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Case on a Union-driven Participatory Ergonomics Program to Control Work-related Musculoskeletal Disorders in Korea

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ABSTRACT

The objective of this paper is to report how workers' actively participate in a participatory ergonomics (PE) program, and how this program resulted in improved working conditions and decreased occurrence of work-related musculoskeletal disorders (WMSDs). A major tire manufacturing company in Korea was studied. Most of the activities in the PE program were designed and actually practiced by the workers and their union. The results revealed some positive effects of applying a PE program to the employees. It was shown that incidence of the WMSDs as well as the lost work days and the economic cost incurred by the WMSDs decreased with the PE program.

Keywords: Labor union, Participatory ergonomics program, Musculoskeletal disorders

1. Introduction

Work related musculoskeletal disorders (WMSDs) have become a major occupational health issues in Korea during the past several years. In Korea, the number of WMSDs compensations has drastically increased from 128 in 1995 to 7,723 in 2007, which was 67.3% of total occupational disease compensations (Ministry of Labor of Korea, 2008). In 2003, the Korean government implemented a new set of laws requiring manufacturers in the country to take preventive measures against WMSDs for their employees. Companies that violate the regulations may be subject to fines and possible prison terms.

Among the various intervention strategies to prevent WMSDs, participatory ergonomics (PE) is defined as a technique by which employees and management join together to impart ergonomics knowledge and implement procedures in the workplace in order to improve working conditions (Nagamachi, 1995). PE has been suggested as an effective intervention strategy to simultaneously address each of the risk factors of WMSDs, while maximizing the contribution of workplace parties, and embedding ergonomics in organizational processes.

Cases and effectiveness of PE interventions has been reported in many countries (Rivilis et al., 2008). In most cases, the practical development of PE program was through understanding and participation by management and employees. Commitment by management provides needed resources and motivating force necessary to deal with risk factors. However, in the present study, practical activities of PE program were driven mainly by labor union. The objective of this paper is to report how workers' participate in a PE program in this special setting, and how this program resulted in improved working conditions and decreased occurrence of WMSDs. In addition, some

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economic benefits of PE program were discussed. A major tire manufacturing company in Korea was studied for this purpose.

2. Methods

2.1 Study group

In the selected plant, which produced tires for automobiles, there were about 2,900 blue collar workers during the study period. All of them were full-time employees working in three shifts, and approximately 95% of them were male. The mean age and number of years employed by the company were 42.3 and 16.9 years, respectively. Most of the works done within the plant were structured and repetitive. Among them, forceful push/pulling movements were routinely involved in the manufacturing process, and repetitive lifting of work pieces with various weights ranging 10~24Kg were required to make end products.

2.2 PE program

In October 2002, the company's management and labor union agreed to introduce a PE program into the plant, and they invited the authors in February 2004 as professional experts. The PE program was then implemented starting December 2004.

The organization of the PE program has two layers. The steering committee (SC) included 6 occupational safety and health representatives both from management and labor union (3 persons from each party). The SC set up policies and budget for the program, agreed upon various decisions on the PE program, and held progress check-up meetings with the authors every month. The other, action committee (AC), consisted of the experienced 15 workers from each department recommended by the union. Therefore, the AC was actually driven by the union. The AC was responsible for worker education, periodic interviews with workers (twice every month), risk assessment, and ergonomic intervention.

Education on the management and labor union leaders (2 hours in 2 times), members of SC (3 hours in 3 times) and AC (46 hours) was done by the authors using the specialized manuals developed by the authors. Especially, AC members were subject to intensive education on ergonomics principles, risk assessment techniques, work improvement guidelines, and principles of medical treatment. AC members then trained other workers in small groups during 10 minute sessions either before work begins or during break time, replicating 5 times. In addition, all workers had 3 hours of education for 3 times.

Ergonomic interventions were performed mainly by the AC in the steps of collection of basic information and workers' opinion for prioritizing problems, selection of the works to be improved, risk factor identification and evaluation, implementation of interventions, documentation of the evaluation results and finally feedback from the workers. Traditional ergonomic methods and tools were employed at all steps, including videotaped detailed analysis, checklist, and subjective discomfort survey.

Health care management for the WMSDs patients was done by occupational medicine specialists who stayed a whole day in the plant every week for consultation and treatment. The general medical surveillance cycle through early detection, prompt treatment, and timely recovery for return to work was pursued. For the early detection, periodic interviews with all workers were done by the AC members twice in every month. Rehabilitation program for WMSDs patients was then available for 4~8 weeks, and return-to-work after rehabilitation was scheduled for 2~4 weeks. All the activities of health care were done within the plant.

Final formal system and documentation for the prevention and intervention of WMSDs was formed by the agreement between management and labor union in December 2004.

2.3 Outcome measures

Main sources of outcome data used in assessing the effectiveness of the PE program are the WMSDs claim records, lost work days, and economic costs. The data from 2003 to 2008 were analyzed, while the intervention was implemented between 2005 and 2008. As stated in Introduction, the Industrial Safety and Health Law of Korea was amended in 2003 with newly added duties of employers to investigate risk factors and improve working environment. Therefore, the data from 2004 was regarded as criteria of comparison.

