Original article

Work-related quality of life scale among Singaporean nurses

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Background: The Work-Related Quality of Life Scale (WRQLS) was developed for health-care workers in England but might be useful, if valid, in other parts of the world or for other professions.
Objective: We test the construct validity and reliability of the WRQLS as applied to nurses in Singapore.
Methods: A descriptive study was undertaken in 2009 on a sample of 811 nurses at the National University Hospital (NUH) of Singapore who had at least one year's work experience. The WRQLS was used in order to test its construct validity. Exploratory factor analysis was performed to reduce the factors used to determine WRQLS variance. The Pearson's correlation was used to evaluate the relationship between the WRQLS and the 12-item short form health survey (SF-12) in order to substantiate conclusions regarding construct validity while Cronbach's alpha was calculated to test WRQLS reliability.
Results: The median age of the respondents was 31 (IQR=12) and the majority were female (96.9%). The median duration of work experience was seven years (IQR=10). Following the exploratory factor analysis, a five-factor model with 22 items was selected, including; 1) job and career satisfaction, 2) general well-being, 3) home-work interface, 4) stress at work, and 5) working conditions. The correlation coefficient showed a moderate relationship between the WRQLS and mental component scale (MCS-12) (r=0.495); and a weak relationship between the WRQLS and physical component scale (PCS-12) (r=0.149). The Cronbach's alpha revealed good reliability (r=0.92).
Conclusion: The WRQLS test among nurses in Singapore showed good construct validity and reliability. It could be useful in a working environment in Asia but further testing might be warranted.

Keywords: Construct validity, quality of work life, registered nurses, work-related quality of life scale, WRQLS

The concept of quality of working life (QWL) is used to describe the feelings of an individual towards their work-related situation and experiences. Job satisfaction might be an important aspect but QWL could be broader than this to encompass perceptions of wellbeing and stress. In a 1987 report, the World Health Organization (WHO) reported that workers in a job with low psychosocial or environmental quality, which might be considered poor QWL, had significant damage to physical and mental health [1]. Since then, others have shown that improving a physicians' QWL could improve the quality of health care they delivered and decrease physician turnover [2-4] and possibly lead to improved work efficiency [5].

There have been several attempts to refine the concepts and develop scales to measure QWL [5-7]. Cunningham [8] suggested that QWL should encompass work tasks, the physical working environment, the social environment within the organization, the administrative system, and the relationship between life on and off the job. However, other researchers have developed different measurement scales as per their own philosophical frameworks. There has not been complete agreement on the essential parameters of the concept and

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therefore no standard list of dimensions or content that should be included in any questionnaire. There are, however, some dimensions in common across QWL life scales, including 1) the working environment [5-7], 2) aspects of one's personal life [6, 7], and 3) the balance between work and non-work life [6]. A European study also concluded that three factors namely working conditions, overall satisfaction with work and perceptions of the work-life balance together indicated QWL [9].

The questionnaires developed for measuring QWL reflect these differing perspectives. While Van Laar et al. [6] determined QWL using six factors from job satisfaction to general wellbeing, Rose et al. [5] used only three, namely career achievement, satisfaction and balance, for factory workers. It is indeed possible that different group of workers might have differing concepts of QWL. In previous studies, only Van Laar [6] and Hsu [7] studied health care workers. Van Laar's scale, the work-related quality of life scale (WRQLS) was found to have good construct validity for health care workers in the UK with Cronbach's alpha for the factors ranging from 0.75 to 0.86.

Nurses are a specialized subset of healthcare workers and a vital component of frontline health care that often have to cope with a heavy workload in their workplace [10, 11], sometimes an unhealthy work environment [12], long working hours or mandatory overtime [13], and can have high levels of stress [14]. The wellbeing of nurses may relate directly to the quality of patient care and yet there are still no standard principles for estimating QWL of nurses [8].

