Psychometric Evaluation of the Chinese (Mainland) Version of Job Content Questionnaire: A Study in University Hospitals

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Abstract: To evaluate the psychometric properties of the Chinese (mainland) version of Job Content Questionnaire (JCQ), this validation study was conducted in university hospitals among 193 men and 581 women health care workers. The Cronbach's alpha coefficients for decision latitude, psychological job demands and social support ranged from 0.56 to 0.82, which indicated that psychological job demands had lower internal consistency. The decision latitude displayed a negative correlation with psychological job demands and a positive correlation with social support. Exploratory factor analysis showed 3 meaningful factors that could explain the 3 theoretical dimensions of job strain model. Apart from some uncertainty over psychological job demands particularly, it is concluded that the Chinese (mainland) version of JCQ is a reliable and valid instrument for measuring job stressors, and is applicable to Chinese working population.

Key words: Job stress, Job content questionnaire, Reliability, Validity

Introduction

With the development of globalization, rising competition, greater cross-national mobility and changing employment relationships, stress becomes increasingly important occupational health problem and a significant cause of economic loss^{1,2}.

The Job Content Questionnaire (JCQ) is a widely used self-reported instrument to measure psychosocial characteristics of jobs^{3,4}. The core scales of JCQ consist of (1) decision latitude, (2) psychological job demands, and (3) social support. The well known demands-control-support model of job strain, as proposed by R. Karasek, predicts that job strain would occur when the psychological job demands are high and the worker's decision latitude is low, while the low support would increase the risk⁵⁻⁸.

In many western countries, a number of researches with cross-sectional or prospective design on job stress using JCQ have been done. The stress-related diseases were explored for cardiovascular diseases^{7,9-11}, musculoskeletal disorders¹²⁻¹⁴, mental illness and self-rated health¹⁵⁻¹⁷, *et al.* These studies showed that various health outcomes were positively associated with job stress. Meanwhile, the relevant studies on this issue in Asia are still on the starting stage except Japan¹⁸⁻²¹. Due to rapid industrializing in mainland of China, stress at work has been the momentous risk factors, which is threatening the health of workers²²⁻²⁴. A few studies on job stress were conducted in the past years in China whose validity and reliability were not well tested yet^{22,25}. However, it is not clear yet whether JCQ could be applied to the Chinese working population under the communist social context, though some studies were conducted in post-communist countries in Europe²⁶. Furthermore, comparison of Chinese evidence with other countries using a standard instrument

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to assess the job stress is indispensable. Consequently, there is an urgent need to initiate systematic studies of job stress in China. The aim of this paper is to investigate psychometric properties of selected scales of a Chinese version of JCQ in a sample of health care workers employed in university hospitals in mainland of China.

Subjects and Methods

Subjects

In this study, participants were health care workers working in the in-patient wards of 3 university hospitals located in north of China, a general hospital, a lung and heart care hospital, and a maternal and child health care center. Of 1,093 eligible subjects, 947 returned the questionnaire (response rate were 86%, 85%, and 89% for each hospital). After some subjects with missing values of age, sex and JCQ items were excluded, the data from 774 subjects (71% of 1,093) were analyzed in this study.

Methods

The 22-item JCQ questionnaire was applied into this study, which consists of 3 scales. They are “decision latitude” including skill discretion (6 items) and decision authority (3 items), “psychological job demands” (5 items), and “social support” including coworker support (4 items) and supervisor support (4 items). Items in the scales are scored using a Likert scale in which 1 indicates that the respondent strongly disagrees and 4 indicates that he or she strongly agrees. The instrument is scored in such a way that the range for decision latitude is 24–96, the range for psychological job demands is 12–48, and the range for social support is 8–48.

Generally, two Chinese character systems are used in Chinese-spoken population while the pronunciations are same, the traditional characters being used in Taiwan and the simplified characters being used in mainland of China. Since Y. Cheng has developed the traditional Chinese version of JCQ for Taiwanese workers²⁷⁾, our simplified Chinese version was produced by modifying Cheng’s version slightly. That was to convert the Chinese characters from traditional to simplified, and modify some expressions to meet mainland style. However, the meaning of statements was still kept the same as the original. Then this Chinese version was back-translated into English and reviewed by R. Karasek, further correction was done with his suggestions. The information on education, marital status, economic status, life style, and work history were also assessed by the questionnaire.

