Psychometric Properties of Effort–reward Imbalance Questionnaire among Nurses

Wisarut Srisintorn, Aporntip Buapeth*

Abstract: Job stress is an important occupational risk factor for nurses that may affect both their physical and mental health, as well as the health of their patients. The Effort-reward Imbalance Questionnaire is a popular tool that can be used to monitor job stress among nurses. However, several versions of the translated instrument demonstrated different structures of subscales than the original version, and these may affect its validity. Hence, within we report on construct validity of the Thai version of this instrument, and its association with psychological health among nurses working within a university hospital in Southern Thailand. The study design was a cross-sectional survey. The questionnaire measured job strain, using the Thai Effort-reward Imbalance Questionnaire, and psychological health, using the Thai General Health Questionnaire-28. Exploratory and confirmatory factor analysis was conducted to evaluate the construct validity. Association between job strain and psychological health was evaluated by logistic regression models.

The analysis included 725 nurses. Factor analysis found that effort and reward both consisted of two subscales, which demonstrated good fit across several goodness of fit indices and acceptable reliability. The prevalence was 34.5% for high job strain, and 19.9% for poor psychological health. The modified high job strain and high overcommitment were statistically significantly associated with poor psychological health, with an odds ratio of 1.74 and 3.42, respectively.

Further study should be conducted to confirm the construct of the Thai Effort-rewards Imbalance Questionnaire among nurses found in this study. Prevalence of job strain and poor psychological health was high which indicates the need for further interventions.

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Introduction

Occupational stress has been recognized by the International Labour Organization (ILO) as an important problem for all workers around the world. The imbalance between perceived job demand and the perceived individual resources as well as ability to cope with these demands may impact workers' health, safety, and wellbeing; including work

accidents, cardiovascular diseases, musculoskeletal disorders, burnout, and depression.[1]

Nursing is a professional career, dedicated to the well-being of others. However, nurses themselves are exposed to many kinds of occupational hazards. These include exposure to bloodborne and airborne pathogens, needlesticks and sharp injuries, chemical exposure such as latex and antineoplastic drugs, workplace violence, shiftwork and long working hours, and heavy lifting and working postures.[2] Job stress among nurses does not only impact health and the wellbeing of nurses, but also impacts the quality of care to patients. The effect of this is a reduction in the nursing workforce due to sickness absence and early retirement.[3-5] Surveillance of the level of job stress, health, and wellbeing of nurses may help guide employers to provide appropriate programs to maintain physical and psychological health for nurses, as well as the quality of care to patients.

Among the most popular psychological models developed to evaluate job stress is the Effort-Reward Imbalance (ERI) model.[6] The model consisted of 'effort,' 'reward,' and 'overcommitment' scales which has been developed into the Effort-Reward Imbalance Questionnaire (ERIQ). Psychometric properties of the questionnaire were tested among workers in five countries across Europe. They found that the questionnaire consisted of three scales as in the proposed model. Additionally, the reward scale consisted of esteem, salary and career, and job insecurity subscales.[7] In Asia, where several countries are progressing to become developed countries, the quality of work-life and its consequences have become subjects of interest, especially in healthcare workers. Several studies conducted in Asian countries found an association between ERI and adverse outcomes, either measured as somatic symptoms or psychological illnesses.[8-11]

Recently, Buapetch et al.[12] developed the Thai version of the Effort-Reward Imbalance Questionnaire (Thai ERIQ). This was administered to a group of garment-factory workers and was subjected to confirmatory analysis. Their model components achieved an acceptable model fit.[12] However, contrary to the original scale, they did not find subscales of reward. A study conducted among healthcare workers in six countries in Latin-America found their reward scale did not conform with the original construct in two countries.[13]

In development of a tool to survey the occupational stress among nurses, evaluation of the psychometric properties of the tool allows us to understand how the respondents comprehend the language and interpret statement wording. Therefore, we aimed to evaluate the psychometric properties of the Thai ERIQ and its association with psychological health among nurses.

Literature review

The ERI model is among the most popular psychological models to evaluate job stress. It was first postulated in 1996 by Siegrist, Siegrist, and Weber.[6] The model defined that 'effort' at work is spent as part of a contract, based on the norm of social reciprocity, wherein 'rewards' are provided in terms of money, esteem, career opportunities, and job security. The experience of a lack of reciprocity in terms of high 'costs' and low 'gains' elicits negative emotions in exposed people, and long-term job strain increases susceptibility to illnesses. Another component of the ERI model, 'overcommitment,' defined the pattern of excessive commitment to work and a high need for approval. Those with high level of overcommitment are at an increased risk of job strain from asymmetrical effort-reward exchange.[7] Conceptually, high effort combined with low reward leads to psychological job strain, and a high level of overcommitment may act as an independent or synergistic factor to the occurrence of adverse health outcomes.[14]

The model was developed into the first version of the ERIQ that consisted of 46 items (6 for effort, 11 for reward, and 29 for overcommitment).[15]

However, 29 items in the overcommitment scale were considered too long for epidemiologic research. Thus, the 23-item version of the ERIQ, which reduced the number of items in overcommitment scale to 6, was produced. The 23-item ERIQ was subjected to confirmatory factor analysis in several groups of workers across 5 countries in Europe; this yielded an acceptable reliability (GFI 0.990–0.997, AGFI 0.921–0.991, RMR 0.009–0.063).[7] This 23-item ERIQ has been translated and used in many studies worldwide.

