



Original Article

Cross-cultural adaptation and psychometric refinement of the Thai Work-Related Stress Questionnaire (T-WRSQ) for registered nurses

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ABSTRACT

Background & Aim: Work-related stress can adversely affect nurses' well-being, workforce stability, and quality of care. However, a culturally appropriate and psychometrically validated instrument for assessing psychosocial work-related stress among Thai nurses is needed. This study aimed to translate, culturally adapt, and psychometrically refine the Work-Related Stress Questionnaire (WRSQ) for Thai registered nurses.

Methods & Materials: This two-phase methodological study translated and culturally adapted the WRSQ following international guidelines. The instrument was evaluated by five experts and pilot-tested with 30 nurses. Psychometric evaluation was conducted among 276 registered nurses from Ministry of Public Health hospitals, randomly allocated to exploratory and confirmatory samples. Exploratory factor analysis (EFA) examined factor structure and item performance, followed by confirmatory factor analysis (CFA) of competing models. Convergent validity, discriminant validity, and internal consistency were assessed.

Results: The Thai WRSQ demonstrated excellent content validity (I-CVI and S-CVI/Ave = 1.00). EFA initially identified four factors broadly corresponding to the original WRSQ; however, the Job Demand domain lacked structural coherence. A revised 10-item, three-factor model excluding this domain showed the best CFA fit ($\chi^2/df=1.66$, CFI = 0.96, TLI= 0.94, RMSEA= 0.07, SRMR= 0.05). The retained domains demonstrated satisfactory convergent validity (CR=0.79–0.85; AVE=0.56–0.66), discriminant validity (AVE>MSV; HTMT=0.09–0.79), and internal consistency (overall $\alpha=0.82$; $\omega=0.85$).

Conclusions: The revised 10-item Thai WRSQ is a valid and reliable instrument for assessing psychosocial work-related stress among Thai registered nurses.

Introduction

Work-related stress is a major occupational health concern and an important factor affecting workers' physical and mental well-being. Workplace conditions such as excessive workload, limited job control, inadequate organizational support, workplace conflict, and work–family interference can contribute to stress and negatively affect employee health (1). Prolonged exposure to these stressors has been associated with burnout, psychological distress, reduced job satisfaction,

absenteeism, impaired work performance, and increased organizational costs (2).

Nurses are particularly vulnerable to work-related stress because of the demanding nature of their work. Increasing patient complexity, workforce shortages, shift work, emotional demands, and organizational pressures place nurses at greater risk of stress-related problems (3). Previous studies have shown that work-related stress among nurses is associated with burnout, poorer quality of care, turnover intention, and workforce instability (1, 4). Given the critical role of nurses in healthcare delivery, identifying and addressing workplace



stressors is essential for promoting nurses' well-being and maintaining a sustainable nursing workforce.

The effective management of work-related stress begins with accurate assessment. Reliable and valid instruments are needed to identify workplace stressors, monitor psychosocial risks, and evaluate interventions aimed at improving employee well-being (2, 5). The Work-Related Stress Questionnaire (WRSQ), developed by De Sio, Cedrone (6), is a brief and practical instrument designed to assess workers' perceptions of psychosocial factors related to work-related stress. The 13-item version measures four domains: workplace environment (WE), job demand (JD), job support (JS), and unpleasant workplace experiences (UWE). Previous studies have demonstrated satisfactory psychometric properties of the original WRSQ and supported its use as a brief multidimensional instrument for assessing psychosocial workplace conditions in occupational settings (7).

Despite growing concerns about work-related stress among nurses in Thailand, no Thai version of the WRSQ is currently available. Although several instruments have been translated and validated for assessing psychosocial work characteristics in Thailand, including the Thai versions of the Job Content Questionnaire (JCQ) (8) and the Effort-Reward Imbalance (ERI) Questionnaire (9). These instruments were developed to evaluate specific theoretical dimensions of the psychosocial work environment, such as job demand, job control, social support, and effort-reward imbalance (5). In contrast, general stress screening instruments primarily assess psychological or physiological manifestations of stress rather than workplace conditions that contribute to occupational stress (10). The WRSQ complements these existing measures by providing a brief multidimensional assessment of psychosocial workplace conditions. Because the dimensional structure of psychosocial work-related stress may vary across cultural and organizational contexts, cross-cultural adaptation requires not only linguistic translation but also empirical evaluation of the underlying measurement structure (6, 7). Such an approach facilitates the

identification of modifiable workplace factors that may inform organizational assessment, occupational health surveillance, and workplace interventions aimed at improving employee well-being (2).

