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ORIGINAL ARTICLE

Nursing Job Rotation Stress Scale development and psychometric evaluation

Shan HUANG,[1,2] Yu-Hua LIN,[3] Chia-Chan KAO,[3] Hsing-Yu YANG,[4] Ya-Li ANNE[3] and Cheng-Hua WANG[1]

[1]*Graduate School of Business and Operations Management, Chang Jung Christian University, Tainan,* [2]*Department of Nursing, Kaohsiung Chang Gung Memorial Hospital,* [3]*Department of Nursing, I-Shou University, Kaohsiung and* [4]*Department of Nursing, Mackay Medical College, Taipei, Taiwan*

Abstract

Aim: The aim of this study was to develop and assess the reliability and validity of the Nurse Job Rotation Stress Scale (NJRS).

Methods: A convenience sampling method was utilized to recruit two groups of nurses ($n = 150$ and 253) from a 2751 bed medical center in southern Taiwan. The NJRS scale was developed and used to evaluate the NJRS.

Results: Explorative factor analysis revealed that three factors accounted for 74.11% of the explained variance. Confirmatory factor analysis validity testing supported the three factor structure and the construct validity. Cronbach's alpha for the 10 item model was 0.87 and had high linearity.

Conclusion: The NJRS can be considered a reliable and valid scale for the measurement of nurse job rotation stress for nursing management and research purposes.

Key words: job rotation, nurse, scale development, stress.

INTRODUCTION

Job rotation is popularly used in different industries. A previous study conducted in the USA reported that 42.7% of the assessed companies used job rotation (Jorgensen, Davis, Kotowski, Aedla, & Dunning, 2005). Several studies have explored the issue of job rotation among various job populations (Arya & Mittendorf, 2006; Chang, Tai & Shih, 2008; Jaturanonda, Nanthavanij, & Chongphaisal, 2006). A job rotation is a specific period of time during which an employee of a unit or department receives on-the-job training to learn new skills (Jaturanonda *et al*., 2006; Seibert, Kraimer, & Liden, 2001).

There are three theories regarding job rotations that are commonly adopted by firms, which include employee learning (the rotation makes the employees more resourceful), employer learning (through rotation, employers learn more about the strengths of individual workers), and employee motivation (rotation alleviates boredom) (Eriksson & Ortega, 2006). Studies have shown that job rotation allows employees to learn job skills from diverse departments, reduces employee fatigue caused by boring or repetitive job assignments (i.e. the challenge of a new assignment can renew an employee's enthusiasm and motivation), and improves both employee confidence and job satisfaction (Huang, Liao, & Thou, 2005; Triggs & King, 2000). When implementing job rotations, organizations should arrange rotation schemes according to each employee's background, learning capabilities, job familiarity, and adjustment time. Thus, high-frequency job rotation may not be optimal (Eriksson & Ortega, 2006; Ho, Chang, Shih, & Liang, 2009).

Job rotation has pros and cons. Several studies have addressed the positive impact of variety and breaks

Correspondence: Yu-Hua Lin, Nursing Department, I-Shou University, 8 Yida Road, Yanchao District, Kaohsiung County 82445, Taiwan. Email: lin2368@isu.edu.tw

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during work, but few studies have dealt with actual job rotation (Ortega, 2001). The benefits noted in the published work include reduced boredom, reduced work stress, increased innovation, increased productivity, reduced absenteeism, and reduced turnover (Chang *et al*., 2008; Jaturanonda *et al*., 2006; Jorgensen *et al*., 2005). However, Ortega (2001) found a significant negative correlation between tenure and job rotation, indicating that more job rotations led to shorter employee tenure. Most of the problems associated with job rotations are derived from the challenge of changing the work structure rather than from the job rotation itself. These problems include the reluctance of experienced workers to learn new types of work, difficulties caused by traveling from one job to the next, unsuitable wage structures, challenges associated with education and training of workers for new jobs, and inappropriate use of job rotations by management personnel (Ortega, 2001). Eriksson and Ortega (2006) found limited evidence to support a positive relationship between job rotation and employee motivation.