In 2008, Buapeth et al. developed the Thai ERIQ by conducting a translation and back-translation of the 23-item English version of the ERIQ, then administered the questionnaire to a group of workers from garment factories.[12] Their confirmatory factor model consisted of effort, reward, and overcommitment scales and all were loaded into a second-ordered ERI scale; however, there were no subscales for reward. They reported an excellent goodness of fit across all indices (GFI 0.99, AGFI 0.98, RMSEA 0.00, and RMR 0.02), and the Cronbach's alpha of individual subscales were 0.66–0.81.

A literature review of prospective studies found that high job strain, as measured by ERIQ, increased risk of cardiovascular diseases, stroke, and depressive disorders.[14] Another study combined data from prospective cohort of 11 European countries and found that the hazard ratio of coronary heart diseases among the ERI imbalance group was 1.16 times (95% CI 1.00–1.35) higher those without imbalance.[16] Those studies provide evidence of causal-effect association between job stress and adverse physical and mental health outcomes which can be prevented by interventions that reduce job stress in workplaces.

Study aims

To the best of our knowledge, there was no study regarding the factorial validity of the Thai ERIQ and its association with psychological health among healthcare workers in Thailand. Hence, this study aimed to evaluate the psychometric properties of the Thai ERIQ, and its association with psychological health among a group of nurses within a university hospital in Southern Thailand.

Methods

Design: A cross-sectional survey. This report follows STROBE Statement—Checklist of items that should be included in reports of cross-sectional studies.

Sample and setting: The study site was with an 800-bed governmental university hospital, in Southern Thailand. The sample size was determined to evaluate the construct validity of the Thai ERIQ among nurses. A ratio of 20 subjects to 1 item was suggested by Hair et al.[17] The Thai ERIQ consisted of 23 items; hence, the minimum number of participants required was 460. We predicted a response rate of 60%; thus, 767 nurses were required to be invited for participation. According to the information from the nursing department, approximately 1,000 nurses were employed during the time of study. Therefore, we decided to invite all nurses working at the hospital during the study period (June to August 2013).

Study tools: Our questionnaire consisted of three parts arranged in the order of demographic variables, job strain, and psychological health.

The *Demographic Characteristics* included age, gender, job (chief-nurse, nurse-manager, or regular-nurse), and education level (bachelor, master, PhD). Chief-nurses were those in the management committee of the nursing department, nurse-managers were heads of each operational unit, and regular-nurses were those responsible for patient care tasks within each unit.

Job strain was measured with 23-item Thai ERIQ which consists of three scales: effort (item 1-6), reward (item 7-17), and overcommitment (item 18-23). All items are measured by a 4-point scale (1 - strongly disagree, 2 - disagree, 3 - agree, and 4 - strongly agree). Items 10–13, and 20 are negative phrases in which their scores must be reversed before the analysis.

Psychological health was measured by a 28-item of the *Thai version of the General Health Questionnaire* (Thai GHQ-28). In brief, the Thai GHQ-28 was developed by Nilchaikovit et al.[18] by a translation and back-translation of the original GHQ questionnaire.[19] This was administered to 100 participants, who also underwent an interview by a psychiatrist. All items are measured by a 4-point scale (better than usual, same as usual, worse than usual, and much worse than usual). The responses were dichotomized as suggested by Nilchaikovit et al.[18]; wherein 'worse than usual' or 'much worse than usual' were scored as one, and the rest were score as zero. The possible range of score is 0-28. A sum score of 6 or higher is considered as having a psychological problem, which had a sensitivity of 88.2% and specificity of 81.3%. In addition, the *Thai GHQ-28* comprises four subscales, each consisting of 7 items: somatic symptoms, anxiety and insomnia, social dysfunction, and severe depression.

Examples of items are given in the discussion section of this paper. The questionnaire was pilot-tested in ten nurses who worked in the out-patient clinics. They were able to answer all items without problem, and had no suggestion for questionnaire modification. Cronbach's alpha coefficients of Thai ERIQ among the participants were 0.81 for effort, 0.70 for reward, and 0.75 for overcommitment.

Data collection: The participant information sheet, anonymous questionnaire, and envelopes were prepared in sets. The nursing department helped introduce the research project to all nurses, and the questionnaires were distributed through the nurse-managers of each ward. We asked the participants to return the sealed questionnaire to the nursing department office, or to the office of the primary investigator within one month.