Moreover, perceptions of workplace experiences are shaped by cultural and organizational contexts, highlighting the importance of cross-cultural adaptation before an instrument is applied in a new setting (11, 12). In Thai healthcare organizations, nursing practice is commonly characterized by hierarchical professional relationships, respect for authority, collective responsibility, and the cultural value of maintaining harmonious interpersonal relationships (13, 14). These characteristics may influence nurses' willingness to report workplace conflict, discrimination, dissatisfaction with supervisory support, or other sensitive psychosocial experiences (15). Consequently, psychosocial workplace problems may remain underrecognized when assessment relies solely on symptom-based measures or instruments focusing on a limited number of workplace dimensions (16). Because perceptions of psychosocial workplace conditions may vary across cultural and organizational contexts, the underlying factor structure of the WRSQ should be empirically evaluated before its application in Thailand. Accordingly, cross-cultural adaptation extends beyond linguistic translation to include examination of whether the original measurement structure is supported or requires refinement in the target population. Such evidence would expand the availability of culturally appropriate instruments for occupational health research and facilitate cross-cultural comparisons of psychosocial workplace factors among nurses.

Therefore, this study aimed to translate, culturally adapt, and psychometrically refine the Work-Related Stress Questionnaire for Thai registered nurses. Specifically, the study sought to identify and validate the most appropriate factor structure through independent exploratory and confirmatory factor analyses and to evaluate the reliability and validity of the refined instrument.

Methods

Research design

This methodological study was conducted in two phases. Phase I involved the translation and cross-cultural adaptation of the Work-Related Stress Questionnaire (WRSQ) for use in the Thai context. Phase II comprised a cross-sectional psychometric study to examine and refine the underlying factor structure of the translated instrument and to evaluate its measurement properties among registered nurses. Structural validity was assessed using independent exploratory and confirmatory factor analyses, followed by evaluation of convergent validity, discriminant validity, and internal consistency reliability. The study was conducted in accordance with the Consensus-based Standards for the Selection of Health Measurement Instruments (COSMIN) recommendations for cross-cultural adaptation and evaluation of measurement properties (17).

Translation and cultural adaptation

Permission to translate and use the Work-Related Stress Questionnaire (WRSQ) was obtained from the original instrument developer before the study commenced. The translation and cross-cultural adaptation process followed the internationally accepted procedures described by Brislin (18) and Beaton, Bombardier (12) to ensure equivalence between the original and Thai versions at the linguistic, semantic, conceptual, and cultural levels.

Two bilingual translators independently produced forward translations of the questionnaire. One translator specialized in linguistics, whereas the other had a clinical nursing background. The research team compared both versions and synthesized them into a single preliminary Thai version, emphasizing conceptual accuracy, contextual appropriateness, and terminology commonly used in Thai nursing practice. Any discrepancies were resolved through discussion until consensus was achieved.

The preliminary Thai version was subsequently translated back into English by two independent bilingual translators who were

blinded to the original questionnaire and had not participated in the forward translation. The back-translators consisted of a registered nurse and an English lecturer, both proficient in Thai and English. The back-translated versions were systematically compared with the original instrument to identify inconsistencies in meaning or interpretation. Differences were resolved through iterative discussions among the translators and the research team to preserve the intended meaning of each item while ensuring cultural relevance.

The pre-final Thai version was then evaluated by an expert panel consisting of five specialists: two nurse educators with expertise in nursing research, one behavioral science instructor with expertise in psychometric evaluation, one nurse technical officer experienced in nursing workforce development, and one nurse administrator with expertise in nursing management. The experts independently evaluated each item for its relevance, clarity, and cultural appropriateness. Feedback from the expert panel was discussed with the translators and research team, and revisions were made until consensus was achieved. The resulting pre-final questionnaire was pilot-tested with 30 registered nurses representing different clinical settings. The pilot evaluation focused on face validity by assessing item clarity, comprehensibility, cultural relevance, and the feasibility of questionnaire administration. Participants indicated that the questionnaire was straightforward to complete, easy to understand, and applicable to their routine clinical practice. As no substantial problems were identified, the questionnaire required no further revision and was subsequently used for psychometric evaluation.

Psychometric evaluation

Study setting and participants

The psychometric evaluation was conducted among registered nurses employed in government hospitals under the Ministry of Public Health, Thailand. Participating hospitals were purposively selected to represent diverse clinical environments while ensuring an adequate number of registered nurses for

psychometric evaluation. Recruitment within each hospital was coordinated through the nursing administration office, which invited all eligible nurses to participate.

Participants were recruited using purposive sampling because the objective of this phase was to evaluate the measurement properties of the translated instrument rather than to estimate the prevalence of work-related stress within the nursing workforce. Accordingly, nurses from a variety of clinical units, professional roles, and levels of work experience were included to maximize variability in psychosocial workplace experiences and strengthen the assessment of the instrument across different nursing practice settings. Eligible participants were full-time registered nurses who held at least a bachelor's degree in nursing and had accumulated a minimum of 12 months of continuous clinical experience. Nurses who were on maternity leave, extended sick leave, or study leave during the data collection period were excluded to ensure that responses reflected current workplace conditions. Participation was entirely voluntary, and all nurses who met the eligibility criteria were provided with an equal opportunity to participate.