Nurse job rotation is defined as the transfer of nursing personnel among departments with different functions or to different units/branches of the same hospital department without a promotion or salary adjustment (Arya, 2004; Ho *et al*., 2009; Järvi & Uusitalo, 2004). Nurse job rotation is viewed as a professional cross-training plan that helps nurses to expand their job territory while broadening work experiences and skills, enhancing job satisfaction, reducing staff costs, facilitating professional growth, and cultivating interpersonal relationships (Inman, Blumenfeld, & Ko, 2005; Järvi & Uusitalo, 2004; Wang, Lin, Chou, & Chen, 2010). However, previous studies that explored nurses' learning experiences from job rotations found that nurses faced difficulties in interpersonal relationships and internal conflict on many issues; these nurses experienced feelings of helplessness, fear, and frustration in addition to experiencing personal limitations and enduring an increased workload (Henderson, Paterson, Burmeister, Thomson, & Young, 2013; Wang *et al*., 2010).

There have been drastic changes in the medical system and quality of patient care, especially with respect to the nursing profession, in recent decades in Taiwan. Nurses with multiple capabilities are more efficient and allow more flexibility in nursing staff management (Pan, Huang, Lee, & Chang, 2012). Hospital administrators expect to increase nurses' capabilities by arranging job rotations, equivalent to cross-training, with the aim of preparing registered nurses to deliver patient care in more than one clinical specialty at an institution (Robbins, 2003). Job rotation is also expected to address nurse shortage issues that arise due to the difficulty in recruiting and retaining registered nurses as well as difficulties in hospital branch expansion in both Taiwan and mainland China (Lin, Huang, Kao, & Lu, 2013). A few studies examined the effects of job rotation on nurses' job satisfaction and organizational commitment in Taiwan (Chang *et al*., 2008; Pan *et al*., 2012; Wang *et al*., 2010). However, the present authors were unable to find a research instrument designed specifically to measure the job rotation stress of nurses. To meet this need, they developed the Nurse Job Rotation Stress Scale (NJRS).

The purpose of this study was to develop and assess the psychometric profile of the NJRS.

METHODS

This study was approved by the ethics review boards at the participants' hospital. To meet the research aim of this study, development and validation phases were utilized. The aim of the former phase was to develop the NJRS. The aim of the latter phase was to assess the reliability and validity of the NJRS. These phases are described in more detail below.

Instrument development phase

The NJRS was developed by the first and second author of this article to measure nurses' perceived stress due to job rotation. The underlying construct of stress due to the job rotation was defined as the nurses' perceived stress related to a manager-ordered switch to another job or department within her/his hospital or branch hospital in domestic or mainland China.

Initially, the present authors used a semistructured questionnaire to interview 10 nurses with job rotation experience. The authors asked, "How do you feel when you need to rotate to another work place – to a different unit in the same hospital, to the domestic branch of the hospital, or to the mainland branch of the hospital?". The authors analyzed the interview contents and identified 22 items in this scale. Content validity testing (Waltz, Strickland, & Lenz, 2005) of the items yielded a content validity index (CVI) composite score of 0.96 across all items and raters from the total scale. All items were retained for further testing. The final version of the NJRS was subjected to psychometric testing.

Validation phase

This phase consisted of a two stage examination of the instrument validity. The first stage involved the use of

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exploratory factor analysis (EFA), which determined the number of domains (constructed factors) of the NJRS. In the second stage, confirmatory factor analysis (CFA) was used to establish the construct validity of the NJRS.

Participants

An initial sample of 426 nurses was recruited from a 2751 bed medical center in southern Taiwan. This medical center contained 15 intensive care units (ICU) with 426 nurses. The final sample consisted of 403 nurses (94.6%) because 23 subjects were on a long vacation when the questionnaire was distributed. The study was approved by the institutional review board of the participants' hospital.

