VALIDATION OF THE OCCUPATIONAL FATIGUE EXHAUSTION RECOVERY(OFER) SCALE AMONG EMERGENCY NURSES IN A BRUNEI PUBLIC HOSPITAL

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ABSTRACT

Introduction: The Occupational Fatigue Exhaustion Recovery (OFER) scale is a reliable and validated tool to measure work-related fatigue. However, its psychometric properties were not found in any studies examining nurses in the Southeast Asian region, particularly in Brunei.

Aim: To ensure validity and reliability of the OFER scale using a sample of emergency nurses in Brunei.

Methods: OFER scale was assessed for face, reliability statistics including Cronbach's Alpha and Corrected Item-Total correlation, along with convergent and discriminant validity. Floor and ceiling effects were also calculated.

Results: Thirty-eight emergency nurses participated in the study. OFER scale demonstrated high face validity. Internal consistency reliability was good where Cronbach's Alpha ranged from 0.72 to 0.80. A ceiling effect was present for Item 6, 7, and 8 of the acute fatigue subscale. Floor effect was present for Item 15 of inter-shift recovery subscale. Item 13 might have slightly lower inter-item correlation amongst the items in the inter-shiftrecovery subscale. The inter-scale correlation might be 'too high' between acute fatigue scale and chronic fatigue subscale.

Conclusion: Overall, there were good reliability and validity estimates for OFER scale using the sample of emergency nurses from Brunei.

Keywords : Fatigue; Surveys and Questionnaire; Reliability and Validity; Emergency nursing.

INTRODUCTION

The Canadian Nurses Association (2010) defined nurse fatigue as nurses' subjective feeling of acute physical and mental tiredness or exhaustion that creates an unrelenting overall condition; interfering with their physical and cognitive ability to function at their normal capacity.

Work-related fatigue amongst nurses has been recognized as a source of adverse impacts on the quality of care, client satisfaction, and patient and nurse safety (Martin, 2015, Witkoski and Dickson, 2010). Extended working hours and short recovery period in nursing may cause cognitive, psychomotor, and behavioural impairment that leads to slow reaction time, lapse in critical judgement, and reduced motivation, and thus increase in work errors (Witkoski and Dickson, 2010). A recent report stated that medical errors are the third leading cause of death in the United States, following heart disease and cancer (Makary and Daniel, 2016).

The Occupational Fatigue Exhaustion Recovery (OFER) scale is a reliable and validated tool to measure work-related fatigue (Winwood *et al.*, 2005). However, its psychometric properties were not found in any studies among nurses in Brunei or the Southeast Asian region. Thus, this brief validation was conducted to assess validity and reliability of OFER using a sample of emergency nurses before administering it to examine exposure of work-related fatigue among emergency nurses in Brunei.

METHODS

The joint Ethics Committee of Institute of Health Sciences, Universiti Brunei Darussalam and the Ministry of Health of Brunei have approved this study. Participants (n=43) comprised of emergency nurses working in one of the main public hospitals in Brunei Darussalam. Convenient sampling technique was used for participant selection. To prevent coercion and protect the integrity of the study, the unit nurse manager administered the questionnaire only to voluntary participants. All participants received a structured questionnaire, which they were given seven days to complete and return to the nurse manager. Participation was voluntary and respondents were provided with an envelope to seal their questionnaire immediately after completion. Participants' basic personal background (such as age, marital status), employment background (such as qualification, the number of years of working as a nurse), and health background (such as body mass index, smoking) was enquired. Body mass index was classified according to World Health Organization expert consultation (Barba *et al.,* 2004). About a month later, 40 respondents returned the questionnaire (93.0% response). Two questionnaires were partially completed and were omitted. A total of 38 questionnaires was used for analysis.

Work-related fatigue was measured using the 'shift workers' trait scale version of the Occupational Fatigue Exhaustion Recovery scale (OFER), developed by Winwood *et al.*, (2005). The OFER scale was used due to previous studies demonstrating good discriminant validity between acute and chronic fatigue, and the measure of recovery between shifts, i.e., inter-shift recovery, which is an important aspect for shift workers. The scale also offers calculation for persistent fatigue. It comprised of 15 items, measuring three subscales, i.e., chronic fatigue, acute fatigue, and inter-shift recovery (and/or persistent fatigue). Seven response categories were used for each item from 0 (Strongly disagree) to 6 (Strongly agree).

ANALYSIS

Comprehensibility or face validity of the scale was assessed by comments and suggestions from the participants.

All statistical analyses were performed using SPSS, version 21. Descriptive statistics for demographic characteristics were analyzed for prevalence on categorical variables. For continuous variables, distribution of histogram was positively skewed thus median and the interquartile range was used instead of mean and standard deviation.