Sample size calculation

The sample size was determined according to recommendations for factor analysis, which suggest a minimum ratio of 10 participants per item to ensure stable parameter estimation and reduce sampling error (19). Given that the WRSQ comprises 13 items, at least 130 participants were required for each factor analytic procedure. As this study employed exploratory factor analysis (EFA) followed by confirmatory factor analysis (CFA) using independent random subsamples, a minimum total sample of 260 participants was required. A total of 276 registered nurses participated in the study, satisfying the recommended sample size for both analyses and supporting the adequacy of the data for psychometric validation.

Instruments

Data were collected using two instruments. The first was a demographic questionnaire developed by the researchers to obtain participants' personal and professional characteristics, including age, sex, marital status, educational level, work experience, monthly income, employment status, and work unit.

The second instrument was the Thai-translated version of the Work-Related Stress Questionnaire (WRSQ), which was translated and cross-culturally adapted from the original instrument developed by Cedrone, Stacchini (7). The translated questionnaire retained the original 13 items organized into four domains: Workplace Environment (4 items), Job Demand (3 items), Job Support (3 items), and Unpleasant Workplace Experiences (3 items). Responses were rated on a five-point Likert scale ranging from 1 (never) to 5 (always). Items 5, 7, 11, 12, and 13 were reverse-coded before analysis so that higher scores consistently reflected greater exposure to psychosocial work-related stress (6, 7). The translated 13-item questionnaire was used for data collection, and its underlying factor structure was subsequently examined and psychometrically refined through EFA and CFA to derive the final Thai version of the instrument.

Data collection

Following ethical approval, eligible participants were identified through nurse coordinators at participating hospitals. Data were collected using a self-administered online questionnaire distributed via Google Forms. Before participation, nurses received information about the study and provided electronic informed consent. The survey required approximately 15–20 minutes to complete. Data collection was conducted between January 1 and February 15, 2026, and participant anonymity and confidentiality were maintained throughout the study.

Data analysis

All statistical analyses were performed using R version 4.2.1. Descriptive statistics were used to summarize participant characteristics. Continuous variables are presented as means and standard deviations, whereas categorical

variables are reported as frequencies and percentages.

Content validity

Content validity was evaluated using the item-level content validity index (I-CVI) and the scale-level content validity index based on the average method (S-CVI/Ave). An I-CVI of ≥ 0.78 and an S-CVI/Ave of ≥ 0.90 were considered indicative of satisfactory content validity for a panel of five experts (20).

Construct validity

To provide independent evidence for construct validation, participants were randomly allocated into two equal subsamples using computerized randomization. The first subsample was used for EFA, and the second for CFA. Prior to factor analysis, sampling adequacy was evaluated using the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity implemented in the psych package. KMO values of ≥ 0.70 and a significant Bartlett's test ($p < 0.05$) were considered indicative of data suitability for factor analysis (21). Multivariate normality was subsequently examined using Mardia's multivariate skewness and kurtosis statistics implemented in the *MVN* package (22).

EFA was conducted using the *psych* package with maximum likelihood (ML) extraction and direct oblimin rotation, allowing correlations among latent factors. The number of factors was determined primarily by parallel analysis and further evaluated using scree plot inspection, eigenvalues, and theoretical interpretability (23). Standardized factor loadings ≥ 0.40 were considered meaningful. Items were further evaluated for cross-loadings and conceptual alignment, and factors were considered structurally interpretable when they demonstrated conceptual coherence and, whenever possible, included at least three meaningful indicators (21). Thus, both the extracted factor solution and item-level psychometric performance were considered in determining whether refinement of the original WRSQ structure was warranted.

CFA was subsequently conducted on the independent validation sample using the *lavaan* package. The original 13-item, four-factor model

was evaluated first, followed by theoretically justified modifications based on modification indices and standardized residuals. Findings from the EFA, including the structural coherence and item-level performance of the extracted factors, were then integrated with the CFA results to specify and evaluate a refined measurement model. Model parameters were estimated using the robust maximum likelihood (MLR) estimator with robust standard errors and the Yuan–Bentler scaled chi-square statistic to account for violations of multivariate normality (24). Model fit was evaluated using the chi-square statistic (χ^2), normed chi-square (χ^2/df), comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). Model fit was considered acceptable when $\chi^2/\text{df} < 3$, CFI and TLI ≥ 0.90 , SRMR ≤ 0.08 , and RMSEA ≤ 0.08 (25).

Model modifications were undertaken only when supported by both substantive theory and modification indices. Correlated residuals were specified exclusively between items within the same latent construct that demonstrated conceptual overlap or shared measurement characteristics, with no residual correlations introduced across different constructs, thereby preserving the theoretical structure of the original instrument (21).

