
8				0.533			
30					0.804		
31					0.802		
29					0.729		
19						0.792	
17						0.635	
20						0.547	
5						0.432	
6							0.678
18							0.639
3							0.591
4							0.547
Cronbach's α for NEW Sub-Scales	0.865	0.838	0.835	0.777	0.898	0.735	0.722
Averall Cronbach's α			= **0.939**				

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 8 iterations.

nurses), 17(high standards of nursing care are expected by the administration or managers), 20(The head nurse is a good manager and leader) and 5 (The director/head of the nursing department is highly visible and accessible). This sub-scale was renamed *Administrative Support and Leadership Quality*. Item 9 was deleted as it had low loading.

8. Confirmatory factor analysis

The overall Exploratory Factor Analysis statistics on KMO and Bartlett's Test were: Kaiser-Meyer-Olkin 0.915, Bartlett's Test of Sphericity $X^2 = 3463.270$, df = 465 and P = 0.000. The KMO value ranges from 0 to 1, with higher values indicating that the data was more suitable for confirmatory factor analysis. A KMO value above 0.80 is considered "meritorious," indicating that the sample size and the correlations among variables were adequate for factor analysis. In our research, the value of 0.915 suggests excellent sampling adequacy, meaning our data was also well-suited for CFA analysis. Bartlett's Test of Sphericity tests the null hypothesis that the correlation matrix is an identity matrix. An identity matrix means that variables are uncorrelated, which would be unsuitable for factor analysis. However, from the above findings, the Chi-square and the P value of less than 0.05 indicate that the results were significant hence suitable for CFA. We therefore proceeded with Confirmatory Factor Analysis (CFA) using SPSS AMOS software with the outcome results shown in Fig. 1.

Validity in our study was confirmed through construct validity. The first item of validity test was the standardized factor loadings of the latent factors F1(Nursing Foundation for Quality of Care), F2 (Nurse Manager Ability, Leadership and support of Nursing, F3(Staffing and Resource Adequacy), F4(Nurses Involvement in Hospital Affairs), F5 (Collegial Nurse-Physician Relationship), F6(Administrative Support and Leadership Quality) and F7(Nurse Professional Development and Opportunities).In CFA, typically, factor loadings greater than 0.50 are good indicators of the latent constructs. The range of this study's factor loadings from smallest to the largest were F1(0.54 to.74), F2(0.67 to 0.79), F3(0.63 to 0.85), F4(0.62 to 0.88), F5(0.80 to 0.88), F6(0.53 to 0.72) and F7(0.56 to 0.70) all indicating good and acceptable factor loadings. Regarding the relationships between the structure's latent variables, the correlation matrix was within acceptable values with the highest latent correlation being 0.81 and lowest 0.32. This is generally within the acceptable range of values between 0.30 to 0.80.

The model fitness of the constructed CFA was also examined. The Chi-square value was significant ($X^2 = 704.450$, df = 384 and P-value=<.000). The other model fitness indices were Goodness of Fit Index (GFI) = 0.821, Comparative of Fit Index (CFI) = 0.896, Normed Fit Index (NFI) = 0.800 and Root Mean Square Error of Approximation (RMSEA) = 0.063. These were mixed results of fitness. Chi-square was significant which could be interpreted to mean that there was some discrepancy between the model and the data. However, this is not the only parameter to confirm the model's fitness. GFI, CFI and NFI in this study confirm that the model was however acceptably fit as all their values were close to 0.90 which is the perfect threshold for model fitness. The RMSEA was also another indicator that showed that the model was fit as the value of 0.063 was below the threshold of 0.80. RMSEA of 0.060 to 0.080 is considered an indicator of model fitness while those below the threshold of 0.0.06 are considered excellent.

9. Nurses' rating of their nursing organizational culture work environments in Kenya

According to (Lake, 2002), the average score above 2.5 indicates a positive organizational culture (Magnet culture) while a score below 2.5 indicates a negative organizational culture. In Table 2, compared using the mean score, staff and resource adequacy had the lowest mean score (2.11, SD 1.06), with all items scoring below 2.5. The nurses indicated that there was a lack of staff, including nurses, to get work done in the provision of quality nursing care. Furthermore, the nurses are overwhelmed with work and rarely get time to discuss patient issues with colleagues. Nurse participation in hospital affairs sub-scale had the second lowest score (M = 2.45, SD = 1.03) indicating moderately mean score. The majority of the items were scored negatively, demonstrating that nurses were not strongly involved in the internal governance of the hospitals (2.39), participated in policy decisions (2.37), had inadequate opportunities for nursing advancement (2.36) and lack of prospects for career development and promotions, (2.22). The nurses also indicated that nurse managers and executives have different power and authority than other profession executives within the same hospital. The other PES-NWI sub-scales and the items within these sub-scales scored highly positive with nursing foundations for quality-of-care scoring (M = 2.64, SD = 1.01) nurse manager ability, leadership, and support of nurses (M = 2.63, SD = 1.00) and collegial nurse–physician relations (M = 2.67, SD = 0.92) as shown in Table 2.