Data analysis: Data analysis was performed with R program.[20] Analytic packages *psych*[21] and *lavaan*[22] were used for exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), respectively. A pre-analytic check was performed. Bartlett's test with a $p < 0.05$ indicates significant correlations among variables and a Kaiser-Meyer-Olkin (KMO) test of ≥ 0.7 indicates that the correlation between variables can be accounted for by a smaller set of factors.[23] Polychoric correlation coefficient of < 0.9 was used to evaluate multicollinearity.[24] Lastly, items with a corrected item-total correlation of < 0.3 were excluded from factor analysis.[25]

The construct validity of the ERIQ among nurses was conducted in a series of analyses. First, Horn's Parallel Analysis was used to extract factor number. Then, principal axis factoring was used to identify the latent factor structure. Oblimin rotation was used because the factors were assumed to be correlated.

EFA was performed using the following criteria to determine the factor adequacy. Items with factor loading of ≥ 0.32 were considered as significant. To maintain a simple structure, items with significance loading on more than one factor were rejected. Factors with a minimum of three significance items, and that were theoretical meaningful, were considered adequate.

A series of CFA was performed to evaluate the construct validity of the modified ERIQ. The estimation was conducted with the maximal likelihood method, with robust standard error and Yan-Bentler test statistic (MLR). We considered three fit indices, the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA). For CFI and TLI, a score of ≥ 0.90 indicated an acceptable fit, and a score of ≥ 0.95 indicated a good fit. For RMSEA, a score of ≤ 0.05 was considered a good fit, and a score of ≤ 0.08 indicated a fair fit.[26] Lastly, reliability of the modified ERIQ was evaluated using Cronbach's alpha.

According to Siegrist and Wahrendorf, two approaches can be used for the analysis of association between ERIQ and health outcomes.[14] The first approach considers effort-reward imbalance in the form of a ratio. In this approach, the effort-reward imbalance ratio (ERI ratio) was calculated by the sum score of the effort scale divided by the sum score of

the reward scale. This was then multiplied by the ratio between number of items in the reward scale and the effort scale to balance out the difference in number of items between effort and reward scales. Participants with ERI ratio > 1.0 were considered as having a high job strain. Another approach was to consider effort and reward scales individually. Therefore, high effort and high reward were classified for those with their respective scores being higher than the 66th percentile.

In both approaches, we classified nurses with overcommitment scores higher than the 66th percentile as having a high level of overcommitment. For the study outcome, a Thai GHQ-28 score of 6 or higher was considered as having poor psychological health. We conducted the multivariate logistic regression of association between ERIQ and psychological health using both approaches, and controlling for age, job, and education level. Additionally, we evaluated if overcommitment acted as an effect modifier for the association between ERI ratio (or individual effort and reward scores) and psychological health. A p-value of < 0.05 was considered as statistically significant.

Ethical considerations: This study was conducted in accordance with the Declaration of Helsinki and its later amendments. The research proposal was approved by the Office of Human Research Ethics Committee of Faculty of Medicine, Prince of Songkla University, Thailand (REC.56-383-09-1). Invitation and informed consent were conducted through the information sheet that explained the background and purpose of the study, eligible criteria, a brief description of the questionnaire, potential risks and benefits, rights of the participant, and information on how to contact the author and the human research ethics committees. Personal, identifiable information was not collected. Waiver of documentation of consent was approved by the human research ethics committee based on the criteria that the questionnaire was anonymous and response to the questionnaire was considered as action consent.

Results

Participant characteristics

From the 1,071 questionnaires distributed, 739 nurses (69.0%) responded to our questionnaire. We excluded 14 questionnaires in which the Thai GHQ-28 was incomplete. Thus, 725 participants were included for further analysis. Participants consisted of seven chief-nurses, 30 nurse-managers, and 688 regular-nurses. **Table 1** presents the demographic characteristics and psychological health of said nurses. Most were female (97.7%) and had graduated up to bachelor's degree level (90.8%). The average score of the Thai GHQ-28 was 3.2 (SD 4.50), with 144 (19.7%) participants being considered as having a poor psychological health. Regarding the subscales of the Thai GHQ-28, most frequently reported symptoms were in the somatic domain (Mean 1.7, SD 2.10), followed by anxiety and insomnia domains (Mean 0.8, SD 1.65). Very few participants reported symptoms in either the social dysfunction or the depression domains.

Table 1 Demographic characteristics and prevalence of poor psychological health among participants (N = 725)

Variables	N	Overall (N = 725)	Thai GHQ-28		p-value
			Normal (N = 581)	Poor (N = 144)	
Age	722				0.16*
Mean (SD)		34.2 (9.7)	34.5 (9.8)	32.9 (9.1)	
Median [IQR]		31 [25, 41]	32 [25, 41]	30 [25, 39]	
Range		22 - 60	22 - 60	22 - 57	
Job	725				0.76*
Chief nurse		7 (1.0%)	6 (1.0%)	1 (0.7%)	
Manager nurse		30 (4.1%)	26 (4.5%)	4 (2.8%)	
Regular nurse		688 (94.9%)	549 (94.8%)	139 (96.5%)	

Table 1 Demographic characteristics and prevalence of poor psychological health among participants (N = 725)(Cont.)