In the first stage of the validation phase, 150 nurses from five ICU were surveyed using the NJRS. The nurses recruited for this study had all experienced job rotations and were willing to participate in the study. In the second stage of the validation phase, 253 nurses from the remaining 10 ICU in the same medical center were surveyed using the NJRS.

Instrument

NJRS

The NJRS is a 22 item scale designed to survey nurses' job rotation-related stress. Items are scored on a 5 point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5). The scores could range from 22 to 110, with higher scores corresponding to higher job rotation stress.

Nurses' Stress Checklist: Chinese version

The original Nurses' Stress Checklist (NSC) is a 47 item scale developed by Benoliel, McCorkle, Georgiadu, Dento, and Spitzer (1990) to measure nurses' stress over the past week, with a 9 point Likert scale of agree–disagree responses. Higher scores correspond to higher stress. The Chinese version of the NSC (NSC-C) was translated by Tsai and Chen (1996) and modified to contain 43 items with four subscales – personal reactions, work concerns, competency, and incompleteness of personal arrangement – all of which accounted for 80.1% of the total variance. Tsai and Chen (1996) reported an overall Cronbach's alpha of 0.93, which ranged 0.84–0.94 for the four subscales. Because this scale is commonly used to survey nurses' stress in Taiwan, the present authors chose to use it as a comparison for the NJRS. In this study, the overall Cronbach's alpha was 0.94, which ranged 0.87–0.94 for the four subscales.

Statistical analysis

Statistical analysis was performed using the SPSS software package, version 20.0 (SPSS, Chicago, IL, USA). Content validity, internal consistency reliability, and construct validity were assessed. The item–objective relevance with a CVI was used to determine content validity (Waltz *et al.*, 2005). Cronbach's alpha was used to assess the internal consistency of the survey. The statistical means and standard deviations of items were examined to provide information about item difficulty for judgment and endorsement purposes (Nunnally & Bernstein, 1994). The item–total correlation was used to examine item discrimination (Waltz *et al.*, 2005). During the first validation phase, validity was assessed by EFA using principal axis factoring with varimax rotation. This method was employed to explain the maximum amount of variance in the sample with enhanced component interpretability. Orthogonal rotation was selected on the assumption that the underlying factors were uncorrelated. In the second validation phase, construct validity was assessed by conducting a CFA with maximum likelihood estimation (Bentler, 1997) to determine whether the data collected from this study sample were consistent with the theoretical properties of the instrument. All tests were two tailed, and significance was defined as a *P*-value of less than 0.05.

RESULTS

Demographic data

A total of 150 nurses (all female) were surveyed in the first validation phase. Their demographic data are summarized in Table 1. The mean age was 31.35 years (standard deviation [SD] = 4.40) with a range of 23–44 years. The mean number of years of nursing experience was 9.17 (SD = 5.04), and the mean number of years of unit experience was 5.52 (SD = 4.26). Most of the subjects (70.7%) were married, held a Bachelor's of Science in Nursing (BSN) degree (72.7%), and considered themselves religious (74.7%). The majority of those surveyed were registered nurses (RN) at the N_2 nursing grade (which is similar to the third stage of Benner's stages of clinical competence: the competent stage).

The second validation phase included 253 nurses (all female). Their demographic data are summarized in Table 1. The mean age was 31.62 years (SD = 5.49) with a range of 22–48 years. The mean number of years of nursing experience was 9.52 years (SD = 5.79), and the mean number of years of unit experience was 6.33 years (SD = 4.99). Most of the subjects (58.9%) were married,

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Table 1 Summary of demographic data ($n = 403$)

