CHINESE VERSION OF THE OSI: A STUDY OF RELIABILITY AND FACTOR STRUCTURES

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SUMMARY

This article examines the reliability of the Occupational Stress Indicator (OSI) in its Chinese version as well as factor structures for three of its scales — stressors, coping and job satisfaction. Estimates of reliability obtained by item-total correlation coefficients and Cronbach's alphas are quite acceptable. Factor analyses using the principal components technique have also found psychologically meaningful structures.

KEY WORDS — Chinese OSI; stressors; coping; job satisfaction

Stress has become one of the most serious health issues of the twentieth century — a problem not just for individuals in terms of physical and mental disability, but for employers and governments, who have started to assess the financial damage.[1] Matteson and Ivancevich[2] estimate that stress causes half of absenteeism, 40 per cent of turnover, and that 5 per cent of the total workforce covers for reduced productivity due to preventable stress ($300 billion for the US economy annually). Although other sources may quote different figures, it is obvious that occupational stress has serious consequences for both individual employees and organizations.

The problem of occupational stress is particularly relevant for countries undergoing enormous economic and social changes. Taiwan is one such society, with the transformation of its industrial structure from labour-intensive to high-tech, as well as rapid westernization in both work and lifestyles. In this context, it is important for psychologists, occupational physicians, managerial executives and even government policy-makers to not only understand and appreciate, but also accurately assess the problem of occupational stress in an organizational context as well as a cultural one.

It was with this in mind that we adopted the widely used diagnostic instrument the Occupational Stress Indicator (OSI)[3] for possible employment in Taiwan. The OSI is an instrument designed by one of the leading workers in the field of occupational stress. It is still a new test, and much further work is in progress both in European countries and northern America. The instrument was originally developed based on a comprehensive theoretical framework, which adopts a transactional view of occupational stress and emphasizes not only stressors and outcomes but also potential moderating variables such as personality and coping strategies. As the OSI is one of very few multidimensional instruments developed to measure occupational stress across different occupations,[12] and is supported by a reasonable theoretical framework, it was chosen as a tool to explore Chinese workers' occupational stress.

The purpose of this article is to present data on the reliability of the Chinese OSI and factor structures of its three scales — stressors, coping and job satisfaction — among a large representative sample of public sector employees. Since this is only an

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exploratory study, and there has been no sufficiently strong psychometric evidence to support the factor structures of the original OSI, no specific hypothesis was *a priori* for results.

METHODS

Subjects

Respondents in this study came from four major state-owned companies in manufacturing and power industries. All companies are located in the southern city of Kaohsiung, which is the biggest industrial centre in Taiwan. Subjects were randomly selected from the employees' lists provided by the companies and completed all measurements at one time, either in groups or individually.

The final valid sample of 1054 workers was about

Table 1 — Sample characteristics (*N* = 1054)

Variables	Categories	*N*	%
Sources	Company A	333	31.6
	Company B	275	26.1
	Company C	217	20.6
	Company D	229	21.7
Age (yr)	Under 25	7	0.7
	26–35	217	22.4
	36–45	497	51.2
	46–55	135	13.9
	Over 55	35	3.6
Gender	Male	858	88.4
	Female	66	6.8
Work	White-collar	417	42.9
	Blue-collar	483	49.7
Length of service (yr)	Under 1	3	0.3
	Under 2	28	2.9
	Under 5	93	9.6
	5–10	83	8.5
	11–15	198	20.4
	16–20	270	27.8
	21–25	101	10.4
	Over 25	61	6.3
Education	Illiterate	2	0.2
	Primary school	27	2.6
	Junior school	22	2.1
	Senior school	413	39.2
	Colleger & university	523	49.6
	Graduate degrees	44	4.2
Marital status	Never married	98	9.3
	Married	912	86.5
	Widowed	7	0.7
	Divorced	4	0.4
	Separated	1	0.1

equally drawn from the four companies, with almost equal numbers of white- and blue-collar workers. Over half of the sample were 36–45 years old, married, and had served at the same organization for 11–20 years, reflecting low labour turnover and high job security in the public sector. Nearly half of the sample had some college education, reflecting the high quality of this labour force. Finally, due to the nature of the industries under study, an overwhelming majority of our sample were males. Overall, this sample was quite representative of public sector employees in Taiwan. Detailed sample characteristics are presented in Table 1.