Variables	N	Overall (N = 725)	Thai GHQ-28		p-value
			Normal (N = 581)	Poor (N = 144)	
Gender	724				0.76*
Male		17 (2.3%)	13 (2.2%)	4 (2.8%)	
Female		707 (97.7%)	568 (97.8%)	139 (97.2%)	
Marital status	721				0.33*
Single		425 (58.9%)	336 (57.9%)	89 (63.1%)	
Married		261 (36.2%)	214 (36.9%)	47 (33.3%)	
Divorced		29 (4.0%)	26 (4.5%)	3 (2.1%)	
Widowed		6 (0.8%)	4 (0.7%)	2 (1.4%)	
Education	725				0.75*
Bachelor		658 (90.8%)	526 (90.5%)	132 (91.7%)	
Master		67 (9.2%)	55 (9.5%)	12 (8.3%)	
Thai GHQ-28 score	725				< 0.01†
Mean (SD)		3.2 (4.5)	1.4 (1.7)	10.5 (4.9)	
Median [IQR]		1 [0, 4]	1 [0, 3]	9 [7, 12]	
Range (possible range 0-28)		0-28	0-5	6-28	
Somatic domain	725				< 0.01†
Mean (SD)		1.7 (2.1)	0.9 (1.4)	4.6 (1.8)	
Median [IQR]		0 [0, 3]	0 [0, 2]	5 [4, 6]	
Range (possible range 0-7)		0-7	0-5	0-7	
Anxiety domain	725				< 0.01†
Mean (SD)		0.8 (1.6)	0.2 (0.5)	3.2 (2.4)	
Median [IQR]		0 [0, 1]	0 [0, 0]	3 [1, 5]	
Range (possible range 0-7)		0-7	0-4	0-7	
Social dysfunction domain	725				< 0.01†
Mean (SD)		0.6 (1.2)	0.3 (0.6)	1.9 (1.9)	
Median [IQR]		0 [0, 1]	0 [0, 0]	1 [0, 3]	
Range (possible range 0-7)		0-7	0-4	0-7	
Depression domain	725				< 0.01†
Mean (SD)		0.2 (0.8)	0.0 (0.1)	0.8 (1.7)	
Median [IQR]		0 [0, 0]	0 [0, 0]	0 [0, 1]	
Range (possible range 0-7)		0-7	0-2	0-7	

* Fisher's exact test, † Wilcoxon rank sum test

Factor analysis of ERIQ

The results of Bartlett's test of sphericity indicated that a statistically significant correlation between items (Chi-square = 7341.59, df = 253, p-value < 0.01) and the KMO statistics was 0.83, which suggested that the association between items can be explained by a fewer number of factors. However, the corrected item-total correlation score of items 7, 8, 9, and 14 were lower than 0.32. Hence, these four items were removed from further analysis.

Horn's parallel test suggested that five factors should be retained. EFA also showed that a five-factor solution was adequate in which all factors consisted of three to four items, and there were no cross-loading items. Overall, 54% of total variance was explained by the model and each factor accounted for 8% to 12% of total variance **(Table 2)**.

Table 2 Pattern matrix from exploratory factor analysis of Effort-Reward Imbalance Questionnaire among nurses (n = 702)

	Questionnaire item	Factors					Communality
		Over-commitment	Time constraint	Recognition for hard work	Workload	Justice and promotion	
1	I have constant time pressure due to a heavy workload	0.03	***0.65***	-0.09	0.19	0.02	0.66
2	I have many interruptions and disturbances in my job	-0.03	***0.75***	0.00	0.02	-0.01	0.57
3	I have a lot of responsibility in my job	0.05	0.31	-0.07	***0.50***	0.18	0.51
4	I am often pressured to work overtime	0.02	***0.57***	-0.01	0.13	-0.18	0.57
5	My job is physically demanding	-0.07	0.18	-0.01	***0.57***	-0.10	0.51
6	Over the past few years, my job has become more and more demanding	0.09	0.02	0.01	***0.82***	-0.07	0.78
10	I am treated unfairly at work	-0.05	-0.09	0.11	-0.08	***0.49***	0.42
11	My job promotion prospects are poor	0.02	0.01	0.29	-0.19	***0.52***	0.60
12	I have experienced or I expect to experience an undesirable change in my work situation	-0.10	-0.19	-0.11	-0.03	***0.45***	0.34
13	My employment security is poor	-0.12	-0.13	0.17	0.08	***0.45***	0.40
15	Considering all my efforts and achievements, I receive the respect and prestige I deserve at work	-0.04	-0.06	***0.84***	0.08	0.04	0.75
16	Considering all my efforts and achievements, my job promotion prospects are adequate	0.02	0.04	***0.89***	-0.03	0.01	0.79
17	Considering all my efforts and achievements, my salary/income is adequate	0.04	0.02	***0.42***	-0.25	0.09	0.32
18	I get easily overwhelmed by time pressures at work	0.14	***0.56***	0.02	-0.04	-0.11	0.43
19	As soon as I get up in the morning I start thinking about work problems	***0.55***	0.32	-0.04	-0.17	-0.05	0.53
20	When I get home, I can easily relax and 'switch off' work	***0.55***	0.01	-0.16	0.09	0.12	0.35
21	People close to me say I sacrifice too much for my job	***0.45***	-0.01	0.16	0.15	-0.16	0.31
22	Work rarely lets me go, it is still on my mind when I go to bed	***0.95***	-0.03	0.00	0.01	0.00	0.88
23	If I postpone something that I was supposed to do today I'll have trouble sleeping at night	***0.63***	-0.02	0.00	0.08	-0.05	0.44
Proportion variance explained		0.13	0.12	0.11	0.10	0.08	
Cumulative variance explained		0.13	0.25	0.36	0.46	0.54	