We wished to assess the validity of the WRQLS for assessing the QWL of nurses in Singapore as well as its correlation with the broader concept of quality of life, measured using the SF12, one of the briefest and most common measurement tools for QOL at present [15]. Singapore is an English-speaking country and is therefore one of the few areas in Asia where one can test an English questionnaire, yet it is populated mostly by Asians including ethnic Chinese, Indian, Pilipino, and Malaysian. We considered that this situation would be a useful test of the concept of QWL in Asian health care workers.

Materials and Methods
Study design and setting

This survey was conducted at the National University Hospital (NUH), an affiliate of the National University of Singapore (NUS) in 2009. It is a general hospital including comprehensive medical department in Singapore [26]. This study was approved by the Domain Specific Review Board of the NUH and Ethics Committee of Khon Kaen University.

Measurement tools

The data were collected using a three-part, self-administered questionnaire. Part one was constructed by the researchers, based on a literature review, and contained 12 items relating to the respondent's characteristics including age, sex, country of origin, education level, marital status, number of children, duration of work experience, shift work, position, chronic disease and income. Part two was the work-related quality of life scale (WRQLS). Part three was the social functioning (SF-12) to capture quality of life.

Participants and data collection

Three local nursing experts were asked to evaluate the first part of the questionnaire and give suggestions. One was an assistant director at the NUH and the other two were nursing experts at the NUS. Twenty-three nurses in the Psychiatric ward were then invited to complete a pilot run of the draft questionnaire to confirm that it was understandable and acceptable to nurses working at the NUH.

After this, all full-time registered nurses (RNs) working at the NUH between May 31, and August 8, 2009 were invited to take part in the survey. Those with less than one year of work experience or who submitted an incomplete questionnaire were excluded. One thousand seven hundred eighty one questionnaires were distributed to the RNs by the nursing administration staff and the researchers and 811 of those returned were used for the data analysis giving a response rate of 45%.

The social functioning (SF-12) can be used to derive two scales, a physical component scale (PCS-12) and a mental component scale (MCS-12).

The PCS-12 covers physical functioning (PF), role-physical (RP), bodily pain (BP) and general health (GH). The MCS-12 covers vitality (VT), social functioning (SF), role-emotional (RE) and mental health (MH). In the SF-12, positive responses are given a high score and negative responses a low score. A full score on the SF-12 is 56 and the higher the score the better the quality of life (QOL).

The WRQLS uses a 5-point response system for each question: strongly agree (5 point), agree (4 point), neutral (3 point), disagree (2 point), and strongly

disagree (1 point). The total possible score for WRQLS is 120. The higher scores indicate the better QWL.

Data analysis

The original WRQLS and SF-12 scores were calculated using the appropriate scoring systems. Exploratory factor analysis was performed on the WRQLS for item-dimension generation. Principal components analysis (PCA) was used and the number of factors selected using the Varimax rotation method. The criteria used to determine the number of factors in the model were a combination of eigenvalues and a priori conceptual construction of QWL. Loading values greater than 0.5 and without cross-loading were considered acceptable [16, 17].

Pearson's correlation coefficient was used to test the correlation between WRQLS and SF-12 to explore the construct validity of WRQLS. A correlation from 0.35 to 0.5 was considered as moderate and greater than 0.5 as strong [18]. Cronbach's alpha was used to test the internal consistency or reliability of WRQLS. For each item a Cronbach's alpha value of 0.6 or larger indicated acceptable reliability [19, 20]. All analyses were performed by SPSS version 15.0 (SPSS Inc, Chicago, USA)

Results
Personal characteristics

The median age was 31 years (range 19-62 years). Most of the participants (96.9%) were female. The majority of participants (44.5%) came from Singapore, followed by the Philippines (20.7%), China (14.3%), Malaysia (11.8%), and others (2.5%). Over one-half (51.3%) of the participants had less than a bachelor's degree, 45.6% had a bachelor's degree, and some (2.7%) had a Master's degree. Over one-half (55.0%) of the participants were married while 42.2% were single. Over one-half (53.5%) reported that they did not have any children and most of those with children reported that they had one (20.5%) or two (17.9%) children.