Variable	First phase ($n = 150$) Frequency (%)	Second phase ($n = 253$) Frequency (%)
Marital status		
Single	44 (29.3)	104 (41.1)
Married	106 (70.7)	149 (58.9)
Education level		
Junior college	41 (27.3)	80 (31.6)
University	109 (72.7)	173 (68.4)
Religious		
No	38 (25.3)	67 (26.5)
Yes	112 (74.7)	186 (73.5)
Job position		
RN	110 (73.3)	167 (66.0)
Nurse leader	30 (20.0)	57 (22.5)
Nurse manager	10 (6.7)	29 (13.5)
Nursing grade		
N_1	15 (10.0)	45 (17.8)
N_2	84 (56.0)	128 (50.6)
N_3	35 (23.3)	33 (12.0)
N_4	16 (10.7)	47 (18.6)
Age range, years (mean)	23–44 (31.35) (SD = 4.40)	22–48 (31.62) (SD = 5.49)
Years of nursing experience	1–23 years (9.17) (SD = 5.04)	1–26 (9.52) (SD = 5.79)
Years of unit experience	1–23 years (5.52) (SD = 4.26)	1–23 (6.330 (SD = 4.99)

RN, registered nurses; SD, standard deviation.

held a BSN degree (68.4%), and considered themselves religious (73.5%). The majority of those surveyed were RN (66.0%) at the N_2 (50.6%) grade.

Item analysis and reliability

The 22 item NJRS showed a high Cronbach's alpha (0.95), indicating that some of the items were redundant. The present authors revisited the meaning of each item, and using a corrected item–total correlation value of over 0.07 (indicating a high correlation) as the criterion for item removal, they deleted 11 items due to redundancy or irrelevance to job rotation conditions. Ultimately, an 11 item NJRS was used for the final psychometric testing.

Reliability analyses showed that the NJRS had good internal consistency. The overall internal consistency had a Cronbach's alpha of 0.90, and the Cronbach's alpha for each subscale ranged 0.84–0.87. The corrected item–total correlation coefficients ranged from 0.58 (item 18) to 0.68 (item 12). The R^2 values represent the proportion of variance in a given item that was shared with the other items, with higher values indicating greater consistency among the items (Pett, Lackey, & Sullivan, 2003). The present authors' R^2 values ranged from 0.44 (item 6) to 0.76 (item 17). The coefficient alpha for item deletion ranged 0.88–0.89 (see Table 2). This finding indicated that all of the items contributed to the overall high reliability; it was also apparent that none of the items seriously reduced the value of the alpha coefficient upon removal from the analysis (Pett *et al*., 2003).

Validity

Content validity

The CVI was used to determine item validity. Seven experts (one nurse and six head nurses) were asked to rate each item of the NJRS based on relevance, clarity, and simplicity as 1 (not relevant), 2 (somewhat relevant), 3 (quite relevant), or 4 (highly relevant). The CVI was computed as the number of experts giving a rating of either 3 or 4 divided by the total number of experts. The item CVI ranged 0.80–1.0, and the total CVI was 0.96 in the final version, indicating adequate content validity (Polit & Beck, 2006).

Criterion-related validity

Criterion-related validity was supported by its correlation with the NSC-C ($r = 0.47$, $P < 0.001$).

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Table 2 Items means, standard deviation, corrected item to total correlations, squared multiple correlation, and alpha if item deleted for the NJRS ($n = 150$)

Item	Mean	SD	CITC	SMC	AID
Emotional response			Cronbach's alpha = 0.84		
3. When I am notified of a job rotation, I feel it is hard to concentrate during the daytime and hard to sleep at night.	4.55	0.63	.64	.56	.89
5. I experience loss of appetite when I am notified of a job rotation.	4.00	0.98	0.60	0.67	0.89
2. When I am notified of a job rotation, I frequently feel anxious.	3.73	1.11	.63	.64	.89
6. I worry about how to get along with my new colleagues.	4.23	0.94	0.64	0.44	0.89
Communication			Cronbach's alpha = 0.84		
17. I worry about whether I will be able to communicate with the physicians in the rotation unit.	4.31	0.75	0.64	0.76	0.89
18. I worry about individual physician's preferences and habits in the rotation unit.	4.32	0.73	0.58	0.70	0.89
22. I worry about whom I can consult when I have problems during the rotation period.	4.10	0.97	0.65	0.52	0.89
16. As a senior nurse, I worry that I will be criticized for making mistakes.	4.33	0.81	0.65	0.48	0.89
Daily life			Cronbach's alpha = 0.87		
11. I worry about whether it will be easy to apply for annual leave.	4.48	0.71	0.63	0.63	0.89
12. I worry that my daily life will be affected during the job rotation period.	4.47	0.75	0.68	0.63	0.88
10. I worry about whether I will get off work on time.	4.53	0.72	0.67	0.61	0.89
Overall alpha			0.90		

AID, alpha if item deleted; CITC, corrected item–total correlation; NJRS, Nurse Job Rotation Stress Scale; SD, standard deviation; SMC, squared multiple correlation.