Convergent validity was evaluated using Composite Reliability (CR) and Average Variance Extracted (AVE) calculated from the CFA models using the *semTools* package. CR values ≥ 0.70 and AVE values ≥ 0.50 were considered indicative of acceptable convergent validity (21). Discriminant validity was assessed using Maximum Shared Variance (MSV) and the heterotrait–monotrait ratio of correlations (HTMT). Discriminant validity was considered acceptable when the AVE of each construct exceeded its corresponding MSV and HTMT values were < 0.85 (21). Inter-factor correlations were also examined to assess the relationships and potential overlap among latent constructs.

Internal consistency reliability

Internal consistency was assessed using Cronbach's alpha and McDonald's omega (ω),

calculated using the *psych* package. Values of ≥ 0.70 were considered indicative of satisfactory internal consistency (26). Corrected item–total correlations were also examined to evaluate item discrimination, with coefficients of ≥ 0.30 considered acceptable and values > 0.50 indicating strong item-scale associations (27).

Ethical considerations

Ethical approval for this study was obtained from the Human Research Ethics Committee of the Office of the Permanent Secretary, Ministry of Public Health, Thailand (Approval No. EC-035-2568), covering all participating study sites. Permission to translate and use the WRSQ was granted by the instrument developer. All participants received information regarding the study objectives and procedures and were informed of their right to refuse or withdraw from the study at any time without penalty. Written informed consent was obtained before participation. Participant anonymity and confidentiality were strictly maintained, and all data were used solely for research purposes.

Results

Demographic characteristics of participants

A total of 276 registered nurses completed the questionnaire. No missing data or extreme outliers were identified; therefore, all participants were included in the analyses. The sample was randomly divided into two independent subsamples of equal size, with 138 participants allocated to the EFA and 138 participants allocated to the CFA.

The overall mean age of the participants was 36.90 years (SD= 10.71), and the mean duration of nursing experience was 13.11 years (SD=11.12). Most participants were female (88.04%), single (54.71%), and held a bachelor's degree (81.16%). The majority were government officers (78.62%), with the largest proportion reporting a monthly income of 25,000–34,999 THB (29.35%). Practitioner-level registered nurses represented the largest professional group (32.61%), and most participants worked in inpatient care units (43.12%). Detailed demographic and professional characteristics are presented in Table 1.

Table 1. Demographic characteristics of participants (n=276)

Characteristics	N	%
Age (Mean $\pm$ SD)	36.90 $\pm$ 10.71	
Gender		
Female	243	88.04
Male	33	11.96
Marital status		
Single	151	54.71
Married	109	39.49
Other (Divorce, Widowed)	16	5.80
Education		
Doctoral degree	4	1.45
Master degree	48	17.39
Bachelor degree	224	81.16
Work experience (years) (Mean $\pm$ SD)	13.11 $\pm$ 11.12	
Salary (THB)		
15,000 – 24,999 THB	77	27.90
25,000 – 34,999 THB	81	29.35
35,000 – 44,999 THB	39	14.13
45,000 – 54,999 THB	33	11.96
$\geq 55,000$ THB	46	16.67
Employment status		
Government officers	217	78.62
Non-government officers	59	21.38
Position, Level		
Registered Nurse	69	25.00
Registered Nurse, Practitioner Level	90	32.61
Registered Nurse, Professional Level	72	26.09
Registered Nurse, Senior Professional Level	42	15.22
Registered Nurse, Expert Level	3	1.09
Work unit		
Intensive and emergency care units	83	30.07
In-Patient care unit	119	43.12
Out-Patient care unit	74	26.81

Note. THB = Thai Baht

Validity

Content validity

The translated Thai version of the WRSQ demonstrated excellent content validity. The scale-level content validity index based on the average method (S-CVI/Ave) was 1.00, and all 13 items achieved an item-level content validity index (I-CVI) of 1.00, indicating excellent agreement among the expert panel regarding the relevance, clarity, and cultural appropriateness of the translated items.

Construct validity

Exploratory factor analysis

The suitability of the data for exploratory factor analysis was supported by a Kaiser-Meyer-Olkin (KMO) measure of 0.83, with individual item KMO values ranging from 0.56 to 0.91, and a significant Bartlett's test of sphericity ($\chi^2 = 1010.52$, $df = 78$, $p < 0.001$).

