Construct Validity of the Thai Version of the Job Content Questionnaire in a Large Population of Heterogeneous Occupations

Pitchaya Phakthongsuk MD, PhD*

* Occupational Health Unit, Community Medicine Department, Faculty of Medicine,
Prince of Songkla University, Hat Yai, Songkhla, Thailand

Objective: *To test the construct validity of the Thai version of the job content questionnaire (TJCQ).*
Material and Method: *The present descriptive study recruited 10415 participants from all occupations according to the International Standard Classification of Occupations. The instrument consisted of a 48-item of the job content questionnaire. Eight items newly developed by the authors from in-depth interviews were added.*
Results: *Exploratory factor analysis showed six factor models of work hazards, decision latitude, psychological demand, social support, physical demand, and job security. However, supervisor and co-worker support were not distinguished into two factors and some items distributed differently along the factors extracted. Confirmatory factor analysis supported the construct of six latent factors, although the overall fit was moderately acceptable. Cronbach's alpha coefficients higher than 0.7, supported the internal consistency of TJCQ scales except for job security (0.55).*
Conclusion: *These findings suggest that TJCQ is valid and reliable for assessing job stress among Thai populations.*

Keywords: *Job Satisfaction, Occupational diseases*, *Questionnaires, Reproducibility of results, Stress, psychological, Workplace*

Over the three decades, the Job Demand Control (JDC) Model[1] and its expanded version as the Job Demand-Control-Support (JDCS) Model[2,3], have dominated researches on stress at work. The JDCS model assumes that job strain is a result of the interaction of three job dimensions, demands, control, and social support. Social support has been defined as overall levels of helpful social interaction available on the job from co-workers and supervisors[3]. Based on the JDCS model, the job content questionnaire (JCQ) was developed and has become a well-known and widely-used self-administered instrument to assess job stressors. Despite the fact that the JCQ has been evaluated for its psychometric properties across Europe, Northern America, and East Asia, it is crucial to study whether it could be applied to populations in different cultural and socioeconomic backgrounds such as Thailand. Additionally, different kinds of criticism of the model have been raised. Some pointed out the methodological and conceptual problems of the model[4-6]. Thus, there is still a need to increase the number of variables that would be relevant in the stress process and Thai sociocultural context.

In Thailand, a number of researchers in occupational medicine have raised concerns regarding the adverse effect of psychosocial work environment on health since a number of epidemiological studies have linked job stress to hypertension, cardiovascular disease, psychosomatic symptom, depression,

Correspondence to: Phakthongsuk P, Occupational Health Unit, Department of Community Medicine, Faculty of Medicine, Prince of Songkla University, Hat Yai, Songkhla 90110, Thailand. Phone: 074-451-167, Mobile: 08-1541-4064, Fax: 074-212-900, E-mail: pphakthongsuk@gmail.com

musculoskeletal disease, and adverse birth out-comes[7-11]. Some previous researches on job stress in Thailand had been conducted using ad-hoc scales of job stressors which were either lacking of clear theoretical ground or not been adequately tested for its validity. The aim of this present study was therefore to evaluate the construct validity of the JCQ and modify some variables representing stressors in a Thai context. The present study was designed to explore the construct validity using both exploratory and confirmatory factor analysis in a large population and a wide range of occupations in order to provide an opportunity to extend occupational stress research in Thailand in the near future.

Material and Method
Study design and sample size
A large cross-sectional survey was conducted in Songkhla province. To achieve the adequate sample size, product moment correlation as recommended by Cohen[12] was used, expecting a total sample of 10,200. There were altogether 116 groups of occupa-tions available according to the 3-digit code of the International Standard Classification of Occupations (ISCO-88)[13] and approximately 100 subjects from each code were recruited under the present study. The sampling frame was based on the provincial registry of public administration organizations and the provincial industrial registry. Purposive samples during field visit in each district were also performed to obtain the subject in informal sector outside the provincial registry namely agricultural and fishery workers, craft and related trade workers, and elementary occupations. Of 16,920 self-reported questionnaires distributed, 10,415 completed questionnaires were returned. The participation rate was 61.6%.