The overall mean score of the five sub-scales was (M = 2.51, SD = 1.01), indicating a largely neutral organizational culture. The results suggest that, on average, the Kenyan nurses perceived that their nursing organizational culture was neither magnetic nor non-magnetic. This implies that there are both positive and negative aspects of the organizational culture, leading to a moderate perception by the nurses.

10. Discussion

This study examined psychometric properties of the PES-NWI among organizational nursing and healthcare working culture in Kenya. To the best of our knowledge, this is the first validation study of PES-NWI in this country and Sub-Sahara Africa. These two reasons bolster this study's significance and applicability in Kenya, Sub-Sahara Africa, and

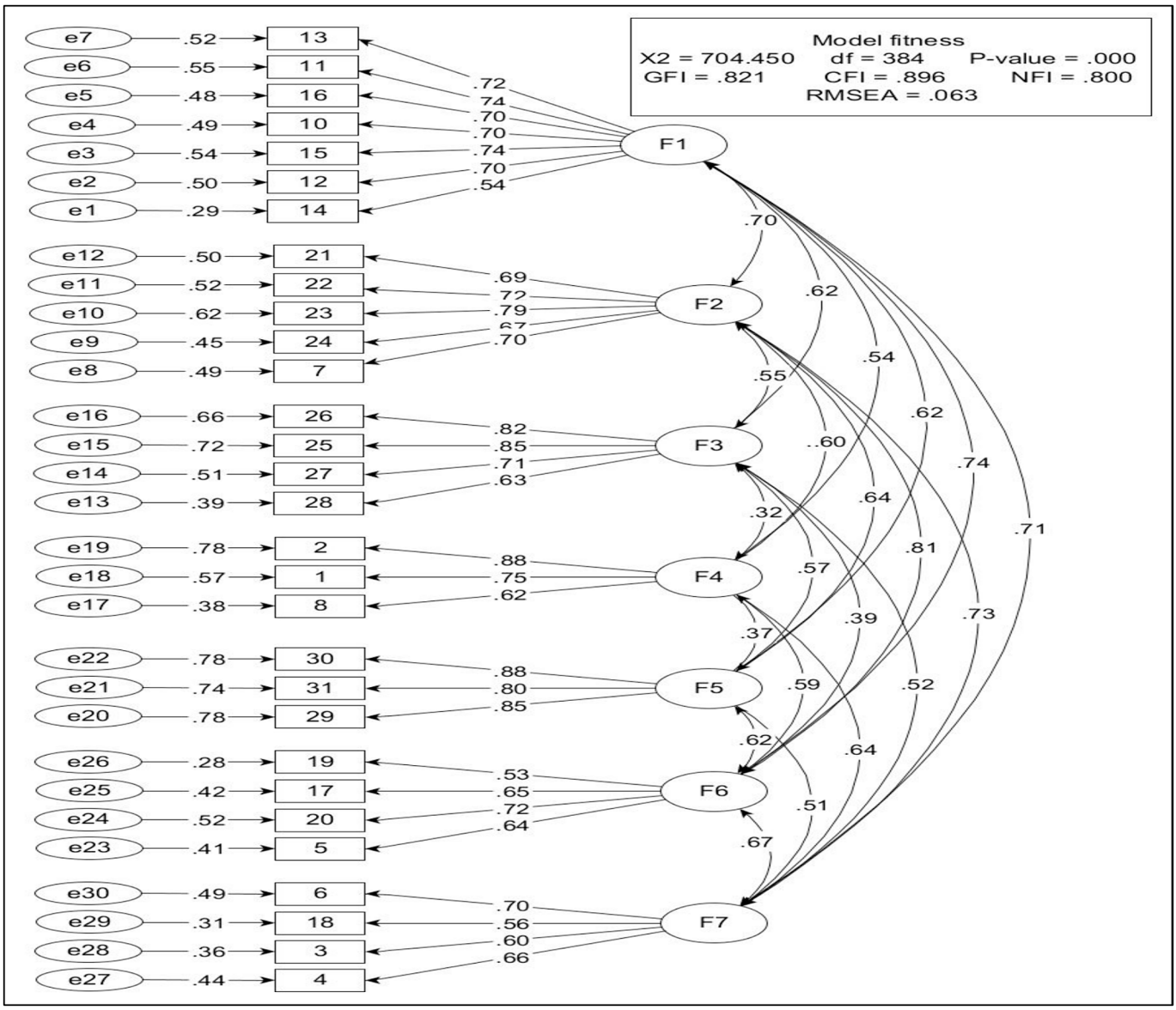

Fig. 1. Seven-factor latent measurement model for the PES-NWI in Kenya Organizational Work Culture Environments, with standardized regression weights and correlations. **F1 = Nursing Foundation for Quality of Care, *F2 = Nurse Manager Ability, Leadership and support of Nursing, *F3 = Staffing and Resource Adequacy, *F4 = Nurses Involvement in Hospital Affairs, *F5 = Collegial Nurse-Physician Relationship, *F6 = Administrative Support and Leadership Quality, *F7 = Nurse Professional Development and Opportunities.*

generally in the African context.

