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Abstract

**Sociopsychological Factors Associated with Symptoms of
Work-related Musculoskeletal Disease**

Chul-Gab Lee, Jong Park¹⁾, Jung-Sik Park²⁾, Seok-Joon Sohn³⁾

*Department of Occupational and Environmental, Preventive Medicine of Chosun University¹⁾
Industrial Safety Engineering of Chosun Graduate School,²⁾
Preventive medicine of Chonnam University³⁾*

Objectives: The sudden increase in work-related musculoskeletal disease is caused by sociopsychological factors and ergonomic risk factors of the work process. This study evaluates the relationship between the symptoms of musculoskeletal disease and the sociopsychological factors.

Methods: A questionnaire survey and ergonomic evaluation were administered to workers of a shipyard company with a high incidence rate of musculoskeletal disease. To quantify the pain score associated with a diagnosis of musculoskeletal disease, the pain degree(1~5points), frequency (1~4 points) and duration (1~4 points) were multiplied to give a maximum score of 80. A score above 64 points on the pain score was defined as ' severe pain group '. This ' severe pain group ' was chosen as the dependent variable and the sociopsychological factors were evaluated as independent variables with structural equation modeling based on a decision tree of exhaustive CHAID.

Results: The standardized regression weights value with reference to the REBA score(0.54) had the largest value by the type of company, followed in order by joining and acting labor union(.313), job demand(.172), senior support(-.095), insufficient sleep (.092), and colleague support (.061).

Conclusion: The symptoms of musculoskeletal disease were greatly affected by sociopsychological factors such as whether joining and acting labor union, job demand, and supervisor or Coworker support.

Key Words: Musculoskeletal disease, Sociopsychological factors

10
가 1999
가 (Ministry of Labor,
가 가
가 가 2003, MOL).

가 (IMF)

(Korean Confederation of Trade Unions, 2003, KCTU).

2003 7

(MOL, 2003).

(National Institute for Occupational Safety and Health, NIOSH, 1997),

Research Council, 1999).

(Carayon, 1999; Kumar, 1999, Joksimovic, 1999).

1999).

(Francesco, 2000).

가 가

Reform Committee, 2003).

1.

2003 1

가 (母)

가

가

1,038

29 2003 5

2.

1)

(Sherri,

Code H-28-2002)

(KOSHA

(Francesco, 2000).

가 가

가 가 가

2)

Karasek

(2002)

(Decision authority) 3

(Skill discretion) 6 9

, 14 , 5

5 10 (Cronbach's) 0.735

NIOSH 1 1 1

6

가

11

(; 4)

(; 4)

2

19

(; 4)

가 64

(Validity)

29 (Gold standard)

(Sensitivity)

(Specificity)

ROC

3)

가

(Receiver Operating Characteristic)

가

ROC

0.855

REBA (Rapid Entire Body

64

(Cutoff point)

Assessment, Sue, 2000)

가

ROC

0.829

79.3%,

가

79.1%

OWAS (Ovako Working Posture Analyzing System, Karhu, 1997)

2)

Karasek(1979)

(Job strain model)

가 (action level)

가

REBA

OWAS

3.

1)

Table 1

1~5

strain),

(low strain)

(active)

(passive)

2가 (high

4

1

가

5 () × 4

0.935,

(

) × 4

(

) 80

0.942

가

6

6

가

480

0.952,

0.962

Table 1. Pain score and definition of severe pain group

Score	Degree of pain	Frequency	Duration
1	No pain	-	-
2	Pain is mild and discomfortable, but it is not feel at work	1/month	Within 1 week
3	Pain is moderate at work, but it disappears with rest.	1/week	Within 1 month
4	Pain is fairly severe at work, it persists at home or rest.	always	Over 1 month
5	Pain is severe at work or rest, it restricts normal activity and work.		

