

Empirical research on the influencing factors of the occupational stress for construction workers

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Abstract. Employee's occupational stress and safety performance are highly related, which has been generally recognized by the researchers. We did this research to understand the status of the stress for construction workers, and explore the influence factors of pressure source with characteristics of construction industry. Based on the results of previous studies, we designed questionnaire to collect the influence factors on occupational stressors. The study selected workers from certain construction units at the grass-roots level as sample source. According to the results of the questionnaire, we redesigned the interview outline, and did the semi-structured interviews on workers randomly selected. Finally, we developed a scale which combined the characteristics of construction projects in China. Using SPSS software for factor analysis, reliability analysis, and descriptive statistical analysis, the results show that there are six factors affecting the workers' occupational stress, including The Work Itself, Family-Work, Career Development, Organization Style, Interpersonal Relationship and Role Management Style. The work itself is the main sources of occupational stress. The results can be used by the construction company to provide guidance for workers to control and manage occupational stress.

1. The Introduction

Occupational stress has been one of the main problems that bother people's work and life, and attracted many scholars' research. Predecessors' research shows that work stress not only harms the job itself, but also causes great damage to individual in psychology and physiology. [1] China's construction industry has evolved rapidly in recent years, since 2008 the full opening of the market in China. During these years, domestic construction companies are not only facing challenges from advanced construction enterprise, but also experiencing structural, technical and personnel aspects of the deep transformations, which cause more and more workers suffering and experiencing chronic stress. However, a vast number of employees lack of understanding of occupational stress and scientific control methods to pressure, which will create a vicious cycle. [2] And job stress can affect not only individual and organizational level, and even affect the society. [3] Therefore, the effective identification of the occupational stress structure for construction staff is of great significance for the development of construction industry. Over the past few decades, a large number of researchers proposed different concepts and models on occupational stress, as well as some theories, stress scales and questionnaires which are different but overlapping each other. Such as Vagg and Spielberger compiled a work stress questionnaire lists 20 things which lead to occupational stress. [4] Evers, Frese and Cooper developed a second edition occupational stress index to measure the stress source, the result shows that mental health, physical health and job satisfaction affect the job stress. [5] Pan YingXin, Wang Lei, Ren XiangYun and Zeng Yan compiled the Chinese employees work stress questionnaire, found that lack of control, time pressure and insufficient information are three main



factors affecting stress.[6] Phillip in the book *Stress and Health* wrote the main occupational stress source of employees can be divided into the working conditions, role stress, relationship factors, career development, organizational structure and the influence between family and work, etc., he also developed an occupational stress scale including interpersonal relationship, physical conditions and job interest[7]. But, whether this kind of scale's structure is in line with the situation in our country, especially the specific conditions of the occupational stress for construction workers, that still needs further research.

At present, there has no research on the stress of construction project staff, but there have been some researches on the stress of other industry practitioners, which we can use for reference. Xu Fuming found that among primary and secondary school teachers the most pressure events, in turn, are the test, the work itself, occupational prestige and employment pressure [8]. Cooper and Marshal's study found that the occupational stress of white-collar workers are career development, interpersonal relationship, the balance between family and work, role conflict, role ambiguity, organizational structure and atmosphere[9]. The research, Janet and Cary did, shows that the pressure of the civil service mainly comes from the work itself, such as relatively low wages, poor working conditions, or lack of controlling on job and the organization [10]. Chen ZhiXia and Liao JianQiao found that the main factors of occupational stress for knowledge workers are the work task, career development, organizational management, interpersonal relationship and ability, time urgency and the work environment [11]. The mainly purpose of this study is to compile a suitable work stress questionnaire for the workers in construction projects. It is concluded that structure factor of workers' occupational stress, and put forward suggestions according to different factors.

2. Research design

2.1. Questionnaire design

The questionnaire designed on the basis of previous relative researches, such as railway locomotive driver [12], knowledge employees from apparel industry [13] and civil aviation practitioners [14], and other workers' occupational stress. We mainly refer to the occupational stress measurement index system which was designed by Cooper and Williams, namely the OSI occupational stress scale. We also refer to the occupational stress scale designed by Bai YuLing. The semi-structured interview outline was designed on the basis of the questionnaire. And then combined with the characteristics of construction project in China, we compiled the occupational stress scale. The factors of this scale include the work itself, management roles, relationships, career development, organization style, conflicts between families and work, six aspects, a total of 20 items, for the form of 1-5 Likert scale. From "strongly disagree" to "strongly agree" meter respectively from 1 to 5.

2.2. Data Collection

Through questionnaire, we collect the structure factors of workers' occupational stress. The sample was selected in a primary construction unit. Before distributing the questionnaire to workers, the investigators explained the aim of this questionnaire and the meaning of each question to the workers. The survey handed out 150 questionnaires and recycle 132. The recovery rate was 88%, excluding eight invalid questionnaires. Finally, we received 124 valid questionnaires, the effective recovery rate were 83%. The basic information of sample is as shown in Table 1.