Statistical analysis

The analysis of covariance (ANCOVA adjusting for age) was used to compare the means of JCQ scales by sex and occupations. Cronbach’s alpha coefficients and item-total correlations were examined to assess the internal consistency. Pearson’s correlation coefficients among age, education, and JCQ scales were calculated for men and women. The exploratory factor analysis was also performed to test Karasek’s model, using principal axis extraction and varimax rotation²⁸⁾. All analysis was conducted by SAS 8.01.

Results

Demographic information

Of the 774 subjects in this study, 75% were women and 62% of all subjects were married. The mean age of men and women were 33 and 29 yr old respectively. The education which men received was about 2-yr longer than women’s. Thirty five percent and 62% men smoked and drank alcohol respectively, while few women did. The men recorded their length of work as 10 yr compared to 9 for the women. Men had longer over time work than women (9 vs. 3 h per wk). Accordingly, men had higher position and salary than women. A great many of men were physicians (94%) who served in the departments of internal medicine and surgery mostly, whereas 64% women were nurses who served in different departments more evenly (Table 1).

Scores of JCQ scales

Means and standard deviations for each JCQ scale were given in Table 2. The score of decision latitude (including skill discretion and decision authority) in men was significantly higher than in women. As for the differences between occupations, physicians’ decision latitude (both skill discretion and decision authority) was also significantly higher than nurses’. Meanwhile, nurses scored significantly greater on psychological job demands and coworker support compared to physicians.

Internal consistency reliability

From Table 3, Cronbach’s alpha coefficient was 0.72 for decision latitude scale, 0.56 for psychological job demands scale, and 0.82 for social support scale. The values of item-total correlations showed that each of scale items had at least modest correlations with other items except 2 items of “repetitive work” and “enough time” with lower correlations than 0.2, which reflected that these 2 items resulted in poor internal consistency (Table 4).

Table 1. Characteristics of the study subjects (N=774)

Variables	Men (N=193)		Women (N=581)	
	Mean	SD	Mean	SD
Age (yr)	33.17	9.21	29.33	8.00
Education (yr)	16.32	2.41	14.30	1.90
Length of work (yr)	10.41	9.04	8.92	7.70
Time of work (h/wk)	49.08	17.12	42.82	14.83
Overtime work (h/wk)	9.09	9.22	3.43	5.98
	N	%	N	%
Marital status				
Married	131	67.88	345	60.21
Unmarried	60	31.09	219	38.22
Others	2	1.04	9	1.57
Salary (US dollars/ month)				
<100	67	37.02	245	43.13
100–150	56	30.94	233	41.02
>150	58	32.04	90	15.85
Exercise				
No	107	56.32	403	69.84
Yes	83	43.68	174	30.16
Smoking				
No	125	65.10	564	98.60
Yes	67	34.90	8	1.40
Alcohol drinking				
No	73	38.22	509	92.88
Yes	118	61.78	39	7.12
Occupations				
Physician	176	94.12	200	35.21
Nurse	7	3.74	362	63.73
Others	4	2.14	6	1.06
Position rank				
Low	80	42.55	342	63.33
Middle	61	32.45	163	30.19
High	47	25.00	35	6.48
Shift work				
No	63	33.33	173	29.98
Yes	126	66.67	404	70.02
Departments				
Internal Medicine	95	49.48	229	39.41
Surgery	70	36.46	124	21.34
Emergency and ICU	5	2.60	36	6.20
Gynaecology and Obstetrics	6	3.13	121	20.83
Pediatrics	16	8.33	71	12.22

Concurrent validity

In general, there was no much difference in the two subscales (skill discretion and decision authority) of decision latitude, in correlations with other scales. So were the two subscales (coworker support and supervisor support) of social support. Psychological job demands had low and negative correlation with decision latitude ($r = -0.01$), whereas social support positively correlated with both decision latitude and

psychological job demands ($r = 0.33$ and 0.03 , respectively). In addition, age and education had positive correlations with decision latitude ($r = 0.17$ and 0.19 , respectively), also with both skill discretion and decision authority, but weak correlations otherwise (Table 5). Moreover, no obvious gender difference was found on the correlations.