Parallel analysis initially supported a four-factor solution, accounting for 66.79% of the total variance and broadly corresponding to the four domains of the original WRSQ. However, closer examination of the factor pattern revealed insufficient structural coherence within the Job Demand domain. Item 5 showed a strong loading on the Job Demand factor (0.99), whereas Item 6 did not load meaningfully on this factor, and Item 7 exhibited substantial cross-loading. Thus, although four factors were initially extracted, the Job Demand domain was not adequately represented by multiple coherent indicators. Removal of the psychometrically problematic Items 6 and 7 would have left Item 5 as the sole indicator of the construct (Table 2). Consequently, rather than interpreting the EFA as directly supporting a three-factor solution, these findings informed the conceptualization of a revised three-factor model excluding the Job Demand domain for subsequent CFA evaluation.

Table 2. Exploratory factor loadings and descriptive characteristics of the T-WRSQ Items (n=138)

ID	Items	Mean	S.D.	Skew	Kurt	WE	JD	JS	UW E
1.	I feel comfortable at work.	3.57	0.93	-0.53	0.34	0.79	0.07	-0.01	0.02
2.	I am given all the tools and instruments I need to do my job.	3.61	0.91	-0.33	-0.16	0.89	-0.08	-0.04	0.08
3.	It is clear to me how my work contributes to achieving the goals of my organization.	3.99	0.81	-0.39	-0.27	0.75	0.05	0.08	-0.19
4.	The equipment that I use is useful for carrying out my work; it complies with safety regulations and is of the latest generation.	3.76	0.83	-0.43	0.31	0.82	0.02	0.07	0.04
5.	My workload is excessive.	2.53	0.99	0.32	-0.06	0.01	0.99	0.02	0.01
6.	I have the freedom to decide when to take a break.	3.30	1.02	-0.28	-0.26	0.29	0.10	0.17	-0.26
7.	My work often interferes with my family, social, or personal duties.	2.86	1.12	0.09	-0.60	0.08	0.46	-0.02	0.40
8.	I can rely on the help of my colleagues.	3.85	0.88	-0.60	0.68	0.02	0.08	0.78	-0.07
9.	I can rely on the help of my boss.	3.80	0.90	-0.54	0.31	-0.03	-0.04	0.91	0.08
10.	Employees are always consulted regarding planned changes.	3.83	0.87	-0.50	0.34	0.28	0.09	0.54	-0.11
11.	I have been a victim of physical and/or verbal abuse at work.	3.65	1.20	-0.46	-0.85	-0.02	0.80	0.01	0.01
12.	In the workplace, I have to hide my real emotions, and I have to express others.	3.37	1.17	-0.26	-0.63	0.05	0.87	-0.01	-0.03
13.	In the workplace, there is discrimination related to gender, sexual orientation, religious faith, ethnicity, or other.	3.84	1.24	-0.79	-0.48	-0.04	0.79	0.05	0.05

Note. Factor loadings ≥ 0.40 are shown in bold; S.D. = standard deviation; WE = workplace environment; JD = job demand; JS = job support; UWE = unpleasant workplace experiences. EFA was performed using ML extraction with direct oblimin rotation.

Confirmatory factor analysis

The suitability of the validation sample for confirmatory factor analysis was supported by a Kaiser-Meyer-Olkin (KMO) measure of 0.81, with individual item KMO values ranging from 0.63 to 0.91, and a significant Bartlett's test of sphericity ($\chi^2 = 857.08$, $df = 78$,

$p < 0.001$). Multivariate normality was assessed using Mardia's multivariate skewness and kurtosis statistics. Significant multivariate skewness ($\chi^2 = 700.50$, $df = 220$, $p < 0.001$) and multivariate kurtosis ($z = 14.60$, $p < 0.001$) indicated violation of the assumption of multivariate normality. Accordingly, all CFA

models were estimated using the MLR estimator.

Model 1 evaluated the original 13-item, four-factor structure of the WRSQ. The model demonstrated inadequate fit to the data ($\chi^2 = 162.47$, $df = 59$, $\chi^2/df = 2.75$, CFI = 0.85, TLI = 0.80, SRMR = 0.12, RMSEA = 0.12, 95% CI = 0.10-0.14).

Model 2 retained the original 13-item, four-factor structure while allowing theoretically justified correlated residuals between Items 2 and 4 and between Items 5 and 7. Model fit improved ($\chi^2 = 118.08$, $df = 54$, $\chi^2/df = 2.19$, CFI = 0.91, TLI = 0.88, SRMR = 0.08, RMSEA = 0.09), although several fit indices remained below the recommended thresholds.

Following the initial four-factor EFA solution, the lack of structural coherence

within the Job Demand domain informed a revised 10-item, three-factor model. Item 5 loaded strongly (0.99), whereas Item 6 did not load meaningfully and Item 7 showed substantial cross-loading. Removing Items 6 and 7 would have left Item 5 as the sole indicator, insufficient to support a separate latent factor. The Job Demand domain was therefore excluded, and the revised model was evaluated using CFA (Model 3). It demonstrated the best fit ($\chi^2 = 53.13$, $df = 32$, $\chi^2/df = 1.66$, CFI = 0.96, TLI = 0.94, SRMR = 0.05, RMSEA = 0.07), with significant standardized factor loadings ranging from 0.51 to 0.87 ($p < 0.001$). The final CFA model is presented in Figure 1, with fit indices for all models summarized in Table 3.

