

A Study on the Job Stress Assessment in Korean Nuclear Power Plants based on KOSS

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1. Introduction

Job stress is a harmful physical and emotional response that occurs when there is a poor match between job demands and the capabilities, resources, or needs of the worker[1]. Stress-related disorders encompass a broad array of conditions, including psychological disorders (e.g., depression, anxiety, post-traumatic stress disorder) and other types of emotional strain (e.g., dissatisfaction, fatigue, tension, etc.), maladaptive behaviors (e.g., aggression, substance abuse), and cognitive impairment (e.g., concentration and memory problems). In turn, these conditions may lead to poor work performance or even injury. Job stress is also associated with various biological reactions that may lead ultimately to compromised health, such as cardiovascular disease[2] or in extreme cases, death[3].

In Korea, organizational job stress factors were investigated for the jobs in nuclear power plants that are operated based on procedures[4]. Especially, the occupational stress scale for Korean employees (KOSS)[5] was developed. The KOSS has 8 subscales by using a factor analysis and validation process in order to measure stress at work and to find methods for the prevention of stressors. In this point of view, the RHRI (Radiation Health Research Institute of KHNP (Korea Hydro & Nuclear Power) assessed how well-suited employees were for their job during their health examination in 2009. In this study the present condition of employee's stress level is investigated to find a way to manage their stressors.

2. Methods and Results

2.1 Influence Factors on Job Stress

On the basis of research, NIOSH (National Institute of Occupational Safety and Health) favors the view that working conditions play a primary role in causing job stress[2]. However, the role of individual factors is not ignored. According to the NIOSH view, exposure to stressful working conditions (called job stressors) can have a direct influence on worker safety and health. And individual and other situational factors can intervene to strengthen or weaken this influence. Examples of stressful working conditions include the following:

- ♦ The design of tasks: heavy workloads, infrequent rest breaks, long work hours and shift-work; hectic and routine tasks that have little inherent meaning,

do not utilize workers' skills, and provide little sense of control.

- ♦ Management style: lack of participation by workers in decision-making, poor communication in the organization, lack of family-friendly policies.
- ♦ Interpersonal relationships: poor social environment and lack of support or help from coworkers and supervisors.
- ♦ Work roles: conflicting or uncertain job expectations, too much responsibility, too many "hats to wear."
- ♦ Career concerns: job insecurity and lack of opportunity for growth, advancement, or promotion; rapid changes for which workers are unprepared.
- ♦ Environmental conditions: unpleasant or dangerous physical conditions such as crowding, noise, air pollution, or ergonomic problems.

2.2 Evaluation Method and Design for Data Analysis

The study was conducted on employees sampled from the whole employees in nuclear and hydro power plants. Job stress was assessed by the KOSS (43 questions, full inventory). The following table summarizes the subscale of the questionnaire. The variable was considered a demographic factor as well as task related one. Table 2 shows the level of variables for the statistical analysis using SAS 9.0.

Table I. Summary of the KOSS

Type	Factor explanation
A1	physical environment (3 items),
A2	Job demand (8 items)
A3	Insufficient job control (5 items)
A4	Interpersonal conflict (4 items)
A5	Job insecurity (6 items)
A6	Organizational system (7 items)
A7	Lack of reward (6 items)
A8	Occupational climate (4 items)
A9	Total score

Table II. Variables for Data Analysis

Class	Level of variables
Independent Variables	B1: Position of a member (10: Head Office, Kori, Yongkwang, Ulchin, Wolsung, Education, Health, Technician, Construction, Hydro-power)
	B2: Distinction of sex (2: Male, Female)
	B3: Age group (5: 20, 30, 40, 50, 60)
	B4: Radiation operation (2: Rad, Non-rad)
	B5: Task function (8: Office, Operation, Technology, Safety, Education, Construction, Specialty, Hydro)
Dependent Variables	KOSS values (9) (see the table I)