Factorial validity

All 22 items of 3 scales of decision latitude, psychological job demands and social support were included in this analysis. A three-factorial solution was applied according to the theoretical assumption. In both men and women, the first factor was associated with social support clearly, whose 8 items were all loaded on this factor. For men, the second factor had a broad loading across 3 JCQ scales, and the third factor might reflect decision authority. For women, the second factor was associated with decision latitude more, whose 7 out of 9 items were loaded on this factor, and the third factor might reflect psychological job demands except 2 items of “no excessive work” and “enough time”. It was remarkable that only “repetitive work” item and “enough time” item had negative factor loadings, indicating these 2 items had different properties from other items (Table 6).

Discussion

In China, it was reported that 54.9% population were employed according to the 5th national population census on September 1, 2000²⁹. Though the major occupational hazards are still pneumoconiosis, industrial poisoning and pesticide poisoning, job stress has grown as an important issue of occupational health and attracted more and more concerns. Some studies were conducted in last decade^{22, 25}. However, the instruments for measuring job stress are still questionable³⁰.

Since Karasek published his landmark article in 1979^{5–7}, the job demands-control-support model has been an extremely important model in the research of psychosocial work environment, stress and health for the past 2 decades^{3, 4}. Many occupational health psychological studies showed that poor psychosocial work environment and job stress led to health problems, such as cardiovascular diseases, musculoskeletal disorders, and mental illness, *et al.* Among these studies, most using JCQ suggested nice model fit to various outcomes^{7, 9–17}.

This study, conducted among health care workers, investigated the psychometric properties of the Chinese (mainland) version of JCQ. When viewing the overall scales, the pattern of scores was similar with other countries' studies.

Table 2. Means and standard deviations (SDs) for Job Content Questionnaire (JCQ) Scales by sex and occupations

Scale	Men (N=193)		Women (N=581)		P*	Physicians (N=376)		Nurses (N=369)		P*	Total (N=774)	
	Mean	SD	Mean	SD		Mean	SD	Mean	SD		Mean	SD
Skill discretion	34.69	4.18	32.48	4.13	<0.0001	34.08	4.13	32.02	4.11	<0.0001	33.03	4.25
Decision authority	30.98	6.25	29.42	6.26	0.0466	30.72	6.20	28.82	6.22	0.0065	29.81	6.29
Decision latitude	65.68	8.76	61.89	9.03	<0.0001	64.81	8.60	60.84	9.16	<0.0001	62.84	9.11
Psychological job demands	33.80	4.87	33.61	4.22	n.s.	33.36	4.41	34.05	4.36	0.0183	33.66	4.39
Coworker support	11.77	1.71	11.86	1.35	n.s.	11.70	1.50	11.99	1.35	0.0016	11.84	1.45
Supervisor support	10.37	2.38	10.60	2.05	n.s.	10.50	2.12	10.61	2.12	n.s.	10.55	2.14
Social support	22.14	3.50	22.47	2.92	n.s.	22.19	3.13	22.59	2.94	n.s.	22.39	3.08

*: difference between men and women, and between physicians and nurses (ANCOVA adjusting for age). n.s.: P>0.05.

Table 3. Cronbach's alpha coefficients for Job Content Questionnaire (JCQ) Scales by sex

Scale (number of items)	Men (N=193)	Women (N=581)	Total (N=774)
Skill discretion (6)	0.58	0.58	0.60
Decision authority (3)	0.67	0.68	0.68
Decision latitude (9)	0.69	0.72	0.72
Psychological job demands (5)	0.65	0.52	0.56
Coworker support (4)	0.84	0.73	0.77
Supervisor support (4)	0.84	0.8	0.81
Social support (8)	0.85	0.81	0.82

Table 4. Item-total correlations for Job Content Questionnaire (JCQ) Scales

Scale	Items	Men (N=193)	Women (N=581)	Total (N=774)
Skill discretion	learn new things	0.36	0.29	0.40
	repetitive work	0.01	-0.06	0.03
	requires creative	0.49	0.47	0.46
	high skill level	0.49	0.46	0.53
	variety	0.44	0.43	0.45
	develop own abilities	0.17	0.36	0.26
Decision authority	allow own decisions	0.56	0.51	0.52
	little decision of freedom	0.38	0.44	0.42
	lot of say	0.51	0.53	0.53
Psychological job demands	work fast	0.44	0.40	0.40
	work hard	0.38	0.27	0.30
	no excessive work	0.37	0.22	0.26
	enough time	0.27	0.14	0.18
	conflicting demands	0.57	0.45	0.48
Supervisor support	supervisor is concerned	0.57	0.41	0.45
	supervisor pays attention	0.66	0.52	0.57
	helpful supervisor	0.74	0.57	0.63
	supervisor good organizer	0.71	0.60	0.64
Coworker Support	coworker competent	0.68	0.61	0.63
	coworker interest in me	0.67	0.57	0.60
	friendly coworkers	0.65	0.64	0.64
	coworkers helpful	0.68	0.66	0.67