Table 3. Fit indices of the factor structure of the T-WRSQ (n=138)

Goodness-of-fit statistics	Threshold values	First model	Second model	Third model
χ^2 (Chi-square)	$p > 0.05$	$p < 0.001$	$p < 0.001$	$p = 0.01$
χ^2/df (Normed Chi-square)	< 3.00	2.75	2.19	1.66
Comparative fit index	≥ 0.90	0.85	0.91	0.96
Tucker–Lewis index	≥ 0.90	0.80	0.88	0.94
Root mean square error of approximation	≤ 0.08	0.12	0.09	0.07
Standardized root mean square residual	≤ 0.08	0.12	0.08	0.05
Akaike information criterion	Lower AIC suggests a model with a better fit.	4393.94	4345.91	3234.28

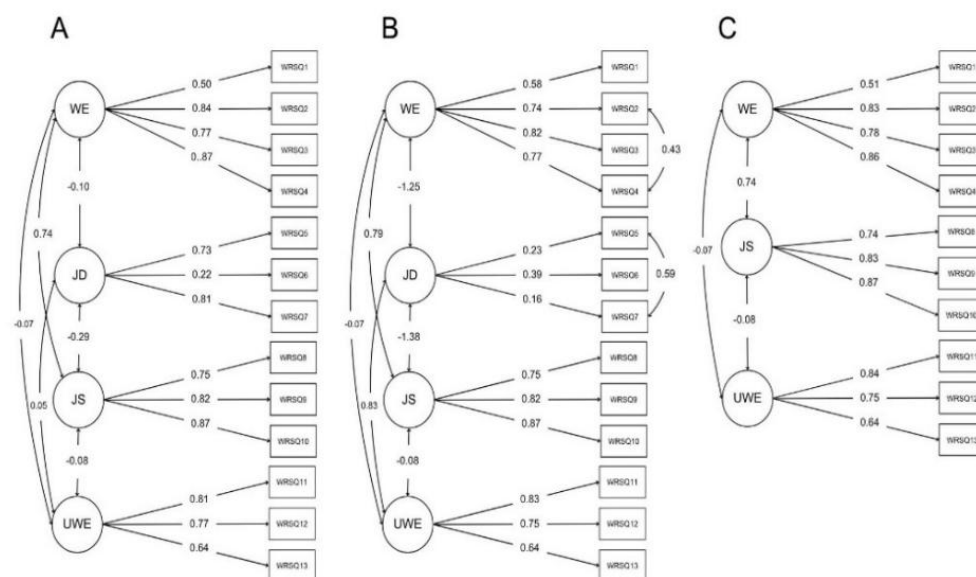


Figure 1. Standardized confirmatory factor analysis (CFA) models. (A) Original 13-item, four-factor model; (B) Modified 13-item, four-factor model with correlated residuals; and (C) Final 10-item, three-factor model. WE = workplace environment; JD = job demand; JS = job support; UWE = unpleasant workplace experiences.

Convergent and discriminant validity

Convergent and discriminant validity are presented in Table 4. WE, JS, and UWE demonstrated acceptable convergent validity (CR= 0.79–0.85; AVE= 0.56–0.66), with AVE values exceeding MSV. In contrast, JD showed inadequate convergent validity (CR= 0.48; AVE= 0.41). Additional assessment using the heterotrait–monotrait ratio of correlations (HTMT) showed that, in the original 13-item model, all factor pairs were

below the recommended threshold of 0.85 except JD–UWE (HTMT=1.37), indicating inadequate discriminant validity between these two domains and providing further evidence consistent with the structural concerns identified for JD. In the revised 10-item model, all HTMT values were below 0.85 (WE–JS=0.79, WE–UWE=0.09, and JS–UWE= 0.20). Inter-factor correlations in the revised model ranged from –0.08 to 0.74, further supporting the distinctness of the three retained domains.

Table 4. Convergent and discriminant validity of the T-WRSQ (n = 138)

Panel A. Composite reliability, average variance extracted, and maximum shared variance					
Construct	No. of items	CR	AVE	MSV	Interpretation
Workplace Environment	4	0.84	0.58	0.55	Acceptable
Job Demand	3	0.48	0.41	0.25	Poor convergent validity
Job Support	3	0.85	0.66	0.55	Acceptable
Unpleasant Workplace Experiences	3	0.79	0.56	0.25	Acceptable
Panel B. Heterotrait–monotrait ratios of correlations.					
Model	Factor pair			HTMT	
Original 13-item model	WE–JD			0.48	
	WE–JS			0.79	
	WE–UWE			0.09	
	JD–JS			0.31	
	JD–UWE			1.37	
	JS–UWE			0.20	
Revised 10-item, three-factor model	WE–JS			0.79	
	WE–UWE			0.09	
	JS–UWE			0.20	
Panel C. Inter-factor correlations of the revised 10-item model					
Factor pair				Correlation	
WE–JS				0.74	
WE–UWE				-0.07	
JS–UWE				-0.08	