Bold-italic face numbers represent highest pattern coefficients of each item

Excluded items: 7 - I receive the respect I deserve from my superiors, 8 - I receive the respect I deserve from my colleagues, 9 - I experience adequate support in difficult situations, 14 - My current occupational position adequately reflects my education and training

The confirmatory factor model was guided by EFA. The first factor, "Time constraint," consisted of items 1, 2, 4, and 18. The second factor, "Workload," consisted of items 3, 5, and 6. These two factors were loaded into the second-ordered "Effort" scale. The third factor, "Justice and promotion," consisted of items 10, 11, 12, and 13. The fourth factor, "Recognition for hard work," consisted of items 15, 16, and 17. These two factors were loaded into the second-ordered "Reward" scale. "Overcommitment" scale consisting of items 19 to 23. Lastly, the effort, reward, and overcommitment scales were loaded into a third-ordered "ERI" scale. The standardized factor loading of manifested variables were between 0.38 and 0.83. Goodness of fit indices of this model were acceptable for CFI (0.926), TLI (0.914), and

RMSEA (0.050, 95% CI 0.044–0.057). Hence, the modified scales of effort, reward, and overcommitment consisted of 7, 7, and 5 items with Cronbach's alpha coefficients of 0.82, 0.73, and 0.74, respectively. **Figure 1** shows the CFA diagram and standardized factor loading of the modified ERIQ among nurses.

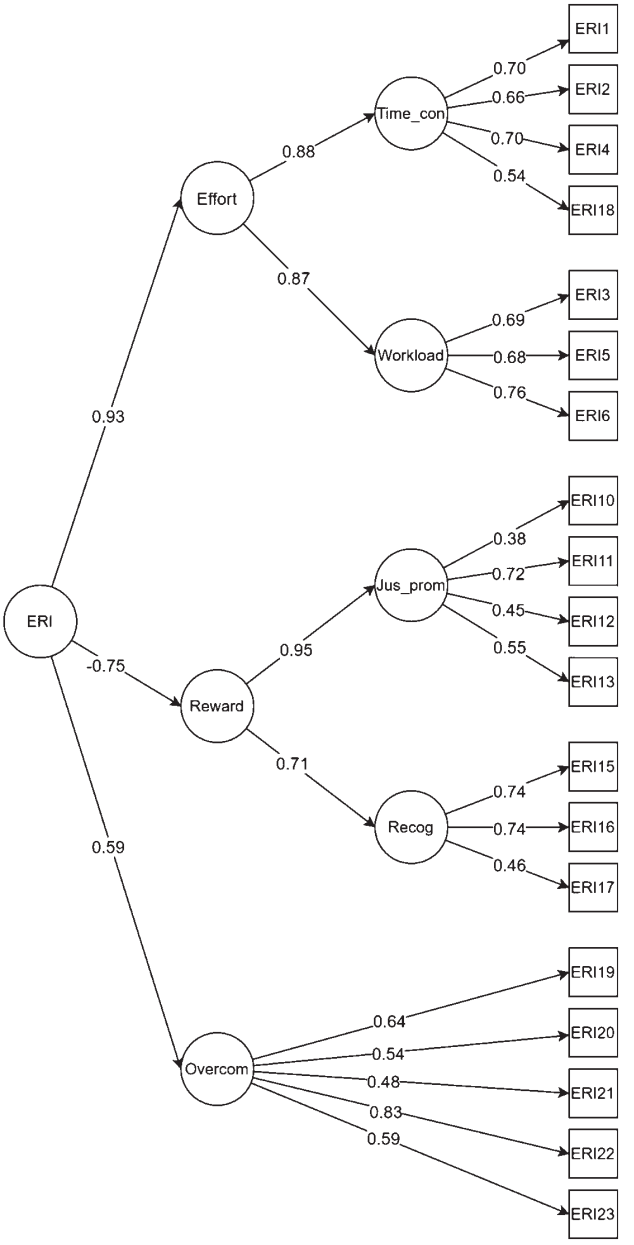

Figure 1 Diagram of confirmatory factor analysis and standardized factor loadings of modified ERIQ among nurses. *Time_con:* time constraint, *Jus_prom:* justice and promotion, *Recog:* Recognition for hard work, *Overcom:* overcommitment.