Job content questionnaire (JCQ)
The 48-item JCQ[14] was translated into Thai and then retranslated into English by two bilingual speakers who were unaware of the original English. The JCQ contained 48 items and consisted of a full set of questions to assess seven scales as decision latitude (9 items), psychological demand (9 items), job security (6 items), coworker support (4 items), supervisor support (4 items), physical exertion (5 items), and hazard at work (8 items). Each item has a response set of four-point Likert scales that range from 1 or strongly disagree to 4 or strongly agree. Subsequently, TJCQ was submitted to the JCQ center, University of Massachusetts, Lowell for approval.

To modify the JCQ to Thai context, in-depth interviews were obtained using 40 subjects from ten groups of the 2-digit occupational codes of ISCO-88 (1. Legislators, senior officials and managers, 2. Professionals, 3. Technicians and associate professionals, 4. Clerks, 5. Service workers and shop and market sales workers, 6. Skilled agricultural and fishery workers, 7. Craft and related trade workers, 8. Plant and machine operators and assemblers, 9. Elementary occupations, and 10. Armed forces). The instrument consisted of the open-ended questions of 'What is the cause of stress in your workplace?' and 'How each of these stressors caused stress in your workplace? -psychological job demand, physical job demand, stress involved in decision latitude at work, stress from supervisors, stress from coworkers, and stress from job security and stress from work hazards?'. Among the eight items modified from in-depth interviews, five items of 'competitive work', 'business risk', urgent/deadline work', 'not enough rest', and 'poor income' were categorized into psychological demand scale while the other three items of 'traffic congestion', 'physical violence', and 'verbal/sexual abuse' were added into work hazards scale. The pilot study with a small group of employees in different types of jobs (n = 58), consisted of administering TJCQ and obtaining the comments of the respondents during an in-person interview. This step allowed the authors to make complementary refinements for TJCQ.

Finally, the final TJCQ consisted of 56-items and constituted a set of questions for seven scales, decision latitude (11 items), psychological demand (14 items), physical demand (5 items), social support (8 items) supervisor support (4 items), coworker support (4 items), job security (6), and work hazards (12 items) as shown in Table 2.

Statistical analysis
To assess the factorial structure of TJCQ, exploratory factor analysis (EFA) was conducted by means of a principle factor extraction method. Prior communalities were estimated using squared multiple correlations and the factor was orthogonally rotated using the varimax criterion. Factor loadings equal to or larger than 0.3 were accepted as sufficient loadings.

To determine the overall fit of the hypo-thesized model to the data, confirmatory factor analysis (CFA) was tested using a mixture of fit indices of Chi-square statistic, goodness of fit index (GFI), adjusted goodness of fit index (AGFI), the root mean square error of approximation (RMSEA), non-normed

fit index (NNFI), and comparative fit index (CFI). The models to be tested in the present study were based on two conceptualization of the psychosocial dimensions of work environment. A seven-factor model proposed in the JDCS model and a six-factor model extracted under study.

The first four measures of fit were absolute fit indices to assess how well the hypothesized model covariance matrix estimates the sample covariance matrix. The Chi-square statistic was a measure of overall fit of the model to the data. It tested the null hypothesis that the sample covariance matrix perfectly fitted the hypothesized model. A small Chi-square corresponded to a good fit and a large Chi-square to a bad fit. The root mean squared error of approximation (RMSEA) focused on the discrepancy between the sample covariance matrix and the hypothesized model covariance matrix but did also account for the degree of freedom. A value of less than 0.05 was indicative of a good fit; between 0.05 and less than 0.08 a reasonable fit and greater than 0.1 a poor fit. The goodness of fit index (GFI) was indicative of the relevant amount of the hypothesized model's covariance and demonstrated how close the model was to the sample covariance matrix. The adjusted goodness of fit (AGFI) was the GFI adjusted for the degree of freedom in the model. Values of GFI and AGFI should range between 0 and 1 and any values exceeding 0.9 reflected acceptable fits.

The last two measures of fit were the comparative fit indices, which showed how much better the model fit compared to the basic model. The non-normal fit index (NNFI) and comparative fit index (CFI) measured how much better the hypothesized model fitted a null model that did not specify any relationships between the variables. The NNFI and CFI ranged from 0 to 1, with values exceeding 0.9 indicating a good fit.