Table 1. Basic information of sample

variables	gender		age				Working age				education				matrimony	
category	male	female	≤30	31-40	41-50	51 ≤	≤3	3-9	10-15	16 ≤	Primary School or below	Junior High school	Senior High school	Up High school	married	unmarried
number	112	12	28	31	42	23	13	40	54	17	31	61	29	3	105	19
Percentage (%)	90	10	23	25	34	18	10	32	44	14	25	49	23	3	85	15

3. Data analyse

3.1. Factor analysis

This research use KMO and Bartlett test to figure out whether the questionnaire is suitable for factor analysis, the results are shown in Table 2.

Table 2. KMO and Bartlett test.

Kaiser-Meyer-Olkin	.856
Bartlett sphericity test	chi-squared approximation Df Sig.
	916.275 25 .000

Test results show that the KMO value between 0.8 and 0.9, Bartlett test showed significant value for.000, which mean that the occupational stress questionnaire is suitable for factor analysis. Occupational stress questionnaire factor analysis uses the statistical analysis software SPSS19.0, and 20 items of work stress questionnaire use principal component analysis method and maximum variance orthogonal rotation method to extract factor, the result of the analysis is shown in Table 3.

Table 3. Rotation matrix of occupational stress questionnaire for construction workers.

Factor	Factor1		Factor2		Factor3		Factor4		Factor5		Factor6		Factor7	Factor8						
item	C3	C4	C1	C2	C19	C18	C20	C14	C13	C16	C15	C17	C9	C10	C11	C7	C6	C8	C5	C12
1	0.867	0.817	0.799	0.784	0.199	0.087	-0.259	-0.142	0.159	0.15	-0.278	-0.059	-0.244	0.179	-0.012	-0.065	-0.217	0.109	0.226	0.291
2	-0.024	-0.084	-0.017	-0.108	0.791	0.742	0.684	0.245	0.277	0.158	-0.614	0.107	-0.115	0.035	0.204	0.08	0.532	-0.469	-0.047	-0.03
3	0.101	0.103	0.083	0.154	0.17	-0.158	0.335	0.96	0.922	0.183	0.17	-0.025	-0.179	0.264	0.043	-0.056	-0.129	0.083	-0.153	-0.166
4	-0.065	-0.065	-0.108	0.137	-0.04	-0.224	0.061	0.324	0.2	0.844	0.779	0.625	0.126	-0.108	0.476	0.134	0.012	0.157	0.107	-0.109
5	0.073	0.173	0.306	-0.153	-0.098	0.062	0.035	-0.448	-0.135	-0.29	0.235	0.048	0.747	0.703	0.576	0.016	0.069	-0.118	0.916	0.75
6	-0.123	0.271	0.311	0.213	0.181	0.033	0.131	-0.057	0.201	0.153	0.088	0.076	-0.148	0.279	0.172	0.729	0.696	0.657	0.013	0.124
7	0.101	-0.198	0.061	0.098	0.221	-0.312	-0.241	-0.14	0.019	0.119	-0.024	0.055	0.031	0.119	-0.124	0.324	-0.067	0.112	0.784	-0.024
8	-0.077	-0.114	0.071	0.112	0.126	-0.394	-0.19	0.041	0.102	0.2	0.242	0.191	-0.331	-0.231	0.221	0.25	-0.121	0.013	0.235	0.713

According to the matrix of occupational stress questionnaire for construction workers, there are totally 8 factors we listed. However, two of them (Factor 7 and Factor 8) only contain a single item respectively, which means they lack of enough evidence to be valid and have to be removed. Therefore, there remain 6 effective factors (dimensions), respectively: The work Itself, Family-Work, Occupation Development, Organization Style, Interpersonal Relationship and Role Management. Thus the rationality of work stress scale dimension is verified. The Work Itself is due to the heavy workload, tight time ,heavy responsibility and poor safety; Family-work is due to lack of communication with families in a long term, work site far from the family or have heavy family burden; Occupation Development refers to workers feel poor working stability; Organization Style refers to some of the workers feel their own rights can't be guaranteed in some unreasonable system; Interpersonal Relationship refers to the relationship between colleagues or leadership is not harmony, or work without supporting and understanding of the leadership; Role Management refers to the uncertainty of their work duties or cannot adjust from different work requirements.