Association between ERIQ and psychological symptoms among nurses

Table 3 presents the scores and percentage of the modified ERIQ among nurses. The median scores of the modified ERIQ were 18 (Interquartile range; IQR 17, 20) for the effort scale, 20 (IQR 18, 21) for the reward scale, and 11 (IQR 10, 13) for the overcommitment scale. The median score of the ERI ratio was 0.95 (IQR 0.82, 1.07) and 459 participants (35%) were considered to have high job strain. The median score of overcommitment was 11 (IQR 10, 13) and 192 participants (27%) were considered as highly overcommitted. Compared to nurses with normal psychological health, those with poor psychological health had a significantly higher proportion of high ERI ratio (53% vs. 30%, p-value < 0.01), high effort (37% vs. 17%, p-value < 0.01), and a high level of overcommitment (50% vs. 21%, p-value < 0.01). On the other hand, nurses with poor psychological health had a lower proportion of high reward than nurses with normal psychological health (12% vs. 37%, p-value < 0.01).

Table 3 Scores and percentage of modified ERIQ among nurses (N = 725)

Variables	N	Overall (N = 725)	Thai GHQ-28		p-value
			Normal (N = 581)	Poor (N = 144)	
Effort	713				
Median [IQR]		18 [17, 20]	18 [17, 20]	20 [18, 21]	<0.01*
Range		9-27	9-26	12-27	
Normal (9-20)		565 (79.2%)	476 (83.2%)	89 (63.1%)	<0.01†
High (21-27)		148 (20.8%)	96 (16.8%)	52 (36.9%)	
Reward	710				
Median [IQR]		20 [18, 21]	20 [18, 21]	19 [17, 20]	<0.01*
Range		10-28	10-28	11-26	
Normal (10-20)		484 (68.2%)	358 (63.1%)	126 (88.1%)	<0.01†
High (21-28)		226 (31.8%)	209 (36.9%)	17 (11.9%)	
ERI ratio	701				
Median [IQR]		0.95[0.82, 1.07]	0.91 [0.80, 1.05]	1.05 [0.93, 1.24]	<0.01*
Range		0.36-2.10	0.36-2.10	0.63-1.92	
Normal (0.36-1.00)		459 (65.5%)	393 (70.1%)	66 (47.1%)	<0.01†
High (1.01-2.20)		242 (34.5%)	168 (29.9%)	74 (52.9%)	
Overcommitment	717				
Median [IQR]		11 [10, 13]	11 [10, 12]	12.5 [11, 14]	<0.01*
Range		5-20	5-18	6-20	
Normal (5-12)		525 (73.2%)	453 (79.1%)	72 (50.0%)	<0.01†
High (13-20)		192 (26.8%)	120 (20.9%)	72 (50.0%)	

*Wilcoxon rank sun test, † Pearson's Chi-squared test

Table 4 shows the logistic models of association between the modified Thai ERIQ and the Thai GHQ-28. Adjusted model A shows that the odds of having poor psychological health among nurses with high job strain was 1.74 times higher than those with a normal level of job strain, which was statistically significant (95% CI 1.14, 2.65). Likewise, those with high levels of overcommitment had statistically significantly higher odds of having poor psychological health (OR 3.42; 95% CI 2.24, 5.24) than those with a normal level of overcommitment. When considering these three scales individually (adjusted model B), odds of poor psychological health were significantly associated with effort (OR 1.86; 95% CI 1.17, 2.94), reward (OR 0.31; 95% CI 0.17,

0.53), and overcommitment (OR 2.99; 95% CI 1.95, 4.59). Testing for interaction were not statistically significant for both models (p-value 0.29–0.45; data not shown).

Table 4 Association between modified ERI ratio, overcommitment, and poor psychological health among nurses (N = 688)

Variables	Unadjusted		Adjusted model A		Adjusted model B	
	OR	95% CI	OR	95% CI	OR	95% CI
Age	0.98	(0.96, 1.00)	0.98	(0.95, 1.00)	0.97	(0.95, 1.00)
Job						
Chief nurse	—	—	—	—	—	—
Nurse manager	0.96	(0.11, 20.6)	0.44	(0.05, 9.77)	0.39	(0.04, 8.80)
Regular nurse	1.49	(0.25, 28.4)	0.60	(0.09, 12.2)	0.50	(0.07, 10.3)
Education level						
Bachelor	—	—	—	—	—	—
Master	0.90	(0.45, 1.68)	1.03	(0.47, 2.14)	1.17	(0.51, 2.54)
Effort group						
Normal (9–20)	—	—			—	—
High (21–27)	2.91	(1.92, 4.40)			1.86	(1.17, 2.94)
Reward group						
Normal (0.36–1.00)	—	—			—	—
High (1.01–2.20)	0.25	(0.14, 0.41)			0.31	(0.17, 0.53)
ERI ratio						
Normal (0.36–1.00)	—	—	—	—		
High (1.01–2.10)	2.59	(1.76, 3.80)	1.74	(1.14, 2.65)		
Overcommitment group						
Normal (5,12)	—	—	—	—	—	—
High (13,20)	4.03	(2.71, 5.99)	3.42	(2.24, 5.24)	2.99	(1.95, 4.59)

