

Short Communication

Workers' Perception of the Changes of Work Environment and its Relation to the Occurrence of Work-Related Musculoskeletal Disorders

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Work-related musculoskeletal disorders (WMSDs) refer to a collection of painful disorders of muscles, nerves, tendons, ligaments, joints, cartilage, or spinal discs that are caused or made worse by work conditions¹. The physical risk factors of WMSDs include: repetitive, forceful, or prolonged exertions; frequent or heavy lifting; pushing, pulling, or carrying of heavy objects; prolonged awkward postures; and vibration. Jobs or working conditions that combine risk factors may increase the risk of WMSDs. Although the physical risk factors are important ones, there are also plausible factors that may provoke a disorder or indirectly influence other risk factors, such as organizational and psychosocial factors². Individual factors may also influence the degree of risk from specific exposures.

In many industrialized countries, WMSDs have become a major problem of occupational health, and are the leading causes of lost-time. In Korea, the number of WMSDs compensations has drastically increased from 128 in 1995 to 4,112 in 2004, the latter number representing 44.8% of total occupational disease compensations³. In Korea, the societal attention to WMSDs has grown much since the national economic crisis of 1998. At the end of 1997, the Korean economy fell into a crisis triggered by a shortage of foreign exchange, and Korea had to receive IMF's (International Monetary Fund) relief aid in 1998. After that, Korea has been struggling not only to reform its monetary system, but also to promote drastic reforms in its economic structure with the aim of improving the productivity of Korean industry. However, it is widely perceived in Korea that the economic crisis caused changes in the work environment due to downsizing of work forces and

increased work load.

The objective of this survey was to study how Korean workers' perceived the changes in their work environment during the post-IMF period of 2001–2003, and to investigate if there is any relation between the perception of changed working conditions and the occurrence of WMSDs. Workers at a major automotive company in Korea were studied for this purpose.

Methods

Study participants

A total of 15,750 male blue-collar workers working on automobile assembly lines in Korea were invited to complete a self-administered questionnaire, and questionnaires were returned by 9,132 workers (response rate 57.9%). Those who had a history of WMSDs and/or related diseases before 2001 were excluded from the analysis. As a result, 8,670 responses were analyzed.

Questionnaire and analysis

The participants were asked to provide information on their demographic characteristics and to assess on a five-point Likert scale [1): significantly decreased, 2) somewhat decreased, 3) no change, 4) somewhat increased, 5) significantly increased] the change of working conditions during the period of 2001–2003. The conditions included working hours per day, the frequency of overtime work on holidays, work speed, allowances, amount of work duty, and the number of co-workers. The level of supervisory control, mandatory participation in company-driven education and management innovation programs, the number of temporary or contract labor co-workers were also rated, along with the levels of overall physical and mental loads.

To minimize information bias and to ensure that workers would not hide sensitive information, all questionnaires were anonymous. The workers were reassured that the data would be used for research purposes only and that the questionnaires would not be released to the company. No managers of the company were present during the survey.

After adjusting for age, work career and working hours, logistic regression analyses were performed to investigate the relations between the perceived change of working conditions and self-reported occurrence of WMSDs. In the questionnaire, it was explained that WMSDs are the injuries or disorders of the muscles, tendons, joints, spinal discs, nerves, ligaments and cartilage, but do not include the injuries caused by accidents such as slips, trips, falls, being struck by objects, or other similar accidents². The participants were asked to report their experience of medical treatment in the last 12 months to obtain relief from and resolve WMSDs signs (deformity, decreased grip strength, decreased range of motion, loss of function) or symptoms (numbness, tingling, pain, burning, stiffness,

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Table 1. Comparison between participants and target population

	Participants	Target population
N	8,670	15,750
Age (yr)	38.1 ± 7.3	38.7 ± 6.2
Work career (yr)	12.6 ± 6.8	12.9 ± 5.1
Work hours per month (h)	255.4 ± 44.2	250.1 ± 35.8
No. of days worked on holidays per month	3.3 ± 1.6	3.2 ± 1.2

Table 2. Results of perceived changes of working environment (%)

Condition	Decreased	Unchanged	Increased
Overall mental load	2.8	27.8	69.4
Overall physical load	3.5	28.6	67.9
Supervisory control	2.9	44.0	53.1
Work speed	7.2	50.1	42.7
No. of temporary co-workers	5.3	53.3	41.4
Amount of work duty	4.8	56.4	38.8
Participation in education	7.2	62.2	30.6
No. of days worked on holidays per month	33.8	36.0	30.2
Work hours per day	17.3	53.6	29.1
No. of co-workers	24.7	60.2	15.1
Allowances	26.1	63.9	10.0

cramping).