Measures

The Occupational Stress Indicator (OSI) was implemented, which measures seven major aspects of occupational stress. These scales include one independent variable, three moderating factors and three dependent variables, as follows:

Independent variable — stressors (61 items), measuring factors intrinsic to the job, the managerial role, relationships with other people, career and achievement, organizational structure and climate, home/work interface.

Moderating factors — (a) Type A behaviour (14 items), measuring attitude to living, style of behaviour and ambition; (b) locus of control (12 items), measuring organizational forces, management processes and individual influences; (c) coping strategies (28 items), measuring social support, task strategies, logic, home and work relationships, time and involvement.

Dependent variables — (a) job satisfaction (22 items), measuring achievement value and growth, job itself, organization design and structure, organizational processes and personal relationships; (b) physical health (12 items); (c) mental health (18 items).

The reliability and validity of the original OSI for UK workers have been tested and presented in many studies.[3-10] The OSI was translated into Chinese by the last three Chinese authors and back-translated into English by the first author. We then consulted five experts in social psychology, organizational behaviour and management psychology, and human resources management executives to clarify and refine the Chinese OSI. We had also conducted a pretest with 70 randomly selected workers from one of the four companies under

study before the large sample survey. As the result of back-translation and pretesting, some linguistic changes were made to enable respondents better to understand the instrument in their organizational contexts.

Reliability was cross-validated using three independent samples: (a) the pretest sample ($N = 70$); (b) the earlier batches of data return ($N = 874$); and (c) the final batch of data return ($N = 180$). Factor structures were cross-validated using sample (b) and the combination of samples (a) and (c). Since results were quite similar, we will only present those based on the entire sample ($N = 1054$) in the following section.

RESULTS AND DISCUSSION

Reliability

Reliability was estimated by two methods: item analysis and internal consistency analysis.

Using item-total correlation (ITC) coefficients as criteria in item analysis, those items with ITC < 0.30 were considered as giving minimal contribution to the relevant scale and hence were deleted to improve scale parsimony and consistency. Although this is a 'rule of thumb' usually followed in psychometrics,[12] it is by no means absolute, as we will see in the case of (b) following. After thus revising the scales, Cronbach's alpha coefficients were computed for each scale.

(a) Job satisfaction scale: all items' ITC exceeded 0.30 and the alpha coefficient was 0.93, demonstrating high reliability for the scale.

(b) Mental health scale: all except two items' ITC exceeded 0.30. Those two items were nos. 1 and 9; however, since they did detect meaningful psychological symptoms, we decided to retain them in the scale. The alpha coefficient was 0.86, demonstrating high reliability for the scale.

(c) Physical health scale: all items' ITC exceeded 0.30 and the alpha coefficient was 0.89, demonstrating high reliability for the scale.

(d) Type A behaviour scale: most items' ITC was below 0.30; however, after deletion, the remaining scale composed of eight items still had an alpha of 0.70, which is reasonable reliability for a personality scale.

(e) Locus of control scale: most items' ITC was below 0.30, and even after deletion the remaining scale composed of four items still had an

Table 2 — Factor loadings of 'job satisfaction' scale

Item numbers	Factor 1	Factor 2	Factor 3	Factor 4
22	0.76			
16	0.72			
12	0.71	0.35		
4	0.64			0.41
11	0.58	0.42		0.44
5	0.53			
15		0.72		0.43
1		0.65		
6	0.48	0.62		
14	0.53	0.59		
3		0.57		
13		0.48	0.43	
10		0.42		
19			0.69	
7			0.66	
20			0.60	
8			0.59	
21			0.50	
2				0.73
9				0.57
18			0.36	0.50
Variance explained (%)	42.30	6.40	5.40	4.90
Cronbach's α (subscales)	0.88	0.86	0.73	0.68
Cronbach's α (total scale)	0.93			

Factors 1, job and personal growth; factors 2, personal ambition and organizational communication; factors 3, identification with the job and the organization; factors 4, interpersonal relationships at work.

alpha of only 0.59, which is not acceptable reliability for a personality scale.

(f) Stressors scale: all except four items' ITC exceeded 0.30. Those four items were nos. 1, 4, 6 and 48. The alpha coefficient for the remaining scale of 57 items was 0.86, demonstrating high reliability for the scale.

(g) Coping strategies scale: all except seven items' ITC exceeded 0.30. Those seven items were nos. 3, 7, 10, 11, 24, 25 and 27. The alpha coefficient for the remaining scale of 21 items was 0.95, demonstrating high reliability for the scale.