Results
Demographic information
Table 1 summarizes the demographic information of the subjects. Of the 10,415 subjects, 50.2% were men and 48.9% were women. Nearly all of the respondents were between 19-45 years of age and was in an active labor force. About 60% had education below or equal to college diploma level. Twenty-eight percent had an income below or equal to 5,000 baht per month and 68% had long working hours of more than 40 hours per week. The occupational groups according to ISCO-88 are also shown in Table 1.

Exploratory factor analysis (EFA)
The result of EFA of 56 items for the six-factor model is shown in Table 2. The sampling adequacy measure of Kaiser's criteria of 0.89 suggested sufficient correlation to conduct EFA. A screen test suggested six meaningful factors, explaining 39.6% of the total variance.

Factor 1 grouped all items theoretically connected to work physical with factor loadings ranging from 0.303 to 0.772.

Factor 2 comprised items mostly connected to decision latitude, though three items of 'repetitive tasks', 'variety of different things', and 'freedom of making decision' were unexpectedly loaded in Factor 3 relevant to psychological demand. Of interest was that three items from other scales according to the JDCS model were extracted into this factor. These were 'intense concentration' from psychological demand, 'career promotion' and 'skill valuable in the next 5 year' from job security.

Factor 3 grouped items mainly connected with psychological demand. One item of 'rapid and continuous activity ' from physical demand and three items from decision latitude as previously mentioned were also loaded on this factor. EFA also revealed that four items belonging to psychological demand scale loaded on other factors as follows: 'conflicting demand' and 'business risk' on Factor 5 relevant to physical demand, 'intense concentration' on Factor 2, and 'competitive work' loaded on Factor 6 relevant to job security. Furthermore, the other two items of 'enough time' and 'excessive work' were dropped due to low factor loadings of less than 0.3.

Factor 4 was unequivocally connected to the scales of supervisor support and coworker support with high factor loadings. Of note was that these two factors were not separated as in the original JDCS model.

Factor 5 grouped four items most likely connected with physical demand scale except for 'rapid and continuous activity', which loaded on Factor 3 associated with psychological demand instead. Additionally, two items of 'conflicting demand' and 'business risk' from psychological demand scale also loaded on this factor.

Factor 6 consisted of four items clearly connected to job security scale and one item of 'competitive work' from psychological demand scale. The other two items 'career promotion' and 'skill valuable in the next 5 years' belonging to job security scale were, however, loaded on Factor 2 relevant to decision latitude.

Table 1. Characteristics of the study population (n = 10,415)

Variable		n (%)
Sex	Male	5231 (50.2)
	Female	5096 (48.9)
	Missing	88 (0.9)
Age (yrs)	≤ 18	232 (2.2)
	19-25	1731 (16.6)
	26-35	3767 (36.2)
	36-45	2865 (27.5)
	45-55	1278 (12.3)
	56-65	359 (3.4)
	> 65	50 (0.5)
	Missing	133 (1.3)
Total years of education	6	1737 (16.7)
	9	1288 (12.4)
	12	1232 (11.8)
	14	1928 (18.5)
	16	3351 (32.2)
	18+	584 (5.6)
	Unclassified	237 (2.3)
	Missing	58 (0.5)
Income (baht per months)	≤ 5,000	2885 (27.7)
	5,001-10,000	3946 (37.9)
	10,001-20,000	2259 (21.7)
	20,001-50,000	922 (8.8)
	50,001+	333 (3.2)
	Missing	70 (0.7)
Working hour per week	≤ 40	3057 (29.4)
	41-60	4848 (46.5)
	61-80	1287 (12.4)
	80-100	677 (6.5)
	101+	244 (2.3)
	Missing	302 (2.9)
Major occupational group	1) Legislators, senior officials and managers	536 (5.1)
	2) Professionals	2059 (19.8)
	3) Technicians and associate professionals	1966 (18.9)
	4) Clerks	831 (8.0)
	5) Service workers and shop and market sales workers	1241 (11.9)
	6) Skilled agricultural and fishery workers	361 (3.5)
	7) Craft and related trades workers	1413 (13.6)
	8) Plant and machine operators and assemblers	959 (9.2)
	9) Elementary occupations	889 (8.5)
	10) Armed force	160 (1.5)

Confirmatory factor analysis (CFA)

CFA was also performed to test a priori-hypothesis on the proposed JDCS model of the seven-factor model and the six-factor model derived from the present study as shown in Table 3. This was done by computing the estimated covariance matrix implied by the hypothesized model and comparing it to the covariance matrix based on the empirical data. CFA indicated moderate goodness-of-fit of both the 6-factor and 7-factor models. The comparison of both models, based on the discrepancy in χ^2 fit values, indicated that the 6-factor model provided a significantly better fit than the 7-factor model.