On the OFER scale, chronic fatigue was calculated as a percentage sum, according to the OFER manual. Score distribution was categorized by quartile into low, low/moderate, moderate/high, and high exhaustion. High score of acute and chronic fatigue and low inter-shift recover indicates 'early warning sign' that the current workplace is incompatible and unsustainable for the nurses' continued health and wellbeing.

Internal consistency reliability was determined using Cronbach's Alpha. The inter-item correlation was analyzed using Corrected Item-Total Correlation (CITC). Floor and ceiling effect, i.e., the proportion of participant's response to the lowest (floor) and highest (ceiling) options for all the instruments was also calculated in order to evaluate the adequate variability of the sample in the study. Discriminant and convergent validity were analyzed by bivariate correlations using Spearman's correlation matrix instead of higher level analysis such as factor analysis due to insufficient sample size (Hertzog, 2008). The correlation coefficient of above 0.70 between two scales is normally considered 'too high' (Nunnally and Bernstein, 1994). All statistical tests were two-sided and a P value less than 0.05 was considered statistically significant.

RESULTS

Table 1.Demographic characteristics of participants

	N	(%)	Median	(IQR)[a]
Age (Years)			30.5	(8.0)
Gender				
Male	18	(47.4)		
Female	20	(52.6)		
Marital status				
Married	25	(65.8)		
Single	13	(34.2)		
Number of children at home				
0	21	(55.3)		
1	9	(23.7)		

2	3	(7.9)		
≥ 3	5	(13.1)		
Nationality				
Brunei	32	(84.2)		
Philippines	6	(15.8)		
Race/Ethnicity				
Malay	29	(76.3)		
Filipino	6	(15.8)		
Chinese	2	(5.3)		
Murut	1	(2.6)		
Highest qualification				
Bachelor degree	7	(18.4)		
Advanced diploma	9	(23.7)		
Diploma	21	(55.3)		
Certificate	1	(2.6)		
Years working as nurse			8.5	(8.0)
Years working in this Emergency department			7.0	(10.0)
Designation				
Nurse Officer	1	(2.6)		
Staff Nurse	34	(89.5)		
Assistant Nurse	3	(7.9)		
Body Mass Index (BMI)				
Normal (18.5-24.9)	9	(23.7)		
Overweight (25-29.9)	14	(36.8)		
Obese class I (30-34.9)	9	(23.7)		
Obese class II (35-39.9)	2	(5.3)		
Obese class III (≥ 40)	3	(7.9)		
Smoking				
Yes	6	(15.8)		
No	32	(84.2)		
IQR=Interquartile range, SD=Standard deviation, [a] Distribution positively skewed				

Table 1 depicts the demographic characteristics of the participants. In brief, the gender of the study sample was almost equally represented. They were mostly local (84.2%), married (65.8%), and worked as staff nurses (89.5%) who had worked in the emergency department for a median of 7 years (IQR=10.0). More than half of them (55.3%) have the nursing qualification at diploma level. Participants mostly abstained from smoking (84.2%) but only 23.7% of their BMI were at a normal range, most of them were overweight (36.8%) or in the obese category (36.9%).

Table 2 shows the mean scores, floor and ceiling effects, and minimum score and scales of the OFER scale. The mean scores for fatigue scales showed that nurses experienced moderate/high-level exhaustion. The acute fatigue score was higher than chronic fatigue. On this note, ceiling effects were also present in the acute fatigue scale and were absent in chronic fatigue scale. Meanwhile, the mean score for inter-shiftt recovery indicated that nurses experienced low/moderate recovery between shifts. Floor effect was present in item 15 on inter-shift recovery scale.

Table 2. Mean score, floor &ceiling effects, and Cronbach's alpha of Occupational Fatigue Exhaustion Recovery scale

	Score				Score	Scale
	Mean	(SD)	% Floor	% Ceiling	Min/Max	Min/Max
Chronic fatigue scale	3.9	(0.9)				
Item 1	3.5	(1.2)	0.0	0.0	1/5	0/6
Item 2	3.8	(1.4)	2.6	10.5	0/6	0/6
Item 3	3.9	(1.3)	2.6	5.3	0/6	0/6
Item 4	4.0	(1.3)	2.6	10.5	0/6	0/6
Item 5	4.2	(1.1)	0.0	10.5	2/6	0/6
Acute fatigue scale	4.2	(0.7)				
Item 6	4.3	(1.3)	2.6	21.1	0/6	0/6
Item 7	4.6	(1.0)	0.0	23.7	3/6	0/6
Item 8	4.3	(1.2)	0.0	18.4	1/6	0/6
Item 9	3.7	(0.9)	0.0	2.6	2/6	0/6
Item 10	4.0	(0.8)	0.0	2.6	3/6	0/6
Intershift recovery scale	1.9	(0.5)				
Item 11	1.7	(0.9)	10.5	0.0	0/3	0/6
Item 12	2.1	(0.6)	2.6	0.0	0/3	0/6
Item 13	2.1	(0.6)	0.0	0.0	1/3	0/6
Item 14	2.0	(0.7)	2.6	0.0	0/3	0/6
Item 15	1.7	(1.0)	15.8	0.0	0/3	0/6
SD=Standard deviation						