In general, six out of seven scales performed quite well in reliability analysis, indicating their potential

Table 3 — Factor loadings of 'stressors' scale

Item numbers	Factor 1	Factor 2	Factor 3	Factor 4
11	0.69			
30	0.68			
27	0.67			
12	0.67			
39	0.63			
46	0.60			
22	0.57			
10	0.57			
2	0.56			
35	0.56			
41	0.53			
16	0.50			
52	0.48			
15	0.48	0.37		
21	0.47			
18	0.41			0.31
28	0.38			
53	0.37		0.27	
60		0.70		
59		0.69		
57		0.65		
32		0.65		
29		0.58		
51		0.57		0.39
56		0.54		
31		0.51		
26		0.51		
44		0.51		
33		0.50		
3		0.50		
38		0.49		
42		0.47		
50		0.46		
25		0.44		
34		0.42		
47		0.42		
49			0.59	
54			0.56	
45			0.55	
19			0.54	
24			0.52	
14			0.52	
36			0.51	
43			0.47	
40		0.30	0.45	
61			0.39	
37			0.38	
23			0.38	
58			0.26	

Table 3 — *contd*

Item numbers	Factor 1	Factor 2	Factor 3	Factor 4
7				0.62
13				0.60
55		0.38		0.50
9				0.49
17			0.41	0.49
5				0.48
20				0.45
8				0.38
Variance explained (%)	24.2	6.10	5.30	3.20
Cronbach's *a* (subscales)	0.89	0.89	0.81	0.77
Cronbach's *a* (total scale)	0.95			

Factors 1, role conflicts and lack of support; factors 2, lack of stability and work/home conflicts; factors 3, problems in job itself and career development; factors 4, stress of the managerial role.

for use in the context of Chinese organizational culture. The only exception was the locus of control scale, which was found problematic in earlier OSI studies.[5]

Parkes[11] has identified three ways of using control as a construct in occupational stress research: (a) control as an objective characteristic of the work situation, reflecting the extent to which work design and environment allow opportunities for control; (b) control as a subjective appraisal, reflecting the individual's judgement of the extent to which work is controllable; and (c) control as generalized belief on the part of the individual about the extent to which important outcomes are controllable in life at large. Research has shown that the OSI measure of control is a subjective appraisal of control of an individual's work situation.

However, within a Chinese organizational culture, personal control in terms of organizational processes or individual influences is rather ambiguous and difficult to measure. Large Chinese organizations may have copied organization structures and even management innovations from their western counterparts, but critical organizational processes are still conducted in very autocratic ways, such as decision-making behind closed doors, top-down communications, emphasis on policy implementations rather than employees' consultations, and personnel selection and promotion based on inter-

Table 4 — Factor loadings of 'coping strategies' scale

Item numbers	Factor 1	Factor 2	Factor 3
21	0.72		
18	0.69		
22	0.64		
15	0.64	0.33	
26	0.59		
17	0.59		
23	0.57		
16	0.50	0.38	
9	0.50		
19	0.46		
13	0.46		0.38
1	0.33		0.31
8	0.32		
5		0.72	
6		0.67	
4		0.55	
28		0.35	
20			0.63
2			0.62
14		0.44	0.56
12			0.38
Variance explained (%)	25.60	7.70	6.00
Cronbach's a (subscales)	0.84	0.62	0.50
Cronbach's a (total scale)	0.86		

Factors 1, rational problem-solving; factors 2, reappraisal or seeking help; factors 3, avoidance.

personal ties rather than ability or performance. All these inherent features in Chinese organizational life have deprived employees of any sense of control or personal influence at work. The situations confronting Chinese workers are very much the same for both traditional blue-collar workers and most managerial staff, except those at the very top of the corporate ladder. Therefore, using a measure of a generalized control belief rather than focusing on individual perception of work *per se* may be more meaningful and feasible in future application of the Chinese OSI.

Factor structures

Three key multidimensional scales were factor analysed using principal components technique with Varimax rotation. Results are presented in Tables 2–4. When one item loaded on more than one factor, we adopted two criteria for item grouping: (a) the magnitude of item loadings and (b) relevance and parsimony of items within a particular factor. For the sake of simplicity, only loadings exceeding 0.30 are presented in the tables, in a descending order, and those attributed to a specific factor are placed in blocks. In order to protect the copyrights of the original OSI, item contents are not listed in tables. Nonetheless, the authors are happy to be contacted if anyone is interested.