The reliability test results from the initial 5 structure(Table 2) overall Cronbach's alpha were 0.941, while the five sub-scales Cronbach's alphas ranged between 0.834 to 0.898, while the new Kenya-PES-NWI 7 structured (Table 4), had overall Cronbach's alpha of 0.939 with 7-sub-scale Cronbach's alphas ranging from 0.722 to 0.898 both indicating excellent reliability. The original PES-NWI (Lake, 2002) had Cronbach's alpha reliability coefficient of 0.820 with the five sub-scales ranging from 0.774 to 0.840. The overall reliability for the entire 31-item instrument is higher than that of each of its five sub-scales since the length of the instrument affects its reliability estimates. The longer scale has a higher reliability coefficient than shorter sub-scales. This is also reflected in other validation studies done in Denmark, which overall scale had a Cronbach's alpha of 0.88. At the same time, sub-scales ranged between 0.71 and 82 (Mainz et al., 2015), Brazil, overall scale 0.89, sub-scales ranged between 0.51 to 0.88 (Gasparino & Guirardello, 2017) and a systematic review-meta analysis study of 38 studies, sample size of 68,278 which yielded an overall Cronbach's alpha of 0.922 and sub-scales lower than the composite score (Zangaro & Jones, 2019).

The Cronbach's alpha reliability findings from this study indicate that the PES-NWI is a reliable instrument for assessing nursing organizational culture and work environments in Kenya.

In confirming validity, we performed EFA and CFA. Our empirical results indicate adequate psychometric properties of PES-NWI in Kenya organizational culture environments. The Lake's 5 structure model was unsupported in the Kenyan context and a 7-component model Kenyan PES-NWI was supported by the data. The most affected sub-scale of the original Lake's questionnaire was *Nurses Participation in Hospital Affairs* whose items were mainly split into items that reflect on 'nurses' involvement in hospital affairs and nurses' professional development and opportunities'. Experts in the field provided the re-naming of the sub-scales of the Kenyan PES-NWI. After the adaption, five experienced nursing lecturers from the Kenya Medical Training College- a leading nursing medical training institution in Kenya- evaluated the tool to confirm its construct validity, cultural appropriateness, relevance, clarity and comprehensibility. In our new tool some of the items also

slightly clustered differently in comparison with other studies e.g Parker et al., 2010, Chiang & Lin, 2009, Elmi et al., 2017, Gasparino & Guirardello,2017, Mainz et al., 2015 among others including the original Lake's. Variation of these results can be attributed to the cultural differences, organization models, health system models and dynamics in the nursing profession. Nurses in developing countries like Kenya within realm of organizational culture demand for more recognition, autonomy, professional development, a fair reward system, leadership and organizational support, work-flexibility, equity, fairness and an administration that cares for their issues at both personal and organizational levels. These values are different from organization to the other and this may influence their responses to the questionnaire.

The CFA confirmed that the 7-factor Kenyan PES-NWI was valid and reliable. The majority of the model fitness indices used (GFI, CFI, NFI, RMSEA and factor loadings, significant values) were satisfactory and acceptable both on the overall scale and the sub-scales although not perfect. The results agree with other studies on validity of PES-NWI like Brzyski et al., 2016,Cho et al., 2011, Ogata et al., 2018, McCusker et al.,2004, Fuentelsaz-Gallego et al., 2013 and Lucas et al.,2021 that indicate that the instrument is an important instrument in measurement of nursing work environments and organizational culture.

The last objective of the study aimed at determining how nurses in Kenya rated their nursing organizational culture. Our study findings reveal magnetic and highly positive results in nursing foundations for quality of care, nurse manager ability, leadership, and support of nurses and collegial nurse–physician relations. These results suggest that the pillars of strength in Kenya's healthcare system are predominantly rooted in these critical facets. The report emphasizes how excellent things are in terms of the standard of care given, the skill of nurse managers, the existence of strong leadership, and the positive dynamics between nurses and physicians. This favourable evaluation suggests that Kenya's healthcare system has a strong base and emphasizes the possibility of further development and improvement in these critical domains.