Table 3. Corrected Item-Total Correlation and Cronbach's Alpha for Occupational Fatigue Exhaustion Recovery scale

	CITC[1]	Apha[2]
Chronic fatigue scale		0.80
Item 1	0.45	
Item 2	0.61	
Item 3	0.68	
Item 4	0.59	
Item 5	0.58	
Acute fatigue scale		0.72
Item 6	0.56	
Item 7	0.68	
Item 8	0.56	
Item 9	0.51	
Item 10	0.15	
Intershift recovery scale		0.73
Item 11	0.54	
Item 12	0.53	
Item 13	0.34	
Item 14	0.59	
Item 15	0.53	
[1]Corrected Item-Total Correlation, [2]Cronbach's Alpha		

Table 3 presents reliability statistics for internal consistency reliability and inter-item correlation interpreted using Cronbach's Alpha and CITC respectively. The OFER scale demonstrated good internal consistency reliability where Cronbach's Alpha ranged from 0.72 to 0.80. All inter-item correlation was good (where r > 0.40) by the standard interpretation indicating good convergent validity except for Item 13 where CITC was only 'adequate' (r=0.34). None of the items have too high CITC (r > 0.70).

Table 4. Correlations between the scales in Occupational Fatigue Exhaustion Recovery scale

Scale	Spearman Correlation Coefficients		
	1	2	3
Chronic fatigue scale	1		
Acute fatigue scale	0.72**	1	
Intershift recovery scale	-0.45**	-0.43**	1
**P<0.01 (2-tailed)			

Table 4 showed that there were good inter-scale correlations between the OFER scales. Intershift recovery showed good discriminant validity against a chronic fatigue scale (r=-0.45) and acute fatigue scale (r=-0.43). However, the chronic fatigue scale and acute fatigue scale might have 'too high' correlations (r=0.72).

DISCUSSION

The distribution of the study sample reflected that staff nurses' demographics at the hospital were mostly overweight or obese. This is an important indication for the ensuing large survey because work-related fatigue has shown to associate with weight gain and subsequent health problems (Lallukka *et al.,* 2005).

The OFER scale has demonstrated high comprehensibility or face validity where participants understood the questions very well and agreed that work-related fatigue was an important aspect of their daily work life.

OFER's chronic fatigue scale, acute fatigue scale, and intershift recovery scale showed good internal consistency reliability where Cronbach's Alphas were 0.80, 0.72, and 0.73 respectively. These values were comparable to those found in the original validation study where Cronbach's Alphas were 0.93, 0.82, and 0.75 respectively (Winwood *et al.,* 2005). Similar to the results reported in the original validation study, this study also showed that there was good discrimination between intershift recovery scale and the fatigue scales where intershift recovery and chronic fatigue (r=-0.45) has higher negative correlation than with acute fatigue (r=-0.43) (Winwood *et al.,* 2005).

Floor and ceiling effects were present in Item 2, 3, 4 of the chronic fatigue scale, and Item 6 in acute fatigue scale. Only ceiling effects were present in Item 5 of the chronic fatigue scale. Only floor effects were present in Item 11, 12, 14, and 15 of intershift recovery scale. No floor and ceiling effects were present for Item 1 and 13. Overall, it still indicated the adequate variability of the sample, which is required for a good validation study(Streiner *et al.,* 2014).

The inter-item correlation was moderate in all items within each of the respective scales indicating good convergent validity except for Item 13 of intershift recovery scale where the inter-item correlation was only adequate. In terms of interscale correlation, it may appear that chronic fatigue and acute

fatigue might have 'too high' correlations (r>0.70). However, the OFER scale has been previously tested and validated among a large number of nurses. Hence, we postulated that the convergent validity issue of Item 13 in the intershift recovery scale and the discriminant validity issue between the fatigue scales were not as good in comparison with original scale development, probably due to the limitation of this study with the very small sample size, which may also limit generalizability of the findings (Nunnally and Bernstein, 1994; Winwood *et al.,* 2006).

CONCLUSION

Overall, there were good reliability and validity estimates for OFER scale using this sample of nurses. Internal consistency reliability was good. A ceiling effect was present for Item 6, 7, and 8 of an acute fatigue scale. Floor effect was present for Item 15 of inter-shift recovery scale. Only two validation issues were identified. Item 13 might have slightly lower inter-item correlation amongst the items in the inter-shift recovery scale. The inter-scale correlation might be 'too high' between acute fatigue scale and chronic fatigue scale. These items and scales were retained since the sample size was small and may limit the generalizability of findings.

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