Table 5. Correlations among age, education, and JCQ scales

Variables	Sex	Variables indicated by number								
		1	2	3	4	5	6	7	8	9
1. Age (yr)	Total	1.00								
	Men									
	Women									
2. Education (yr)	Total	0.35 **	1.00							
	Men	0.12								
	Women	0.40 **								
3. Skill discretion	Total	0.08 *	0.21 **	1.00						
	Men	0.08	0.30 **							
	Women	0.02	0.06							
4. Decision authority	Total	0.20 **	0.13 **	0.48 **	1.00					
	Men	0.18 **	0.06	0.39 **						
	Women	0.18 **	0.11 **	0.49 **						
5. Decision latitude	Total	0.17 **	0.19 **	0.79 **	0.91 **	1.00				
	Men	0.17 *	0.19 **	0.75 **	0.90 **					
	Women	0.13 **	0.11 **	0.80 **	0.92 **					
6. Psychological job demands	Total	0.01	0.00	0.11 **	-0.08 *	-0.01	1.00			
	Men	0.13	0.12	0.18 *	-0.10	0.01				
	Women	-0.04	-0.07	0.08	-0.08 *	-0.02				
7. Coworker support	Total	0.02	-0.02	0.23 **	0.19 **	0.24 **	0.16 **	1.00		
	Men	0.10	0.12	0.34 **	0.23 **	0.32 **	0.19 **			
	Women	-0.01	-0.09 *	0.21 **	0.18 **	0.22 **	0.15 **			
8. Supervisor support	Total	-0.07	0.01	0.28 **	0.26 **	0.31 **	-0.06	0.45 **	1.00	
	Men	-0.15 *	0.08	0.29 **	0.23 **	0.30 **	-0.04	0.44 **		
	Women	-0.02	0.00	0.31 **	0.29 **	0.34 **	-0.07	0.45 **		
9. Social support	Total	-0.04	-0.00	0.31 **	0.27 **	0.33 **	0.03	0.78 **	0.91 **	1.00
	Men	-0.06	0.12	0.36 **	0.27 **	0.36 **	0.07	0.79 **	0.90 **	
	Women	-0.02	-0.04	0.31 **	0.29 **	0.34 **	0.02	0.78 **	0.91 **	

*: $P < 0.05$, **: $P < 0.01$.

The mean scores of social support in workplace were close to those of western countries of United States, Canada, Netherlands, and France, though lower a little bit. However, the mean scores of decision latitude were much lower, especially the decision authority subscale; whereas the mean scores of psychological job demands scale were slightly higher compared to western countries. As regards standard deviations, they were consistent with other studies^{8, 31, 32}. Due to the restricted occupational category (health care workers), the differences were likely to be of consideration. Moreover, the subordinate is required to respect the supervisor and obey the orders from leaders in Chinese culture. It might explain the lower decision authority of Chinese workers.

In Asia, the trend of comparison with Japanese study of JCQ scales followed the western countries^{33, 34}. No much difference of mean scores of JCQ scales was found except the skill discretion subscale for women, between this study and Taiwanese study, whose participants were also Chinese-spoken samples²⁷. Nevertheless, Korean nurses study

showed that the Korean nurses had higher psychological job demands and lower decision latitude than Chinese health care workers³⁵. For the sake of occupations, it was reasonable that health care worker had higher job stress than other occupations, particularly nurses in worse situation^{35, 36}. Moreover, the gender differences could be observed in our study. The skill discretion and decision authority in women were systematically lower across not only this study, also all other countries' studies^{8, 27, 31–35, 37}. This finding indicated that women had less freedom for their own job in the psychosocial work environment, they would be more susceptible to the poor condition therefore.