The median work experience duration was seven years (range 1-44 years). Over two-thirds of the participants (74.4%) worked shifts. The majority (60.5%) of the participants were staff nurses, followed by 27.9% senior staff nurses and 11.6% others. The data was shown in **Table 1**. Most of the participants (94.7%) reported that they did not have any chronic disease while 5.3% complained of being sick. One-third (37.2%) of the participants earned less than 1,999 Singapore dollars per month and another third (38.8%) earned between 2,000 and 2,999 Singapore dollars per month.

The questionnaire findings showed that the staff nurses, especially those with less work experience had a lower salary, longer work experience was associated with higher salaries. Special groups such as nurse managers, nurse clinicians, nurse educators, and nurse directors earned more than staff nurses.

Characteristics of WRQLS and social functioning (SF-12) distributions

Most of the participants responded positively to the WRQLS although some (n=6) tended to give only neutral answers. A number of participants responded negatively to item 9, suggesting they felt unhappy or depressed at work. The SF12 responses tended to be positive for the physical component scale (PCS-12), less so for the mental component scale (MCS-12).

Exploratory factor analysis

Principal component analysis was conducted for factor extraction. The results of the communalities ranged between 0.473 and 0.672, except for item 23, which was 0.310. The higher the value of the communality for a particular variable after extraction, the greater the amount of variance explained by the extracted factors [21]. Using an eigenvalue of greater than one as a criterion for retaining a factor [21, 22] a four-factor model was tested by Varimax rotation methods shown in **Table 2**. Several items that had cross-loading did not, however, support the use of a four-factor model. Since the original scale had six factors, a six-factor model was also run. The Varimax Rotation showed that a six-factor model had two items with cross-loading. The Cronbach's alpha, however, showed that the last factor in the six-factor model was poor (0.575). Thus, a five-factor model was tested. Two cross-loading runs were in items 4 and 18 while the other items had clear loading values ranging between 0.511 and 0.815. The Cronbach's alpha indicated that the cross-loading was not clear enough to indicate the generation of items in some dimensions and items 4 and 18 were deleted. Therefore, the best model was a five-factor model minus items 4 and 18, which explained 60% of the variation in responses to the WRQLS.

Table 1. Socio-demographic and economics characteristics (n=811)

Characteristics	n (%)
Age	
Year (mean±SD)	32.95±9.03
Median (IQR: min, max)	31 (12: 19, 62)
Sex	
Female	786 (96.9)
Male	25 (3.1)
Country of origin	
Singapore	361 (44.5)
Philippines	168 (20.7)
China	116 (14.3)
Malaysia	96 (11.8)
India and the subcontinent	39 (4.8)
Others	21 (2.5)
Education level	
Lower than bachelor degree	417 (51.3)
Bachelor degree	370 (45.6)
Master degree	22 (2.7)
Marital status	
Married	446 (55.0)
Single	342 (42.2)
Divorced/ Separated	22 (2.7)
Engage	1 (0.1)
Number of children	
0	434 (53.5)
1	166 (20.5)
2	145 (17.9)
≥3	66 (8.1)
Working as RNs	
Year (mean±SD)	9.49±8.48
Median (IQR: min, max)	7 (10: 1, 44)
Work in shift	
Yes	603 (74.4)
No	208 (25.6)
Current position	
Staff nurse	491 (60.5)
Senior staff nurse	226 (27.9)
Others	94 (11.6)
Chronic disease	
Yes	43 (5.3)
No	768 (94.7)
Income (Singapore dollar/month)	
≤1,999	302 (37.2)
2,000-2,999	315 (38.8)
≥3,000	194 (23.9)

Table 2. Total variance explained by the five-factor model

Component	Initial eigenvalues			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	9.147	38.1	38.1	4.441	18.5	18.5
2	1.837	7.7	45.8	3.894	16.2	34.7
3	1.256	5.2	51.0	2.116	8.8	43.5
4	1.171	4.9	55.9	2.051	8.5	52.1
5	0.966	4.0	59.9	1.876	7.8	59.9

Extraction Method: Principal Component Analysis.