Internal consistency reliability

From Table 4, Cronbach's alpha coefficient was adequate for decision latitude scale (0.82), psychological demand (0.76), social support (0.81), physical demand (0.71), and work hazards (0.86) but moderately adequate for job security (0.55). The

Table 2. Eigenvalue, %variance explained, cumulative% variance explained, communalities and factor loading of TJCQ using varimax rotation method

	F1	F2	F3	F4	F5	F6	Communality
Eigen values	5.283	4.308	4.252	3.981	2.314	2.018	
% variance	9.435	7.694	7.793	7.109	4.132	3.603	
Cumulative % variance	9.435	17.128	24.721	31.831	35.963	39.566	
Physical hazard							
Dangerous tools, machinery	0.772						0.623
Dangerous work method	0.768						0.604
Fire, burns, electrical shock	0.724						0.550
Dangerous chemicals	0.710						0.516
Catching diseases	0.702						0.511
Air pollutions	0.700						0.517
Things stored dangerously	0.697						0.519
Poor house keeping	0.617						0.415
Verbal/sexual violence (Thai)	0.481						0.344
Traffic congestion (Thai)	0.428						0.208
Physical violence (Thai)	0.425						0.224
Loud noise	0.303						0.119
Decision latitude							
Develop own abilities		0.684					0.508
A lot of say		0.641					0.484
Creative		0.641					0.501
Significant influence in group		0.599					0.485
Decision on my own		0.573					0.338
High skill level		0.553	0.320				0.429
Learn new thing		0.514					0.390
Democratic group		0.465		0.409			0.466
Repetitive tasks			0.460				0.227
Variety		0.360	0.431				0.324
Freedom of making decisions			0.337				0.234
Psychological demand							
Hectic work			0.655				0.443
Work hard			0.632				0.434
Not enough rest (Thai)			0.541				0.340
Urgent work (Thai)			0.532				0.325
Work interrupted			0.506				0.278
Conflicting demand					0.505		0.261
Work fast			0.492				0.290
Poor income (Thai)			0.461				0.241
Intense concentration		0.451					0.319
Waiting on others			0.389				0.193
Business risks (Thai)					0.402	0.401	0.396
Competitive work (Thai)						0.324	0.339
Enough time							0.215
Excessive work							0.147
Social support							
Supervisor concern				0.728			0.569
Supervisor good organizer				0.707			0.538
Supervisor helpful				0.692			0.499
Coworker helper				0.672			0.480
Coworker friendliness				0.645			0.451
Supervisor pay attention				0.644			0.479
Coworker competent				0.506			0.305
Coworker interested in me				0.501			0.316

Factor loading < 0.30 was not listed

Table 2. (Cont.)

	F1	F2	F3	F4	F5	F6	Communality
Eigen values	5.283	4.308	4.252	3.981	2.314	2.018	
% variance	9.435	7.694	7.793	7.109	4.132	3.603	
Cumulative % variance	9.435	17.128	24.721	31.831	35.963	39.566	
Physical demand							
Lift/carry heavy loads	0.351				0.554		0.525
Awkward head and arm			0.373		0.547		0.489
Physical effort			0.366		0.468		0.477
Awkward body			0.452		0.459		0.465
Rapid and continuous activity			0.457				0.358
Job security							
Job loss last year						0.668	0.463
Job loss in next 2 years						0.653	0.487
Steady job						0.566	0.330
Job security		0.349				0.560	0.458
Career promotion		0.523					0.405
Skill valuable in next 5 yrs		0.473					0.306