Construct validity

Construct validity was supported by the factor analysis. In the first phase, a factor analysis using principal axis factoring and the Varimax rotation method was performed on the 11 items. The numbers of factors were determined by eigenvalues (≥1), Kaiser–Meyer–Olkin (KMO) sampling adequacy values, screen plots, coefficients of factor loadings over 0.40, and explainable percentages of variance over 60% (Steven, 1996). The KMO was 0.858, indicating sampling adequacy (>0.5; Kara *et al.* 2006). In Bartlett's test of sphericity ($\chi^2 = 987.63$, $P < 0.001$), three factors were retained and accounted for 74.11% of the variance. Eigenvalues ranged 1.05–5.58. After rotation, these three factors accounted for 66.06% of the variance, and all 11 items demonstrated moderate to strong loading (see Table 3).

The first factor, labeled emotional response, consisted of four items, explained 23.44% of the variance, and reflected the emotional response to the job rotation. The second factor, labeled communication, consisted of four items, explained 22.04% of the variance, and reflected concern about rotation unit coworker communication issues. The third factor, labeled daily life, consisted of three items, explained 20.58% of the variance, and reflected participants' concerns about the impact of their daily activity during the job rotation period.

In the second phase of construct validity examination, CFA was used to confirm the three subscale model and test the goodness of fit with interfactor correlations ranging 0.24–0.35, χ^2 (41) of 161.1 ($P < 0.001$), χ^2/degrees of freedom (d.f.) of 3.94, and a goodness of fit index (GFI) of 0.90 (>0.90 is desirable). The adjusted GFI (AGFI) was 0.84 (>0.80 is desirable), the normed-fit index (NFI) was 0.88 (>0.90 is desirable), and the root mean square error of approximation (RMSEA) was 0.11 (<0.10 is desirable). However, the analytical model did not fit the data well; thus, a modified model was constructed to improve the model fitting. Item 22 ("I worry about whom I can consult when I have problems during the rotation period") was eliminated, and the modified model was found to have a χ^2 (32) of 120 ($P < 0.001$), χ^2/d.f. of 3.75, GFI of 0.92, AGFI of 0.85, NFI of 0.90, and RMSEA of 0.01. The modified model fitted to 10 items had greater explanatory and feasibility parameters than the model fitted to 11 items. All test statistics were compared with general rules of thumb for each statistic (Hooper, Coughlan, & Mullen, 2008; Hu & Bentler, 1999; McDonald & Ho, 2002). A summary of the model fits for the NJRS is presented in Table 4, and the structure model is shown in Figure 1. Overall, the 10-item scale had an internal consistency of alpha = 0.87, and the subscales had Cronbach's alphas of 0.81, 0.80, and 0.84, respectively.

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Table 3 Factor analysis of the NJRS ($n = 150$)