Correlation coefficient between WRQLS and social functioning (SF-12)

The correlation between WRQLS and SF-12 was assessed using Pearson's correlation coefficient. The WRQLS and SF-12 scores as tested by Kolmogorov-Smirnov (p <0.000) indicated a non-normal distribution, which indicated that translation from the original form to norm-base scoring was inappropriate. Thus, a correlation coefficient study was done using the original WRQLS and SF-12 scores.

The correlation between WRQLS and physical component scale (PCS-12) was very weak (R=0.149) and the correlation between WRQLS and mental component scale (MCS-12) was moderate (R=0.495). A strong correlation was found between WRQLS and mental health (R=0.513) and a moderate correlation between WRQLS and vitality (R=0.390) and role-emotional (R=0.353). A weak correlation was found between WRQLS and role-physical (R=0.237), bodily pain (R=0.273) and general health (R=0.279). A very weak correlation was found with the other factors.

The correlation was strong between general well-being (GWB) and mental health (R=0.510) and moderate between GWB and vitality (R=0.401) and MCS-12 (R=0.495). A weak correlation existed between job and career satisfaction and mental health (R=0.322). There was a moderate correlation between working conditions and mental health (R=0.373) and MCS-12 (R=0.356) and weak correlation with general health (R=0.300) and vitality (R=0.305). A moderate correlation was found between stress at work and social functioning (R=0.388), role-emotional (R=0.362), mental health (R=0.472), and MCS-12 (R=0.495). A very weak or weak correlation was found in the remaining domains (**Table 3**).

Based on these results, it can be seen that WRQLS and its domains have a consistently moderate correlation with MCS-12 and its domains but a weak correlation with PCS-12 and its domains. **Table 4** summarizes each factor and its associated items in the five-factor model. Further descriptive analysis of the scores on WRQLS and SF-12 was performed. **Table 5** presents the SF-12 scores according to the different level of quality of work life as determined by WRQLS. The WRQLS score was separated into three levels; low (≤68), middle (>68, <82), and high (≥82). As the WRQLS score increases, the PCS-12 and MCS-12 scores also increase shown in **Table 5**.

Discussion

The current study conducted an exploratory factor analysis and calculated the correlation with another scale to assess the construct validity of the work-related quality of life scale (WRQLS) in Singaporean nurses. This approach has also been used by other authors [19, 23] to test the construct validity of new scales.

We found that the WRQLS has a moderately good performance with a five-factor model with items 4 and 18 removed. The five factors are job and career satisfaction (JCS), general well being (GWB), home-work interface (HWI), stress at work (SAW) and working conditions (WCS). These domains described the nurses' quality of work life as being affected by work and non-work factors, as expected. Cross factor linkages, which were identified, could be explained since JCS, SAW, and WCS are work factors (i.e., the job environment) while GWB is a non-work factor (i.e., personal life) and HWI is a cross-linked factor (i.e., an assessment of the work-life balance).

In contrast to the study by Van Laar [6], our study determined that a five factor model was more appropriate for Singaporean nurses than a six-factor model. The factor called control at work was found to

Table 3. Correlation coefficient between each dimension of WRQLS and social functioning (SF-12)

Dimension	Physical functioning	Role-physical	Bodily pain	General well-being	Vitality	Social functioning	Role-emotional	Mental health	PCS-12	MCS-12
General well-being	0.106	0.231	0.265	0.284	0.401	0.327	0.343	0.510	0.138	0.495
Job and career satisfaction	0.096	0.133	0.169	0.146	0.236	0.190	0.206	0.322	0.088	0.295
Work condition	0.104	0.163	0.178	0.300	0.305	0.221	0.254	0.373	0.132	0.356
Home-work interface	0.093	0.171	0.203	0.202	0.297	0.222	0.241	0.340	0.123	0.334
Stress at work	0.109	0.252	0.270	0.179	0.285	0.388	0.362	0.472	0.120	0.478
WRQLS	0.127	0.237	0.273	0.279	0.390	0.337	0.353	0.513	0.149	0.495

WRQLS=Work-related quality of life scale, PCS-12=Physical component scale, MCS-12=Mental component scale