(a) Job satisfaction scale: four factors had eigenvalue exceeding 1, and they could explain 58.9 per cent of total variance. Further reliability analyses showed the alpha coefficients for the four subscales ranged from 0.68 to 0.88, lower than that for the total scale (0.93). The four factors identified were: (i) 'job and personal growth', such as 'the actual job itself' and 'the degree to which you feel that you can personally develop or grow in your job'; (ii) 'personal ambition and organizational communication', such as 'the scope your job provides to help you achieve your aspirations and ambitions' and 'communication and the way information flows around your organization'; (iii) 'identification with the job and the organization', such as 'your level of salary relative to your experience' and 'the extent to which you may identify with the public image or goals of your organization'; (iv) 'interpersonal relationships at work', such as 'the relationships you have with other people at work'.

(b) Stressors scale; the scree plot indicated that a four-factor structure should best fit the data. These four factors all had eigenvalue exceeding 1, and could each explain more than 3 per cent of variance and in combination 38.8 per cent of total variance. Further reliability analyses showed the alpha coefficients for the four subscales ranged from 0.77 to 0.89, lower than that for the total scale (0.95). The four factors identified were: (i) 'role conflicts and lack of support', such as 'conflicting job tasks and demands in the role I play' and 'lack of social support by people at work'; (ii) 'lack of stability and work/home conflicts', such as 'changes in the way you are asked to do your job' and 'pursuing a career at the expense of home life'; (iii) 'problems in job itself and career development', such as 'business travel and having to live in hotels' and 'opportunities for personal development'; (iv) 'stress of the managerial role', such as 'managing or supervising the work of other people'.

(c) Coping strategies scale: the scree plot indi-

cated that a three-factor structure should best fit the data. These three factors all had eigenvalue exceeding 1, and could each explain more than 5 per cent of variance and in combination 39.3 per cent of total variance. Further reliability analyses showed the alpha coefficients for the three subscales ranged from 0.50 to 0.84, lower than that for the total scale (0.86). The three factors identified were: (i) 'rational problem-solving', such as 'try to deal with the situation objectively in an unemotional way'; (ii) 'reappraisal or seeking help', such as 'seek as much social support as possible'; (iii) 'avoidance', such as 'use distraction to take your mind off things'.

Overall, we can see that internal consistencies for subscales formed after factor analyses did have larger variations, and were generally lower than those for their corresponding full scales. However, the lower internal consistencies always occurred for subscales with fewer items, such as three or four items. This is to be expected in psychometrics, but it does indicate that we should exercise more caution in interpreting these subscales.

Factor analysis is a rather controversial statistical technique, with many criticisms surrounding its stability and interpretation. However, it is useful in reducing variables and providing suggestive information for further detailed studies. Since the factor structures presented above had already passed the test of cross-validation using two independent samples, they should be able to serve as useful indicators in future diagnostic applications. Differentiations in factor structures between the Chinese OSI scales and the original English ones were interesting too, as they may indicate different dimensionalities in occupational stress-related perception and experiences among different cultures. The Chinese OSI scales generally yielded fewer factors but higher average alphas for subscales than the UK OSI.[3]

However, differences in factor structures could also be attributed to sample variations. The original OSI factor analyses were based on relatively small samples (typically $N = 156$), with the exception of the stressors scale, which was not factor analysed but rather was based on theoretical inferences. Furthermore, the British sample was composed of managers in a range of organizations, whereas the Chinese one was a representative sample of industrial employees in the public sector. Therefore, caution must be exercised in interpreting test scores in terms of factor structures, and a continuous accumulation of data or cross-validation using independent samples is very necessary.

CONCLUSION

This study has demonstrated a fairly good reliability for the job satisfaction, physical health, mental health, Type A behaviour, stressors and coping strategies scales. However, the reliability for the locus of control scale was not acceptable. Further studies should either revise this scale or replace it with a measure of generalized control belief in life at large.

In addition, using a large representative sample of Taiwanese public sector workers, three major OSI scales were factor analysed. Job satisfaction, stressors and coping strategies scales all presented factor structures markedly different from their UK counterparts. As the factor structures were quite stable across replication tests, further validations are desirable and meaningful. In summary, these preliminary results have shown that the Chinese OSI is a promising instrument in measuring stress and related factors in organizational contexts in Taiwan.

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