Items	Factor and loading		
	1	2	3
3. When I am notified of a job rotation, I feel it is hard to concentrate during the daytime and hard to sleep at night.	**0.86**	0.09	0.17
5. I experience loss of appetite when I am notified of a job rotation.	**0.81**	0.12	0.23
2. When I am notified of a job rotation, I frequently feel anxious.	**0.69**	0.21	0.23
6. I worry about how to get along with my new colleagues.	**0.52**	0.36	0.25
17. I worry about whether I will be able to communicate with physicians in the rotation unit.	0.12	**0.90**	0.28
18. I worry about individual physician's preferences and habits in the rotation unit.	0.14	**0.83**	0.17
22. I worry about whom I can consult when I have problems during the rotation period.	0.25	**0.54**	0.40
16. As a senior nurse, I worry that I will be criticized for making mistakes.	0.39	**0.49**	0.29
11. I worry about whether it will be easy to apply for annual leave.	0.19	0.23	**0.81**
12. I worry that my daily life will be affected during the job rotation period.	0.29	0.26	**0.75**
10. I worry about whether I will get off work on time.	0.28	0.29	**0.71**
Factor eigenvalues	5.58	1.52	1.05
% of explanatory variance	23.44	22.04	20.58
Total % of explanatory variance		66.06	

Bolding indicates items included in factor.

Table 4 Summary of confirmatory factor analysis of the NJRS ($n = 253$)

Model	χ^2 (d.f.)	χ^2/d.f.	GFI	AGFI	NFI	RMSEA
Ideal model		<3	>0.9	>0.8	>0.9	<0.05
11 item NJRS	161.4 (41)***	3.94	0.90	0.84	0.88	0.07
10 item NJRS	120.0 (32)***	3.75	0.92	0.85	0.90	0.05

***$P < .001$.
AGFI, adjusted goodness of fit index; GFI, goodness of fit index; NFI, normal fix index; RMSEA, root mean square error of approximation.

DISCUSSION

Job rotation is a common cross-training method in nursing, but very few instruments have been designed to measure nurse job rotation stress in Taiwan. Reliability and validity are the essential qualities of a good instrument. The present authors used EFA ($n = 150$) and CFA ($n = 253$) to examine the validity and reliability of the NJRS. The results show that the NJRS is a reliable instrument for the assessment of job rotation stress in Taiwanese nurses.

In the first phase, using the 22 item NJRS, Cronbach's alpha was 0.95, which is excessively high. The alpha coefficient should be above 0.7, but it should not be much higher than 0.9 (Spilsbury & Meyer, 2001). A very high alpha level suggests a high level of item redundancy (i.e. multiple items asking the same question in slightly different ways) (Streiner, 2003). The present authors rechecked the meaning of each item and found that 11 items asked questions similar to those already posed. These items were subsequently deleted from the scale. The 11 item version of the NJRS was then used for psychometric testing. According to the EFA in this study, three factors contributed to the variations in responses, namely emotional response, communication, and daily life, and these factors accounted for 74.11% of the variance. The internal consistency (overall Cronbach's alpha) was 0.90, and the subscales of Cronbach's alpha ranged 0.84–0.87, satisfying the recommendations of Spilsbury and Meyer (2001).

The establishment of criterion validity involves determining the relationships between an instrument and an external criterion (Polit & Beck, 2004). In this study, the relationship between the NJRS and the NSC was used as a concurrent criterion. Although criterion validity is indicated by a high correlation coefficient (Polit & Beck, 2004), the moderate correlation between the NJRS scores and NSC-C scores was found to be statistically significant ($r = 0.47$, $P < 0.001$).

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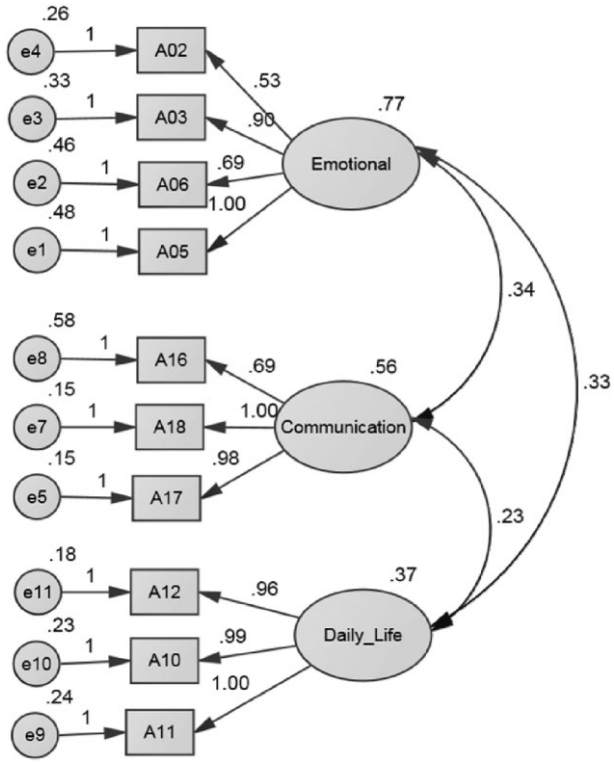