Internal consistency for the social support scale was highly acceptable, whereas for decision latitude was moderate. However, the internal consistency for psychological job demands was relatively low. According to other studies, the Cronbach's alpha coefficient for psychological job demands was ranged from 0.5 to 0.7^{38, 39}. Thus our results seemed to be acceptable satisfactorily. Regarding as the

Table 6. Factor analysis of 22-item JCQ using Principal Axis Extraction and Varimax Rotation (N=774)

Scale	Items	Men (N=193)			Women (N=581)		
		F1	F2	F3	F1	F2	F3
Decision latitude	learn new things		0.44				0.39
	repetitive work						-0.30
	requires creative		0.40			0.49	
	high skill level		0.53			0.47	0.45
	variety			0.54		0.53	
	develop own abilities			0.59		0.66	
	allow own decisions			0.70		0.58	
	little decision of freedom			0.42		0.49	
	lot of say			0.66		0.63	
Psychological job demands	work fast		0.49				0.50
	work hard		0.72				0.60
	no excessive work		0.35				
	enough time			-0.34			
	conflicting demands		0.57				0.48
Social support	supervisor is concerned	0.69			0.61		
	supervisor pays attention	0.67			0.54		
	helpful supervisor	0.72			0.66		
	supervisor good organizer	0.73			0.72		
	coworker competent	0.51	0.32		0.42		
	coworker interest in me	0.46	0.37		0.57		
	friendly coworkers	0.60	0.35		0.56		
	coworkers helpful	0.58	0.32		0.56		
Variance explained (%)		15.2	11.0	10.5	13.4	11.5	8.0

Only items with factor loading >0.30 are shown.

item-total correlations, 2 items of “repetitive work” and “enough time” were weakly correlated with other items within each scale. The “repetitive work” item was questioned by many studies for its poor consistent role in the decision latitude scale^{8, 32–34}. But the “enough time” item was seldom mentioned by other studies, in which the “conflicting demands” item was usually criticized^{8, 27, 32–34, 39}. In the current context of Chinese hospital setting, it probably revealed the time pressure might not be the job stressor yet because the occupations of physician and nurse are relatively stable, the amount of work in charge is not as high as other countries’ health workers, especially for women.

The correlations between JCQ scales and subscales were explored JCQ structure. The strong positive correlation between the 2 subscales (skill discretion and decision authority) of decision latitude ($r = 0.48$) was found, so did the 2 subscales (coworker support and supervisor support) of social support ($r = 0.45$). It was agreed by other studies, too^{8, 32, 33, 35}. Psychological job demands had low and negative correlation with decision latitude, which was also found in Netherlands study and Korean study, but not in other studies^{8, 35}. In addition, social support displayed a strong

positive correlation with decision latitude, as confirmed by all previous studies^{8, 32, 33, 35}; it also positively correlated with psychological job demands, in agreement with only Japanese study³³. Thus, the 3 obviously different dimensions of Karasek’s job strain model were showed here.

Both age and education had positive correlations with decision latitude, as pointing out as other studies^{8, 32, 33, 35}. However, the former was more correlated with decision authority, whereas the latter preferred skill discretion except women. Accordingly, it was implied that the older people had a greater influence on decision making, and the men with higher education level would like to conduct higher techniques, considerably.

Exploratory factor analysis showed the first factor was associated with social support clearly in both men and women. Interestingly, the items belonging to skill discretion and psychological job demands were loaded on same factor in both genders, especially in men. This was found in Japanese study and French study, too^{32, 33}. With the development of sciences, high techniques and skills would be more and more required for the workers, therefore skill discretion might also be another aspect of psychological job

demands. Note that “repetitive work” item and “enough time” item had low or negative factor loadings in both men and women, “no excessive work” item had low loading in women. We suspected the “excessive work” might mean “increased working time” in Chinese culture. As it was discussed before, the “enough time” item might be not the source of psychological job demands in this study. Subsequently, the “no excessive work” item was not related to this JCQ scale tightly. Thus the findings suggested that these 3 items might be not appropriate for Chinese (mainland) working population probably and need to be modified afterwards^{8, 27, 32, 33, 39}.

The major limitation of this study was the participants' occupations were rather restricted, only health care workers. The large-scale study on this issue with expanding more occupations and industries in mainland of China is expected in the future.

In conclusion, the results of this validation study suggested that the psychometric properties of Chinese (mainland) version of JCQ were satisfactory. Nevertheless, the more efforts will be put onto the 2 scales of decision latitude and psychological job demands for the development of further version of JCQ.

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