Note: CR= composite reliability; AVE = average variance extracted; MSV = maximum shared variance; HTMT = heterotrait–monotrait ratio of correlations; WE = Workplace Environment; JD = Job Demand; JS = Job Support; UWE = Unpleasant Workplace Experiences. HTMT values < 0.85 indicate adequate discriminant validity.

Internal consistency reliability

The original 13-item WRSQ demonstrated good internal consistency, with a Cronbach's alpha of 0.80 and McDonald's omega (ω) of 0.83. The revised 10-item Thai WRSQ also demonstrated good overall internal consistency (Cronbach's alpha= 0.82; McDonald's ω = 0.85). At the domain level, good internal consistency was observed for WE (α = 0.86, ω = 0.87), JS (α = 0.85, ω = 0.85), and UWE (α = 0.83, ω = 0.83). Corrected item–total correlations for the revised scale ranged from 0.35 to 0.64, exceeding the recommended threshold of 0.30 and supporting the internal consistency of the retained items.

Discussion

This study translated, cross-culturally adapted, and psychometrically refined the WRSQ for use among registered nurses in Thailand. Overall, the Thai WRSQ demonstrated excellent content validity, satisfactory construct validity, and good internal consistency reliability. However, unlike the original Italian version, the original four-factor structure was not fully retained (7). Instead, the findings supported a revised 10-item, three-factor instrument comprising WE, JS, and UWE, which demonstrated stronger structural validity while preserving the overall purpose of assessing psychosocial work-related stress. These findings extend previous evidence by demonstrating that successful cross-cultural adaptation involves not only achieving linguistic equivalence but also evaluating whether the

underlying measurement structure adequately reflects workplace experiences within the target population (12, 17, 20, 28).

The most important finding of this study was that the original JD domain was not retained in the final measurement model. This refinement was guided by both empirical evidence and conceptual considerations rather than statistical model optimization alone. Importantly, the decision was not based on uniformly weak performance across all three items. Item 5 demonstrated a strong loading on the JD factor (0.99), whereas Item 6 did not load meaningfully on this factor and Item 7 exhibited substantial cross-loading, indicating insufficient structural coherence of the domain. Excluding Items 6 and 7 would have left Item 5 as the sole indicator of JD, resulting in a single-indicator latent construct that would provide insufficient representation of the intended construct (21, 23). Consequently, exclusion of the JD domain represented the most parsimonious and psychometrically defensible solution.

More importantly, the present findings suggest that the limitation may reside in the operationalization of the original JD construct rather than in the theoretical importance of job demands themselves. Examination of the original items indicates that they captured three conceptually distinct occupational experiences: excessive workload, autonomy over work scheduling, and interference between work and personal life. Although these experiences are interrelated, contemporary occupational stress theories conceptualize them differently. Within the Job Demands–Resources (JD–R) model, excessive workload is regarded as a job demand, autonomy is considered a job resource, whereas work–family interference is generally viewed as a consequence of prolonged occupational demands rather than a demand itself (29). Likewise, the Job Demand–Control model distinguishes decision latitude from job demands because greater autonomy moderates, rather than constitutes, occupational demands. Consequently, combining these heterogeneous indicators into a single latent construct may have reduced conceptual coherence, particularly when applied in a healthcare system and cultural

context different from that in which the WRSQ was originally developed.

This interpretation may also explain why the revised structure differed from that reported by Cedrone and Stacchini (7). Nurses working in public hospitals under the Ministry of Public Health routinely experience persistent workforce shortages, increasing patient acuity, rotating shifts, expanding administrative responsibilities, and sustained service demands associated with Thailand's universal health coverage system (1, 4, 14). Within this environment, excessive workload is often perceived as an inherent component of professional practice rather than an exceptional occupational demand. Similarly, opportunities to decide when to take breaks are largely determined by staffing levels, patient dependency, and unit workflow rather than individual discretion, meaning that this item may reflect organizational constraints more than personal job demands (15). Likewise, interference between work and family responsibilities is influenced not only by occupational demands but also by family roles, social expectations, and cultural responsibilities outside the workplace (1). Collectively, these contextual influences may explain why the three items failed to represent a single homogeneous construct among Thai nurses.