Table 4. Description of each factor in the five-factor model

Factor	Count of item	Items	Name	Range of possible score	Obtained Score			Cronbach's alpha coefficient
					Range	Mean (SD)	Median (min, max)	
1	7	10,15,16,17,21,22,24	General well being (GWB)	7-35	7-35	23.5(4.19)	24.0(7,35)	0.88
2	6	8,11,12,13,20,23	Career and job satisfaction (CJS)	6-30	6-30	24.2(3.81)	21.0(6,30)	0.83
3	3	1,2,3	Working condition (WCS)	3-15	3-15	14.9(2.19)	10.0(3,15)	0.74
4	3	5,6,14	Home work interface (HWI)	3-15	3-15	10.1(2.14)	11.0(3,15)	0.77
5	3	7,9,19	Work stress (SAW)	3-15	3-15	8.9(2.11)	9.0(3,15)	0.66
Total	22		Quality of Working Life (QWL)	22-110	22-108	81.6(11.50)	75.0(22,108)	0.92

Table 5. Comparison of the different levels of QRQLS with SF-12

QWL (%)	QOL (Mean±SD); Median (Min: Max)		
	PCS	MCS	Total
Low score (25.5%)	19.18±3.82	19.69±3.95	38.86±7.01
(x≤68)	19 (7:26)	20 (11:29)	39 (21:55)
Middle score (48.2%)	20.35±3.09	22.44±3.34	42.79±5.57
(68<x<82)	20 (8:26)	23 (14:30)	43 (28:55)
High score (26.3%)	21.62±2.76	24.55±3.07	46.18±5.18
(x≥82)	22 (13:26)	25 (15:30)	47 (31:55)

be irrelevant in our sample. NUH is a university teaching hospital, so it is possible that RNs may have highly regulated working standards or actions to follow and thus control at work might not be a major factor influencing the quality of working life (QWL). It would be interesting to see if this finding was replicated in other Asian settings.

However, we also found that the concept of the quality of work life is not the same as quality of life, as measured by the SF-12, although general well being was one of the important factors in the OWL life scale and quality of work life is an aspect of quality of life. Elizur [24] pictured the relationship between quality of work life and quality of life as a cob of corn. The quality of work was on the surface and the quality of life was the core or foundation. He reasoned that the quality of life included several profiles, one of which was the quality of work life. This is supported by the European quality of life survey, which also showed that job satisfaction influenced life satisfaction [9] but was not the same. In our study, some individuals had low QWL but a moderate QOL score.

Therefore, separate and specific instruments for QOL and QWL are probably indicated. While quality of life and quality of work life have some corresponding aspects, the two concepts do not appear to be completely within each other's domain. Given our findings, the use of WRQLS for testing the quality of work life among nurses could be beneficial for identifying some key issues and addressing areas of weakness among staff, perhaps before they experience chronic work dissatisfaction issues. One limitation in this study was ethnic representation. The ethnic distribution among respondents was 20.7% Pilipino, 14.3% Chinese, 11.8% Malay, 4.8% India, and 2.5% others. This is different from the Singapore Nursing Board overall statistics, which reported 67.3% Chinese, 10.1% Malay, 10.1% Indian, and 12% others

[25]. The Singapore Ministry of Health reported 76.7% Chinese, 13.9% Malay, 7.9% Indian, and 1.5% others [26]. Therefore, there may be an under-representation of those that are less fluent in English, even though English is an official language in Singapore. Furthermore, this was a single-centre study as the data was collected only at the NUH.

Conclusion

This current study confirms that the English language WRQLS can have appropriate construct validity and reliability for determining the quality of work life among nurses in Asia. Assessing the quality of work life may provide insights into nurses' health status, stress coping mechanisms, employee retention and knowledge management insofar as these relate to their working life. However, the quality of work life was not the same as the broader concept of quality of life. Further implementation of the WRQLS for examining quality of work life in nurses might help identify work-related problems at an early stage and could help to improve healthcare facilities, quality of healthcare outcomes, and quality of nursing care in Asia.

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