Results

The average age of the participants was 38.1 yr (SD=7.3) and their average work career was 12.6 yr (SD=6.8). No significant differences were found between the participants and the target population ($p=0+$), Table 1.

The results of the workers' perception of the changes in work environment are shown in Table 2. It can be seen that the participants rated that all the working conditions except for the number of days worked on holidays had deteriorated during the period, 2001–2003. In fact, the number of blue-collar workers working at the company had dropped from 31,842 in 1999 to 29,586 (92.9%) in 2003, while the number of automobiles produced had increased from 1,269,542 in 1999 to 1,648,130 (129.8%) in 2003.

The number of the participants who reported experience of medical treatments for WMSDs in the past 12 months was 1,552 (17.9%). To determine if there was any relation between the perceived changes of working conditions and self-reported occurrence of WMSDs, multiple logistic regression analyses were performed. For the analyses, the ratings 1~3 on the Likert scale were categorized as one group and the ratings of 4~5 as an other. The results indicate that overall physical load, supervisory control, work speed, overall mental

Table 3. Association between the changed working conditions and work-related musculoskeletal disorders

Condition	*Adjusted OR (95% CI)
Overall physical load	1.39 (1.23–1.58)
Supervisory control	1.39 (1.26–1.53)
Work speed	1.32 (1.17–1.48)
Overall mental load	1.25 (1.10–1.42)
No. of days worked on holidays	1.22 (1.09–1.36)
Work hours per day	1.20 (1.08–1.35)
Amount of work duty	1.13 (1.00–1.26)
No. of co-workers	0.83 (0.73–0.95)
No. of temporary co-workers	1.09 (0.98–1.19)
Participation in education	1.03 (0.93–1.14)
Allowances	0.99 (0.88–1.11)

* Odds ratio adjusted for age and working hours per month.

load, the number of days worked on holidays, work hours per day, and amount of work duty had positive effects on the self-reported occurrence of WMSDs, while the number of co-workers had a negative effect. No association was found between the number of temporary co-workers, mandatory participation in company-driven

education and innovation programs, allowances and the self-reported occurrence of WMSDs.

Discussion

In Korea, the amount of labor has decreased since IMF intervention in 1998; that is, the average actual working hours per month have decreased from 206.6 h in 1999 to 197.2 h in 2004 nationwide. The actual working hours of Korea's manufacturing industry has also decreased from 24.5 d per month in 1999 to 23.7 d in 2004⁴). For the automobile company of this study, the number of blue-collar workers had dropped from 31,842 in 1999 to 29,586 in 2003. However, the number of WMSDs compensations of the company had increased from 182 cases in 2000 to 735 in 2004. This was the motivation for our study.

In our study, the study participants perceived that all the working conditions except for the number of days worked on holidays had deteriorated during the post-IMF period of 2001–2003. From the multiple logistic regression analyses, we found that overall physical load, supervisory control, work speed, overall mental load, the number of days worked on holidays, work hours per day, and amount of work duty had positive effects on the self-reported occurrence of WMSDs, while the number of co-workers had a negative effect.

There are some limitations of the present study. First, since no data on the physical risk factors of WMSDs (i.e., repetition, forceful exertion, materials handling, awkward posture, and vibration) were collected in the study, it was not possible to explore whether the changes of the working conditions studied here, directly, or through interaction with the physical risk factors, influenced the development of WMSDs. Prospective cohort studies would be needed to confirm or refute the causal links between the changes of working conditions and WMSDs, although the complex relationship between psychosocial factors and physical demands of work would make it difficult to reach definitive conclusions about their relative importance to the risk of developing WMSD's⁸).

Second, recall bias might have affected the results of the survey. That is, those who suffered from WMSDs might have been more likely to attribute their physical conditions to the deteriorated working environment. In addition, it is possible that the study participants intentionally responded incorrectly to the questions about their conditions, resulting in response bias. Therefore, the observed results may suffer from types of bias favorable to the positive association between the perceived increase in work load and self-reported occurrence of WMSDs. However, it should be understood that unlike the effects of chance and confounding factors which can be evaluated quantitatively, the effects of recall bias are far more difficult to quantify because they often lack a gold standard source of validated data for comparison to self-reported data.

In conclusion, Korean workers' perceived that their work environment had deteriorated after IMF relief in 1998, and a relation between the changed working conditions and occurrence of WMSDs was implied. Further studies are expected to explore the effects of work environmental changes on occupational safety and health outcomes.

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