Table III. Results of Statistical Mean Differences by Independent Variables

Variables	Statistics	Physical environment	Job demand	Insufficient job control	Interpersonal conflict	Job insecurity	Organizational system	Lack of reward	Occupational climate	Total score
Position of a member	Pr>F	<.0001**	<.0001**	<.0001**	0.1573	<.0001**	0.0001**	0.0068**	<.0001**	<.0001**
	F Value	13.46	14.27	6.83	1.46	11.78	3.66	2.53	7.60	3.85
Distinction of sex	Pr>F	0.2650	0.0102*	<.0001**	0.1357	0.0446*	0.0004**	0.0001**	<.0001**	<.0001**
	F Value	1.24	6.61	71.1	2.23	4.04	12.62	14.66	47.01	21.05
Age group	Pr>F	<.0001**	<.0001**	<.0001**	<.0001**	<.0001**	0.6757	0.1897	<.0001**	0.4904
	F Value	31.33	23.76	59.62	25.54	48.67	0.51	1.59	25.33	0.81
Radiation operation	Pr>F	0.9629	0.3640	<.0001**	<.0001**	0.0052**	<.0001**	<.0001**	0.0008**	<.0001**
	F Value	0.00	0.82	32.67	53.15	7.82	44.40	69.11	11.31	42.22
Task function	Pr>F	<.0001**	<.0001**	<.0001**	<.0001**	0.0001**	<.0001**	<.0001**	<.0001**	<.0001**
	F Value	13.98	19.11	19.78	11.01	4.22	18.46	17.56	13.90	11.66

* p<0.05, ** p<0.01

3. Conclusions

2.3 Results and Discussion

According to the result, the subjects showed a various perceived levels of stress induced from job stressors for every independent variable: A1 (27.62±15.7), A2 (45.09± 14.1), A3 (47.48±11.5), A4 (34.30±12.5), A5 (45.60± 11.6), A6 (42.22±13.1), A7 (39.07±12.5), A8 (39.16± 14.1), A9 (40.07±8.5). Table 3 summarizes the result of 1-way ANOVA (analysis of variance). The results showed that main effects were significant for the greater part of the variables.

As shown in the table 4, Radiation operators who are possible to work within the radiation zone had a lower level of job stress, since the individual or situational factors might intervene to weaken the effects of stressful working conditions. For the physical environment and job demand factors, however, there were no significant differences among tested items.

Table IV. A Sample of Descriptive Statistics by Radiation

Dependent variable	Rad. Operator		Non-rad. Operator	
	Mean	Std	Mean	Std
A1	27.63	15.34	27.61	16.01
A2	44.9	13.8	45.27	14.29
A3	46.53	10.92	48.41	11.97
A4	32.99	11.78	35.59	13.02
A5	45.13	11.75	46.07	11.51
A6	40.96	12.54	43.46	13.5
A7	37.58	11.53	40.54	13.25
A8	38.48	13.92	39.84	14.18
A9	39.28	8.38	40.85	8.47

This study was conducted to evaluate the job stress levels of nuclear power plant employees. Job stress was assessed by the KOSS. As results, statistical differences by variables were discovered in the all groups. Especially, the average of all factors for female workers was higher than male workers. Moreover, there were workers within the 25% of data at the Korean's top standard stress levels for the job demand and occupational climate. Therefore, there is a need to develop a management program, which includes the control of job stress by considering the characteristics of nuclear fields with a routine health examination. The suggested way is to make sure that a comprehensive approach is necessary through a combination of working conditions (e.g., workload, job design, clear role, providing opportunities, adequate work schedules, and etc) and individual factors (e.g., a balance between work and family or personal life, a support network of friends and coworkers and a relaxed and positive outlook in all situation).

REFERENCES

- [1] NIOSH, Stress at Work, U.S. National Institute for Occupational Safety and Health, DHHS Publication Number 99-101, 1999.
- [2] "NIOSH Work Organization and Stress Related Disorders". U.S. NIOSH, <http://www.cdc.gov/niosh/programs/workorg>, Retrieved 2007-12-01.
- [3] Wikipedia, http://en.wikipedia.org/wiki/Job_stress, Retrieved 2010-04-03.
- [4] D. H. Kim, Y. H. Lee, and J. W. Lee, Assessment of Job Stress Factors and Organizational Personality Types for Procedure-Based Jobs in Nuclear Power Plants, Journal of nuclear science and technology, 45(8), 2008.
- [5] S. J. Jang et al, Developing an Occupational Stress Scale for Korean Employees, The Korean Journal of Occupational and Environmental Medicine, 17(4), 2005.