Figure 1 Confirmatory factor analysis of the Nurses Job Rotation Stress Scale.

In the second phase, the 11 item version of the NJRS was used to test the construct validity. CFA confirmed the three factor structure identified in the first phase, but the results of goodness of fit tests did not approach the desired values, indicating that there was some unexplained variance. When one item (item 22) that loaded on multiple factors was deleted, the model fit the data better, and the final 10 item NJRS had an internal consistency (overall Cronbach's alpha) of 0.87. Additionally, the Cronbach's alpha of the subscales ranged 0.80–0.84, again satisfying the criteria described by Spilsbury and Meyer (2001).

The NJRS appears to be a reliable and valid instrument for the assessment of nurses' job rotation stress; however, several limitations should be noted. First, the sensitivity of the NJRS in detecting meaningful changes in outcomes following interventions has yet to be determined. A longitudinal study will be necessary to document how well the NJRS can evaluate nurses' job rotation stress over time. Second, to enable the authors to contact the study population, most of the participants were drawn from a single hospital, and the sample was restricted to ICU nurses because the rotation frequency of these nurses is higher than that of general ward nurses. These factors limit the generalizability of the study. Different sampling methods, such as systematic random sampling or stratified random sampling from different nurse groups, should also be considered in future studies. Finally, the halo effect is a possible limitation of this study due to the use of a self-reporting questionnaire, which occurs when nurses were watched closely over a short period and may tend to over influence more specific ratings (Polit & Beck, 2004). It is possible that participants' responses reflected socially desirable responses rather than personal responses.

CONCLUSION AND SUGGESTIONS

In conclusion, the NJRS demonstrated satisfactory validity and reliability for measuring the stress of nurses participating in job rotations. The NJRS may be valuable in research and may also be useful in nursing management to pre-assess the likelihood of job rotation stress before the rotation is initiated.

DISCLOSURE

The authors declare no conflict of interest. There are no competing financial interests (actual or potential) associated with this manuscript.

AUTHOR CONTRIBUTIONS

S. H., Y. H., and Y. L. were responsible for the study conception and design, and performed the data collection. Y. H., C. C., C. H., and H. Y. performed design and data statistics analysis. Y. H. was responsible for the drafting of the manuscript. C. C. and H. Y. made critical revisions to the paper for important intellectual content.

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APPENDIX I

NURSES JOB ROTATION STRESS SCALE (NJRS)

Directions: How would you rate each of the following when/if job rotation occurred? Please choose one of the following that best describes your situation.

Items	Agreement				
	Strongly agree				Strongly disagree
1. When I am notified of a job rotation, I frequently feel anxious.	5	4	3	2	1
2. When I am notified of a job rotation, I feel it is hard to concentrate during the daytime and hard to sleep at night.	5	4	3	2	1
3. I experience loss of appetite when I am notified of a job rotation.	5	4	3	2	1
4. I worry about how to get along with my new colleagues.	5	4	3	2	1
5. I worry about whether I will get off work on time.	5	4	3	2	1
6. I worry about whether it will be easy to apply for annual leave.	5	4	3	2	1
7. I worry that my daily life will be affected during the job rotation period.	5	4	3	2	1
8. As a senior nurse, I worry that I will be criticized for making mistakes.	5	4	3	2	1
9. I worry about whether I will be able to communicate with the physicians in the rotation unit.	5	4	3	2	1
10. I worry about individual physician's preferences and habits in the rotation unit.	5	4	3	2	1

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