Broader sociocultural characteristics may have further contributed to the revised factor structure. Thai nursing practice is embedded within a professional culture that emphasizes respect for hierarchy, collective responsibility, interpersonal harmony, and commitment to patient care (13, 15). Within such environments, organizational support, workplace climate, and interpersonal relationships may exert greater influence on nurses' perceptions of occupational well-being than workload alone (8, 14). Conversely, experiences such as workplace conflict, discrimination, or inadequate managerial support may represent more salient deviations from expected professional norms and therefore emerge as stronger indicators of psychosocial work-related stress. Although these contextual mechanisms were not directly examined in the present study, they provide a plausible explanation for why WE, JS, and UWE

demonstrated clearer structural coherence than the original JD domain.

Importantly, these findings should not be interpreted as suggesting that job demands are unimportant among Thai nurses. Extensive evidence consistently identifies excessive workload, staffing shortages, work-family conflict, and emotional demands as major determinants of burnout, psychological distress, turnover intention, and quality of care (1, 29). Rather, the present findings indicate that the original three items may not adequately capture the multidimensional nature of occupational demands experienced in contemporary Thai nursing practice. Future refinement of the WRSQ may therefore benefit from incorporating culturally relevant indicators reflecting emotional demands, administrative workload, documentation burden, staffing adequacy, moral distress, and increasing care complexity to provide a more comprehensive representation of job demands within Thai healthcare settings.

The present findings are not unique to the WRSQ. Refinement of item composition has frequently been reported during instrument development and cross-cultural adaptation when empirical evidence indicates that the original measurement structure does not adequately represent the target population. For example, Badolamenti, Biagioli (30) refined the Emotional Labor Scale for Nurses by removing items with conceptual redundancy or inadequate psychometric performance to improve construct validity and cultural applicability. Likewise, our previous validation of the Thai Emotional Labor Scale (T-ELS) required removal of several items because of cross-loadings and semantic overlap, resulting in a shorter instrument with improved construct validity while preserving its theoretical framework (31). Collectively, these studies reinforce that refinement of item composition is an expected outcome of rigorous psychometric evaluation and should be regarded as strengthening, rather than weakening, the validity of cross-culturally adapted instruments.

Taken together, the present study demonstrates that cross-cultural adaptation should not be viewed as a process of reproducing an existing measurement model unchanged. Instead, it requires balancing theoretical

consistency with empirical evidence to ensure that retained constructs remain conceptually meaningful and psychometrically robust within the target population. The revised Thai WRSQ therefore represents not only a culturally adapted instrument but also an empirically refined measure that more accurately reflects psychosocial work-related stress among Thai registered nurses while preserving the overarching theoretical purpose of the original WRSQ.

This study has several strengths. The translation and cross-cultural adaptation followed internationally recognized guidelines, including forward translation, back translation, expert review, and pilot testing, ensuring linguistic, semantic, conceptual, and cultural equivalence. Psychometric evaluation adhered to current COSMIN recommendations and employed independent EFA and CFA, providing robust evidence for structural validity. Rather than simply reproducing the original factor structure, this study empirically refined the instrument using complementary evidence from construct validity and reliability analyses, resulting in a shorter and psychometrically stronger measure for Thai registered nurses.

Several limitations should be acknowledged. Participants were recruited exclusively from Ministry of Public Health hospitals, which may limit generalizability to other healthcare settings. The cross-sectional design precluded evaluation of test-retest reliability, responsiveness, and predictive validity. In addition, measurement invariance across healthcare settings and demographic subgroups was not examined; therefore, the equivalence and stability of the revised factor structure across different groups remain to be established. Although the revised three-factor structure demonstrated satisfactory psychometric performance, exclusion of the original JD domain indicates that this construct requires further conceptual and psychometric refinement rather than being considered unimportant.

Future research should develop culturally relevant indicators of nursing job demands, supported by qualitative studies exploring how Thai nurses conceptualize occupational demands. Further psychometric

evaluation, including measurement invariance across healthcare settings and demographic subgroups, together with longitudinal assessment of reliability and predictive validity, is warranted to strengthen the robustness and generalizability of the revised T-WRSQ.

Conclusion

This study successfully translated, cross-culturally adapted, and psychometrically refined the WRSQ for Thai registered nurses. Although the overarching conceptual purpose of the original WRSQ was preserved, empirical evaluation indicated that its original four-factor structure was not fully supported in the Thai nursing context. Instead, a revised 10-item instrument comprising WE, JS, and UWE demonstrated satisfactory structural validity, convergent validity, discriminant validity, and internal consistency reliability.

The findings highlight that cross-cultural adaptation should extend beyond linguistic translation to include empirical evaluation and, when necessary, refinement of the measurement structure to ensure conceptual coherence and cultural relevance. The revised Thai WRSQ provides a culturally appropriate and psychometrically sound instrument for assessing psychosocial work-related stress among Thai registered nurses, while contributing to the growing evidence supporting rigorous cross-cultural psychometric evaluation of occupational health instruments.

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Conflict of interest

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