As shown in Table 4, the cumulative explanation of these six factors was 72.495%, namely the extracted six kinds of working pressure factors can summarize 72.495% the information of original variables for workers' job pressure. The construct validity of the questionnaire is ideal. The explanatory rate of the work itself, family-work and occupational development were 21.722%, 16.022% and 14.544% respectively. The explanatory rate of organizational style, interpersonal

relationship and role management were 7.256%, 6.944% and 5.967% respectively. This indicates that The Work Itself is the main source of work stress for construction staff. Family-Work and Occupation Development are the most important source of workers occupational stress, While the explain rate of Organizational Style, Interpersonal Relationship and Role Management are relatively low.

Table 4. Construction industry staff work stress questionnaire total variance explained.

Component	Initial Eigenvalues			Extraction square and loading		
	Total	Variance %	Accumulation %	Total	Variance %	Accumulation %
1	3.919	21.772	21.772	3.919	21.772	21.772
2	2.881	16.022	37.794	2.681	16.022	37.794
3	2.618	14.544	52.388	2.3 18	14.544	52.388
4	1.306	7.256	59.594	7.256	10.033	59.594
5	1.250	6.944	66.538	6.944	6.944	66.538
6	1.074	5.967	72.495	5.967	5.967	72.495

3.2. Reliability analysis

Reliability analysis of occupational stress questionnaire uses SPSS19.0 statistical analysis software. Then we validate the internal consistency of the work stress questionnaire by the 'Cronbach's coefficient. It is generally believed that Cronbach's coefficient reached 0.7; the result is credible [15]. In this study, the reliability coefficients are all above 0.7, as shown in Table 5, so, the questionnaire reliability meets the requirements.

Table 5. Reliability statistics of the questionnaire for construction workers' job stress.

variable name	Cronbach's Alpha	Cronbachs Alpha based on the standard term	term numbers
The work itself	.791	.753	4
Family-work	.727	.783	3
Occupational development	.843	.761	2
organization style	.695	.723	3
interpersonal relationship	.675	.712	3
role management	.698	.706	3
Occupational stress	.731	.742	18

3.3. Descriptive statistical analysis

According to the results of the factor analysis for the occupational stress questionnaire, this questionnaire contains 6 dimensions, 18 items, the descriptive statistics of each item and the dimension's score are determined as shown in Table 6.

Table 6. Descriptive statistical of workers' occupational stress.

Factor	Occupational stress questionnaire items	N	Mean value	Standard deviation
The work itself	C1 My work is very complex, big workload	124	3.284	.633
	C2 worry about his safety during working	124	3.651	.775
	C3 I often work overtime work	124	3.176	.684
	C4 Work responsibility, afraid of accountability	124	3.053	.798
	Dimension mean		3.291	
Family –work	C18 I felt I bear the burden of family economic income is very heavy	124	3.170	.789
	C19 Nature of work need to separation, can't take care of family responsibility	124	3.325	.699

	C20 Family understanding and support for work is not enough	124	2.926	.759
	Dimension mean		3.207	
Career development	C13 More concern on the development of their future career	124	3.412	.517
	C14 Work stability is poor, worried that after the end of the project cannot find another project	124	3.856	.427
	Dimension mean		3.634	
Organizational Style	C15 My rights and interests cannot be guaranteed sometimes.	124	3.067	.726
	C16 organization wage system is not reasonable	124	3.062	.875
	C17 The organization has not responded to my performance.	124	2.859	.899
	Dimension mean		2.996	
Interpersonal Relationship	C9 Have conflict or unpleasant with colleagues	124	2.983	.994
	C10 Lack of leadership to support their own	124	2.883	.950
	C11 Leaders are unwilling or unable to help me with my work.	124	2.536	.923
	Dimension mean		2.801	
Role Management	C6 My work has no clear explanation and explanation.	124	2.693	1.112
	C7 Sometimes the leaders have different requirements of the work	124	2.706	1.083
	C8 Sometimes being assigned to the different work at the same time	124	2.943	.966
	Dimension mean		2.781	
Occupational Stress	The score of the occupational stress		3.118	

According to the score standard of occupational stress, score 1-5 in turn represent: do not feel the occupational stress; feel the light occupational stress; feel the moderate occupational stress; feel the high occupational stress; and feel the serious work stress. From the statistical analysis of the results, we can find a total score of 3.118 points of the occupational stress, the overall of the construction project staff feel moderate occupational stress. The professional development gets the highest score, 3.634 points, and the closet to a high degree of occupational stress. The Work itself and Family - Work dimension score, respectively, 3.291 points and 3.207 points, to be higher than the moderate level of occupational stress. Organization style, interpersonal relationship and role management scores are not more than 3 points are 2.996 points, 2.801 points and 2.781 points, slightly lower than the moderate level of occupational stress, which explain these three factors have little effect on construction workers' job stress.