Discussion

Our study evaluated the psychometric property of the Thai ERIQ among nurses in a university hospital in Southern Thailand. Our modified Thai ERIQ consisted of effort, reward, and overcommitment scales, in which each of the effort and reward scales consisted of 2 subscales. Goodness of fit indices suggested a good fit for this model. Hence, the construct of the Thai ERIQ among nurses may differ from prior studies, including 'white- and blue-collar workers' in European countries,[7] and workers from garment factories in Thailand.[12]

We found that the effort scale consisted of two subscales, which were time constraint and workload. To our knowledge, this pattern of response had never been reported by prior studies. In addition, item 18 ("I get easily overwhelmed by time pressures at work") was well conformed with the time constraint subscale; instead of overcommitment. We believe that this distinction potentially emerges from the work characteristics of nurses. Some nurses are frequently presented with patients in critical conditions in areas such as emergency departments, intensive care units, and surgical theaters, who require urgent treatment within limited time periods. Other nurses may work with patients not in urgent conditions but are presented with a large number such as in outpatient clinics.

In regard to the reward scale, items 7, 8, and 9 from the original esteem subscale ("I receive the respect I deserve from my superiors," "I receive the respect I deserve from my colleagues," I experience adequate support in difficult situations"), and item 14 from the job promotion subscale ("My current occupational position adequately reflects my education and training") were excluded from analysis due to low corrected item-total correlation, which means that the perception of these four items were similar across all units in this hospital (especially item 14, in which nurses performed the job that they were trained for).

The remaining items of the reward scale were loaded into two subscales that was different from prior studies. "Recognition for hard work" consisted of items associated with rewards received, in the form of prestige, job promotion, and salary. "Justice and security" consisted of the remaining four items associated with job security, fairness, and promotion prospects. Different subscales of reward have been reported by several prior studies. For example, the study conducted in garment-factory workers in Thailand, and the study conducted among white collar workers in a petrochemical factor in Iran did not find subscales of reward.[12,27] The study in healthcare workers in Greece reported three subscales of reward but each subscale consisted with different items than the original ERIQ.[28] Additionally, the EFA of the Japanese version of ERIQ conducted among dental technicians found that several items of the reward scale were loaded across multiple factors,[29] and the Korean version conducted among workers in a petrochemical refinery reported cross-loading of items in both the effort and overcommitment scales.[30] The difference in subscales and factor cross-loading potentially relates to the nature of the job, context of the working environment, and cultural differences between populations among these studies.

The average ERI ratio among our participants was 0.95. It was higher than a prior study conducted among garment workers in Thailand (mean 0.46).[12] However, it was lower when comparing to other studies conducted among healthcare workers such as nurses in Japan (mean 0.90),[9] female healthcare workers in Taiwan (mean 1.15),[10] healthcare workers in community hospitals in China (mean 1.17),[31] and medical assistants in Germany (mean 1.28).[32] Likewise, the prevalence of high job strain in our study was 34.5% which was lower than the prevalence reported by surgical nurses in China (83.2%),[11] medical assistants in Germany (73.8%),[32] nurses in emergency department in China (59.7%),[33] and healthcare workers in community hospitals in China (78.4%).[31] The difference in both the ERI score and prevalence of high job strain between these studies may have occurred for a variety of reasons, including the difference in meanings perceived from the translated versions of the ERIQ, difference in perception of factors related to job strain, and the cultural context that affected the level of resilience to job strain.

The prevalence of poor psychological health in our study was 19.9%, which was lower than a prevalence of 30.3% among surgical nurses in the UK,[34] 34.7% among nurses in Nepal,[35] and 43.8% among nurses in China.[36] This lower prevalence may have occurred due to several reasons, including healthy worker survivor bias (those who had poor psychological health quit the job prior to data collection), translated versions of the GHQ may have different sensitivity and specificity, and different cultural contexts may affect resistance to psychological stress and willingness to reported self-illness.