Factor loading < 0.30 was not listed

Table 3. Confirmatory factor analysis of six factor and seven factor of TJCQ

	Absolute fit indeices				Comparative fit indices		
Model	χ^2	df	GFI	AGFI	RMSEA	NNFI	CFI
Six factor model	14029.69	1333	0.79	0.71	0.054	0.51	0.55
Seven factor model	14934.39	1422	0.73	0.70	0.063	0.49	0.53
		$\Delta \chi^2$, df 89 = 904.7; p-value < 0.05					

GFI = goodness of fit index, AGFI = adjusted goodness of fit index, RMSEA = root mean square error of approximation, NNFI = non-normed fit index, CFI = comparative fit index

Table 4. Internal Consistency of six factor model of TJCQ

Scale	Cronbach's alpha coefficients
Decision latitude	0.82
Psychological demand	0.76
Social support	0.81
Physical demand	0.71
Job security	0.55
Work hazards	0.86

values of item-total correlations showed that each of the scale items had at least modest correlations with other items of more than 0.2 except one item of 'competitive work'. This item had item-total correlations of 0.09, reflecting poor internal consistency with job security scale (data not shown). The standardized α

of job security scale, however, increased from 0.55 to 0.58 when this item was deleted.

Discussion

The factor analysis in the present study showed adequate construct validity of the Thai version of JCQ of decision latitude, psychological demand, physical demand, job security, and work hazards, though the goodness of fit indices by CFA was moderately acceptable. The factor patterns generally corresponded to the theoretically construct of JDCS model except for supervisor and co-worker support being clearly loaded on the same factor and some items distributed differently along the extracted factor. The Cronbach's α coefficient was satisfactory for five factors of 0.71-0.86 except job security scale, which was moderately acceptable at 0.55.

The first factor extracted was obviously associated with work hazards. All items including three Thai_modified items were extracted as theoretically expected. Some differences of item distribution, however, characterized the results of Factor 2 and Factor 3. EFA showed the mixture of items between both factors under study. Though, nearly all the items of decision latitude loaded on Factor 2 related to decision latitude, the three items of 'repetitive tasks', 'variety', and 'freedom of making decision' loaded on Factor 3 related to psychological demand. Additionally, the decision latitude item of 'high skill level' shared loadings with Factor 3. The finding that 'repetitive tasks' loaded on psychological demand was in agreement with the studies from China[15], Taiwan[16], and Korea[17]. Actually, in the cross-national validity study by Karasek[18], the most troublesome decision latitude item was 'repetitive work' because it had a low and inconsistent loading on the decision latitude factor. Theoretically, decision latitude comprised of two main components of skill discretion or intellectual demand (a degree to which the job_involves learning new things, performing repetitive tasks, requiring creativity at work, involving various tasks, developing one's special abilities, etc) and decision authority (the individual's ability to make decisions about one's own job, influence the work group, and influence company policy). It might be postulated that repetitive tasks lost capacity for_intellectual challenge or demand providing people with a sense of control over their work activities after consistent rehearsal and this finally led to a routine workload. Thus, the degree of constraints and choices over learning opportunities might be the key to distinguish the differences between skill discretion and psychological workload. That the item of 'variety' loaded on psychological demand also reported in another study[15,17]. Likewise, Kawakami[19] also found that 'freedom of making decisions' loaded on psychological demand. Of note was that these groups of items loading on psychological demand involved high intellectual demand. Actually, intellectual demand was strongly debated that it might not only reflect decision latitude but also the difficulty and complexity of the task and could be a source of stress at work. The authors' findings reflected the conceptual difficulties that too high a level of intellectual demand can be disastrous, though some level of intellectual demands is necessary for job autonomy and satisfaction.

Additionally, one psychological demand item 'intense concentration', as well as two job security items of 'career possibilities' and 'skill valuable in next 5 years', loaded on Factor 2 related to decision latitude. The findings that the psychological demand item of 'intense concentration' shared loadings with decision latitude was common among Western studies[20-23] while most Asian studies did not include this item. Further comparison with any studies of the two job security items could not be made since most validation studies rarely included a job security scale. Thailand's social and educational development has lagged considerably behind its level of economic development. A shortage of skilled labor is currently a major constraint for an attempt to evolve into an advanced economy and Thailand is currently far behind in the enrollment of technical training and tertiary institutions[24-26]. In such circumstances, jobs involving high intellectual demand and significant decision abilities could result in career promotion and job security for skillful employees.