Despite the strengths noted within Kenya's healthcare system, significant setbacks exist. Staffing and resource adequacy are the main concerns. This sub-scale scored the lowest among the five sub-scales. Most participating hospitals needed more staff, mainly nurses, to provide quality healthcare to patients. Nurses indicated that they rarely get enough time to spend with patients or discuss patient care problems with the healthcare team due to the shortage. This is a prerequisite for stress, burnout, intention to leave career, and other negative issues among nurses(Deborah Majerovitz, 2007; Kaushik et al., 2021; Lee & Jang, 2020; Zhang et al., 2014). Nurse participation in hospital affairs also scored dismally low, with nurses responding that they could be more involved in hospital affairs, policy, and decision-making. Career advancement through promotions, career development opportunities, and education opportunities are limited. The general picture is that nursing must be more highly recognized. The findings from this study are contrary to other validation studies done in Denmark, China, Japan and Spain, where nurses are highly regarded(Chiang & Lin, 2009; Fuentelsaz-Gallego et al., 2013; Mainz et al., 2015; Ogata et al., 2018).

This study's significance is on the valuable knowledge contribution to the validity and reliability of PES-NWI in Kenya, Sub-Sahara Africa and the African context. The findings from this study may form baseline for future studies, add and broaden knowledge and contribute to policy decisions and formulations, particularly those pertaining to improvement of nurse retention in Kenya and other nations experiencing a nurse exodus. The information obtained will help Kenyan government, county governments, the nursing council of Kenya, Non-Governmental organizations (NGOs), Faith Based Organizations (FBOs) and other international stakeholders working in the complex area of hospital culture and nursing turnover.

It is clear from the findings that nurse researchers within the region should be aware of cultural differences and dynamics in the field of nursing and healthcare. Caution should be exercised in the adoption and use of validated instruments and therefore further re-validation is encouraged for better adoption. These tools may benefit from customization to reflect other areas in nursing and healthcare, such as adding more items and sub-scales for example on the use of technology, corruption, organizational justice, reward systems and politics, which are common problems in Sub-Sahara African healthcare systems and nursing.

11. Conclusions

The Kenyan version of PES-NWI showed exceptional reliability and validity for measuring organizational culture among hospital nurses in Kenya. This research constitutes a groundbreaking endeavour to corroborate the psychometric qualities of the PES-NWI within the framework of organizational nursing and healthcare practices in Kenya and Sub-Saharan Africa. The results highlight the instrument's exceptional validity and reliability. These findings greatly enhance the instrument's suitability in the African setting. The study identifies several strengths in Kenya's healthcare system, including leadership, nurse-physician relations, quality-of-care, and nurse-manager ability which are positive elements in mitigating nurse shortage. However, it also identifies significant challenges, including inadequate staffing and resources, limited nurse involvement in hospital affairs, and limited opportunities for career advancement. This analysis of Kenya's healthcare system highlights the need for the Kenyan government to address these shortcomings while enhancing its areas of strength. In conclusion, this study offers insightful information to nurse researchers, opening the door to more investigation and enhancement of nursing work environments and organizational culture and further improvement of the PES-NWI scale to reflect more on the dynamic nursing cultures.

Limitations of the study

The main limitation of this research is the small sample size. Even though the present sample size satisfies acceptable research criteria, further thorough validation may be conducted using a more extensive and more varied sample in the context of the all the 47 counties in Kenya. Subsequent studies may broaden the focus to encompass other nursing specialties, especially nursing educators. Furthermore, comparative studies among different African nations might provide significant perspectives and improve the PES-NWI applicability and use within the continent.

Availability of data and materials

Further datasets supporting the conclusions of this research are not publicly available but are available from the corresponding author on reasonable request.

Ethical considerations

The ethical approval for this study was obtained from Moi University College of Health Sciences & Moi Teaching and Referral Hospital Institutional Research and Ethics Committees (IREC-759/2024, FAN 0004809). A signed consent was sought from all the participants. Ethical principles of respect for persons, beneficence, justice and non-maleficence were adhered to and applied at all stages. To protect the participants' anonymity and confidentiality, no identifying information e.g names, email or phone numbers was collected. Participation was voluntary, and there were no consequences if a participant chose not to participate or decided to stop at any point while the study was ongoing.

CRediT authorship contribution statement

Evans Kasmai Kiptulon: Writing – original draft, Formal analysis, Data curation, Conceptualization. **Mohammed Elmadani:** Writing – review & editing, Methodology, Data curation. **Godfrey Mbaabu Limungi:** Writing – review & editing, Formal analysis, Data curation. **Anna Szőllősi:** Writing – review & editing, Methodology, Data curation. **Dahabo Adi Galgalo:** Writing – review & editing, Formal analysis, Data curation. **Peter Murage:** Data curation. **Pauline Okari:** Writing – review & editing, Data curation. **Orsolya Maté:** Writing – review &

editing, Supervision, Project administration. **Adrienn Ujváriné Siket:** Supervision, Project administration.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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