4. Discussion

The most important factor of work pressure on construction workers is the pressure from The Work Itself. The construction industry is facing enormous competitive pressure, they must ensure the quality of the project, but also need to improve work efficiency. To reach these purposes, some construction units may require the workers to work overtime. As we all know construction industry is a high-risk industry, so workers have to face the threat of production accidents. Accordingly, the contractor should arrange work and rest time reasonably, do not allow workers to work overtime. At the same time, the construction company should provide safety equipment fully and create a good atmosphere of safety.

The Family-Work dimension is also one of the important structural factors. Construction projects always in remote areas, so the workers have to follow the project and leave far from home. They have not enough time to contact with their families. Besides, most of the workers also face heavy family burdens. These are virtually increasing the occupational stress. The construction company should focus more on workers' family situation. For those workers who have experienced a number of big changes or events and become overstressed, the construction company should transfer these workers to safer post until they calm down.

The Career Development is another important source of occupational stress. It is decided by the nature of the construction industry, each cycle of construction projects is different, and so many construction units often face no project status. The most basic thing is the stability of work can't be guaranteed, which will give the workers a strong psychological burden. In order to avoid the workers' worries of whether they can get a stable job, the construction company needs to keep their project stable, so as to eliminate the menace of the future changes. Construction unit should carry out psychological health education regularly to support the workers take a positive attitude in face of such stress.

Organizational Style, Interpersonal Relationship and Role Management, these three dimensions have little influence on the occupational stress of workers in construction project. But they still need to take seriously. However, some construction companies have not enough attention to the protection of the workers' interest, corporate culture, and humanistic care. These factors might cause occupational stress, too. Construction unit should improve their management level, create a corporate culture environment, and care about the mood of workers to ensure safety in construction.

5. Conclusion

This research compiled the occupational stress questionnaire for the workers in China's construction project. Factor analysis using SPSS software, the KMO and Bartlett test shows that the occupational stress questionnaire is suitable for factor analysis. For reliability analysis, the reliability coefficient is above 0.7, which meets the requirement of reliability. Statistical analysis of the results of the occupational stress finds a total score of 3.118 points, represent most of the construction project workers feels moderate occupational stress.

The factors that constitute the occupational stress of workers in the construction project are: Work Itself, Family-Work, Career Development, Organizational Style, Interpersonal Relationship and Role Management. One of the most important factors is the Work Itself, followed by Family-Work and Career Development. Finally, according to different factors, some suggestions can be applied to manage and control occupational stress of workers.

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References

- [1] Shi Lin 2003 Occupational stress research: a review *Psychological Science*.26(3):494-497.
- [2] Ji Qinghua and Zhang Wen 2011 Primary construction of work stress scale of construction companies for first-line administrators Qufu Normal University.
- [3] Viorica P,Raluca I and Mihaela S 2013 Assessment of Work Stress Influence on Work Productivity in Romanian Companies *Procedia-Social and Behavioral Sciences*. 92 420-425
- [4] Vagg P R and Spielberger C D 1998 Occupational Stress Measuring Job Pressure and Organizational Support in the Workplace *Journal of Occupational Health Psychology*.3 294-305
- [5] Evers A.,Frese M. and Cooper C L 2000 Revisions and further developments of the Occupational Stress Indicator: LISREL results from four Dutch studies *Journal Of Occupational & Organizational Psychology*. 73 221-240
- [6] Pan Yingxin, Wang Lei, Ren Xiangyun and Zeng Yan The Development of a Job Stress Questionnaire for Chinese Employees *Psychological Science*. 29 312-314
- [7] Phillip L.Rice 1992 Pressure and health(Beijing: China light industry press) p 149-151.
- [8] XU Fuming 2003 A Study on Teachers' Occupational Stress and Burnout Chinese *Journal of Clinical Psychology*. 11 195-197
- [9] Cooper C L and Marshal J 1980 Stress amongst nurses In White Collar and Professional

Stress. Wiley :Chichester

- [10] Janet B and Cary C 1995 Job Satisfaction, mental health, and occupational stress among senior civil servants. *Human Relations*. 48 327-338
- [11] Chen Zhixia and Liao Jianqiao 2005 Structural components of knowledge - worker's Job stressor and it's relationship with job strain *Industrial Engineering and Management*. 4 26-30
- [12] Liu Yv, Wu Zhenye, Zhao Enjiang, et al 2010 Structural Analysis on the Influencing Factors of Locomotive Drivers' Occupational Stress *China Railway Science* . 31 130-133
- [13] Bai Yvling 2010 Relationship Between Job Stress, Perceived Organizational Support and Job Burnout Research--Knowledge Workers in Clothing Industry as an Example Beijing: The capital economic and trade university. 25 79-85
- [14] Liang Wenjuan and Chen Ming 2009 Research on occupational stress impact factors for workers in China's civil aviation *Journal of China civil aviation flight institute*. 20 13-16
- [15] Nunnally J C 1978 *Psychometric Theory* (2nd Edition) (New York: McGraw-Hill) p 45 -87