The finding that eight items clearly belonging to supervisor support and co-worker support extracted into the same factor was consistent with previous studies in Asia[15,17,23,27] but some reported two subscales as original model[16,19]. Most studies in Western countries, however, reported clearly two different subscales[18,20,22,28].

The EFA also indicated not only the four physical demand items loaded on Factor 5 but also shared_loadings with Factor 3 related to psychological demand. The item of 'rapid and continuous activity' originally meant to capture a dynamic workload also extracted into Factor 3. The interpretative ambiguities between physical and psychological demand was elaborated by Karasek[18] that most of psychophysiological costs of work could occur since high physical demand could arouse high levels of autonomous nervous system and certainly contribute psychologically. Interestingly, the two items of 'conflicting demand' and 'business risk (Thai item)', meant to capture psychological demand were extracted into this factor. The item 'conflicting demand' might be subjected to misinterpretation in Thai cultural context and might be interpreted as assessing the degree of conflict at work as previously occurred in the Japanese validity study[19]. It was postulated that these items capture the work characteristic of lowest skill level workers who had strenuous physical activity, overt violent conflict at work and being in the unsecured business sector in Thai society.

In conclusion, the result of scale reliability and EFA of TJCQ in this large population was generally

supportive of the JDCS model, though CFA suggested a gap-to-fill and called for further exploration to refine its psychometric properties in the Thai population. Strengths of the TJCQ were its modification to a Thai context, satisfactory validity and reliability including the ability to identify a psychosocial work environment with a simple and concise questionnaire that can be applied to a wide range of Thai work settings.

Acknowledgement

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ความตรงเชิงโครงสร้างของแบบประเมินความเครียดจากงานชนิด Job Content Questionnaire ฉบับภาษาไทย ในประชากรขนาดใหญ่และหลากหลายอาชีพ

พิชญา พรรคทองสุข

วัตถุประสงค์: เพื่อทดสอบความตรงเชิงโครงสร้างของแบบวัดความเครียดจากงานชนิด Job Content Questionnaire ฉบับภาษาไทย (TJCQ)

วัสดุและวิธีการ: การศึกษาเชิงพรรณนานี้เก็บข้อมูลจากประชากรทุกกลุ่มอาชีพ ตามคู่มือการจัดประเภทมาตรฐานอาชีพระหว่างประเทศ จำนวน 10,415 คน เครื่องมือที่ใช้คือแบบสอบถาม Job content questionnaire 48 ข้อ และข้อคำถามที่พัฒนาโดยผู้นิพนธ์เพิ่มขึ้นอีก 8 ข้อจากการสัมภาษณ์เชิงลึก

ผลการศึกษา: การวิเคราะห์องค์ประกอบเชิงสำรวจพบว่ามี 6 องค์ประกอบหลักคือสิ่งคุกคามในงาน (hazard at work) การควบคุมงาน (job control) งานเรียกร้องทางจิตใจ (psychological job demand) แรงสนับสนุนทางสังคม (social support) งานเรียกร้องทางกาย (physical demand) และความมั่นคงในงาน (job security) สอดคล้องกับโมเดลของ JCQ แต่แรงสนับสนุนจากหัวหน้างานและแรงสนับสนุนจากเพื่อนร่วมงานไม่จำแนกเป็น 2 องค์ประกอบ ตามโมเดลต้นฉบับเช่นเดียวกับข้อคำถามบางส่วนมีการกระจายในแต่ละสเกลต่างกันบ้าง ส่วนการวิเคราะห์องค์ประกอบเชิงยืนยันสนับสนุน 6 องค์ประกอบ โดยให้ค่าดัชนีความเหมาะสมของโมเดล อยู่ในเกณฑ์ปานกลาง ส่วนค่าสัมประสิทธิ์ครอนบาคแอลฟาของทุกสเกลอยู่ในเกณฑ์ดีเกิน 0.7 ยกเว้น ความมั่นคงในงาน (0.55)

สรุป: การศึกษานี้แสดงว่าแบบประเมินความเครียดจากงานชนิด Job Content Questionnaire ฉบับภาษาไทย มีคุณสมบัติในการวัดที่เหมาะสมต่อการประเมินความเครียดจากงานในประชากรไทย