Lastly, we found that high job strain and high level of overcommitment were associated with self-reported poor psychological health with an odds ratio of 1.74 and 3.42, respectively. The association between job strain and poor psychological health in our study is consistent with prior studies that reported the association between job strain and psychological problems. For example, Li et al. reported an association between poor mental health with high ERI ratio (OR 2.18, 95% CI 1.80 – 2.64), and high overcommitment (OR 3.21, 95% CI 2.59 – 3.74).[37] Additionally,

Garbarino et al. reported an association between depressive disorders and high ERI ratio (OR 7.89, 95% CI 2.32 – 26.82) as well as high overcommitment (OR 3.27, 95% CI 1.01 – 10.63).[38]

Limitations

Our study must be considered with some limitations. First, it used a cross-sectional design, which limited the interpretation of the causal-effect relationship between job stress and psychological health. Secondly, participants in our study were nurses from a single university hospital, hence, our results may not represent all nurses or other healthcare workers in Thailand. Thirdly, about one-third of the nurses did not respond to our questionnaire; therefore, a non-response bias may have occurred, which could have resulted in an under- or overestimation of the prevalence of job stress and poor psychological health. On the other hand, our study was the second evaluation of the construct validity of the Thai ERIQ, and the first among nurses in Thailand.

Conclusions and Implications

In conclusion, components of effort and reward scales of the Thai ERIQ among nurses in our study differed from the prior studies. These components can be described by the work characteristics of the nurses participating in our study. However, further study should be conducted among nurses in other workplace settings, and other groups of governmental healthcare workers to confirm our findings. The prevalence of poor psychological health among nurses was high. Job strain and overcommitment were strongly associated with poor psychological health. Employers should monitor nurses' job stress using tools such as the ERIQ, as well as implement interventions at both the organizational and individual levels to reduce job stress and improve quality of life of the nurses and their patients.[39,40]

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คุณสมบัติการวัดทางจิตวิทยาของแบบสอบถามความไม่สมดุลระหว่างความทุ่มเทและผลตอบแทนในพยาบาล

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บทคัดย่อ: ความเครียดเป็นปัจจัยเสี่ยงที่สำคัญอย่างหนึ่งของอาชีพพยาบาลที่ส่งผลต่อทั้งสุขภาพร่างกายและจิตใจของพยาบาลรวมถึงผู้ป่วย แบบสอบถามความไม่สมดุลระหว่างความทุ่มเทและผลตอบแทนเป็นเครื่องมือหนึ่งที่เป็นที่นิยมและสามารถใช้ในการเฝ้าระวังภาวะความเครียดในพยาบาลได้ อย่างไรก็ตามตามรายงานวิจัยของแบบสอบถามที่แปลเป็นภาษาต่าง ๆ มีการจัดองค์ประกอบที่แตกต่างจากต้นฉบับ ในงานวิจัยฉบับนี้ผู้วิจัยรายงานความถูกต้องเชิงโครงสร้างของแบบสอบถามความไม่สมดุลระหว่างความทุ่มเทและผลตอบแทนฉบับภาษาไทย (Thai ERIQ) ในพยาบาลที่ปฏิบัติงานในโรงพยาบาลมหาวิทยาลัยแห่งหนึ่งในภาคใต้ของประเทศไทย เก็บข้อมูลโดยการสำรวจภาคตัดขวาง ความเครียดจากการทำงานวัดโดย Thai ERIQ และสุขภาพจิตวัดโดย General Health Questionnaire ฉบับภาษาไทย 28 ข้อ (Thai GHQ-28) ทำการวิเคราะห์ความถูกต้องเชิงโครงสร้างโดยการวิเคราะห์องค์ประกอบเชิงสำรวจและเชิงยืนยัน ความสัมพันธ์ระหว่าง Thai ERIQ และ Thai GHQ-28 ทดสอบโดยสมการถดถอยโลจิสติค

การวิเคราะห์ข้อมูลจากการตอบกลับแบบสอบถามของพยาบาลจำนวน 725 คน การวิเคราะห์องค์ประกอบพบว่าทั้งความทุ่มเทและผลตอบแทนมีสององค์ประกอบย่อย ซึ่งมีผลการทดสอบดัชนีความสมรูปอยู่ในเกณฑ์ดีและมีความน่าเชื่อถือในระดับยอมรับได้ ความชุกของความเครียดสูงจากการทำงานพบร้อยละ 34.5 สุขภาพจิตที่ไม่ดีพบร้อยละ 19.9 และพบว่าปัจจัยความเครียดสูงและความทุ่มเทที่มากเกินไปสัมพันธ์กับสุขภาพจิตที่ไม่ดีอย่างมีนัยสำคัญทางสถิติที่ odds ratio 1.74 และ 3.43 ตามลำดับ ควรมีการศึกษาเพื่อยืนยันองค์ประกอบของ Thai ERIQ ในพยาบาลที่พบในการศึกษานี้ และควรมีมาตรการเพื่อแก้ปัญหาความชุกของความเครียดจากการทำงานและความผิดปกติด้านสุขภาพจิตที่สูงในพยาบาล

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คำสำคัญ: ความเครียดจากการทำงาน ความไม่สมดุล สุขภาพจิต พยาบาล ปัญหาสุขภาพจิต คุณสมบัติการวัดทางจิตวิทยา รางวัล แบบสอบถาม

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