The number of WMSDs claims was identified from the records of public insurance compensations, and the rate of

WMSDs claims was calculated as the annual WMSDs claims per 100 workers. Annual total lost work days were counted for the workers with at least one day of absence due to WMSDs. Economic cost incurred by WMSDs claim was defined as the sum of direct costs (labor cost + compensation cost + national pension + retiring allowance reserve). For the indirect cost, the well known Heinrich's 4:1 ratio of indirect costs to direct costs was applied. The cost incurred by medical treatment was excluded for practical reasons.

3. Results

3.1 Ergonomics interventions

304 items out of 195 tasks were successfully improved with some technical support from the authors. Fig. 1 shows a sample case of improvement.

(a) Before intervention

(b) After intervention

Figure 1. Improvement with a hoist

3.2 WMSDs claims

With the introduction of the PE program, WMSDS incidence increased remarkably from 2.4 cases per 100 workers in 2003 to 7.5 cases per 100 workers in 2004, as shown in Table 1. This implies that the level of workers' perception of WMSDs became much higher with the program. After 2004, the rate then gradually decreased with implementation of the program. It should be noted that the injuries and illnesses other than WMSDs were about the same in 2007 compared to 2004.

Table 1. Incidence rate of WMSDs and other injuries/illnesses

Year		2003	2004	2005	2006	2007	2008
Total workers		2,916	2,853	2,833	2,909	2,891	2,841
Incidence Rates	WMSDs	2.4	7.5	3.0	2.2	2.4	2.1
	Others	1.5	1.7	1.6	1.3	1.5	1.4

3.3 Lost work days

It can be known from Table 2 that total lost work days caused by WMSDs had a same trend as the WMSDs claims. It increased from 11,897 days in 2003 to 36,384 days in 2004. After 2004, it decreased with implementation of the PE program.

Table 2. Lost workdays caused by WMSDs and other injuries/illnesses

Year	2003	2004	2005	2006	2007	2008
By WMSDs	11,897	36,384	14,047	10,493	8,428	6,334
By others	5,671	5,343	5,922	4,229	4,425	3,983

3.4 Economic costs

Table 3 shows that workers' compensation costs caused by WMSDs had a same trend as the WMSDs claims and the lost work days. It increased from US $ 2,243,000 in 2003 to $ 6,861,000 in 2004. After 2004, it also decreased.

Table 3. Compensation costs (thousands US$)

Year	2003	2004	2005	2006	2007	2008
WMSDs	2,243	6,861	2,649	1,979	1,589	1,194
Others	1,159	1,091	1,210	864	908	814

Table 4. Summary of effects of the PE program

	Pre-intervention (2003)	PE program				
		1st-year (2004)	2nd-year (2005)	3rd-year (2006)	4th-year (2007)	5th-year (2008)
Incidence rate	0.32	1.00	0.40	0.29	0.32	0.28
Lost work days	0.33	1.00	0.38	0.29	0.23	0.17
Compensation costs	0.33	1.00	0.39	0.29	0.23	0.17

3.5 Summary of the effects

Table 4 summarizes the quantitative effects of the PE program on the prevention and control of the WMSDs when the outcome measures of 2004 were regarded as 100%.

4. Discussion

This study reveals some positive effects of applying a PE program to the employees working in a tire manufacturing factory of Korea. Overall, the incidence of the WMSDs as well as the lost work days and the economic costs incurred by the WMSDs decreased with the PE program, while in the first year of the program, some increases were found. In addition to the direct effects of ergonomic interventions, workers' enhanced awareness of the WMSDs with the PE program may be partly influential to the results. Further, the results might be partly explained by the amended governmental regulation which became effective from July, 2003.

To reduce the costs and workers' sufferings incurred by the WMSDs, industrialized countries began to invest various efforts since late 1980s (OSHA, 2000), and many successful cases have been reported. For example, in the Ford motor company, a case with about 300% of cost saving was reported (Joseph, 2003). And in the cases of 5 work places, 35~91% of cost savings in 2~5 years of PE program implementation have been documented (GAO, 1997). In a recent review, cost savings of 10~20%, exposure time decrease of 20~40%, diminishing of exposure level as much as 40~60%, and 60~100% improvement of risk factor were reported (Goggins et al., 2008). The benefits of PE program also include enhancement of productivity, quality, and motivation in addition to cost savings.

In Korea, the WMSDs became the center of occupational health issues during the past 10 years. The first WMSD case was officially recognized by lawsuit in 1986 for a typist of a broadcasting company. In 1991, ten employees in the computerized typesetting department of a newspaper company were first accepted into a workers' compensation program (all employees are covered by the national health insurance and compensation program). WMSDs in Korea have not gathered attentions of the society until the labor unions have made WMSDs as one of the important issues by means of collective struggles for the right of healthy working environments.

In general, PE program includes strong management support, active employee involvement, and providing training for employees, supervisors, managers, engineering and maintenance personnel. Some cases were reported where labor unions have actively promoted PE program (Bryson, 2004; Canadian Auto Workers, 2004). In our study, it was clearly shown that educated and trained workers are essential to achieve the goals of PE programs, and the activities driven by labor union were proved to be effective. And it should be pointed out that the roles of professional experts were minimized in that only technical supports were provided by them. Rather, most of the activities in the PE program were designed and actually practiced by the workers and their union. The results of this study would be of help in establishing a good model of worker and labor union's participation in occupational safety and health related issues.

This study has some limitations in collection of outcome data. More specifically, medical cost and lowered productivity due to the WMSDs were not considered. And in the following studies, subjective survey on WMSDs symptoms should be accompanied.

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