19 가 , 40~44 , 45 6 , ~4 ,
 5 , 19 가
 0.730 (Quartimin) (Factor
 analysis) (Operation speed),
 KMO(Kaiser-Meyer-Olkin) 0.77, 6 가 20 kg/m² , 20.0~24.9 kg/m²,
 59% . 6 25.0 kg/m² 3
 가 ' 3 가 , , ,
 4 (Job category)
 가 , , , , ,
 가 , , , , ,
 ' 4 4.
 3)
 가 REBA 5 , OWAS 4 (Data mining)
 1~5 (Decision tree)
 Answer Tree 3.1
 (Choi , 2002). 64
 4)
 ' ()

Table 2. Dependent and Independent variable categories

Dependent (target) variable		
Pain score (scale)		
Severe pain group (nominal)		
Independent (predictor) variable		
Personal characters	Job characters	Sociopsychological factors
Sex	Department	Karasek 's job strain group
Age	Position	Decision latitude score
Body Mass Index	Job category	Job demand score
Smoking	Working duration	Social support group
Drinking	Overtime working	Supervisor support score
Exercise		Coworker support score
Sleeping	Ergonomic factor	Join in labor union & activity
	REBA score	Cognition of working condition change
Living conditions	OWAS score	Work hours and relaxation times
Total income	Vibration tool use	Operation speed and work intensity
Working together		Introduction new technique and machine
Support family		Outsourcing
School children		Manpower change
Insurance		Welfare change

Exhaustive CHAID (Chi-squared Automatic Interaction Detection) (46.4%) , 93 (9.0%),
 (Decision rule) (Splitting) 381 (36.7%), 82 (7.9%)
 (Merging) (Alpha) 0.05 , 25 ~ 29 가 11.2%, 30 ~ 34 12.0%
 (Parent node) 20 , (child , 30 ~ 34 35 ~ 39 가
 node) 10 , 가 4 , 가
 , 4 ,
 , 5 ~ 9 ,
 가 45.2%
 (Table 3).
 (Scale)
 (Analysis structural equation modeling) 2) 가
 Amos 5.0 (Kim, 2001; Rho, 2003) REBA
 Table 2 가 가 35.5%가 ' ' 3
 , 30.5%가 ' ' 4 가
 4가 44.8% 9.8%,
 21.8%
 1. OWAS 56.9%가
 4 가 , 65.6%가
 1) 가 4
 1,038 가 482 (Table 4).

Table 3. General characteristics of the subjects number (%)

	Parent company			Subcontract company workers	Total
	Non unionists	General	Unionist Core*		
Sex					
Male	93 (9.0)	376 (36.2)	82 (7.9)	429 (41.3)	980 (94.4)
Female	-	5 (0.5)	-	53 (5.1)	58 (5.6)
Age (yrs)					
-24	1 (0.1)	5 (0.5)	-	45 (4.3)	51 (4.9)
25-29	4 (0.4)	48 (4.6)	10 (1.0)	116 (11.2)	178 (17.1)
30-34	10 (1.0)	108 (10.4)	31 (3.0)	125 (12.0)	274 (26.4)
35-39	24 (2.3)	107 (10.3)	21 (2.0)	79 (7.6)	231 (22.3)
40-44	25 (2.4)	76 (7.3)	11 (1.1)	61 (5.9)	173 (16.7)
45-49	29 (2.8)	37 (3.6)	9 (0.9)	56 (5.4)	131 (12.6)
Working duration [†] (yrs)					
- 4	7 (0.7)	54 (5.2)	6 (0.6)	439 (42.3)	506 (48.7)
5 - 9	74 (7.1)	290 (27.9)	61 (5.9)	39 (3.8)	464 (44.7)
10 -	12 (1.2)	37 (3.6)	15 (1.4)	4 (0.4)	68 (6.6)
Sleeping [†]					
Inadequate	34 (18.5)	125 (32.8)	37 (45.2)	127 (26.4)	305 (29.4)
Adequate	59 (63.5)	256 (67.2)	45 (54.8)	355 (73.6)	733 (70.6)
Total	93 (100.)	381 (100.)	82 (100.)	482 (100.)	1038 (100.)

* Core; Experienced unionist as representative or executive members of union

† ²-test, p-value 0.000

3) Karasek 179.6% , 5 (Fig. 1, Table 6).
Karasek 가 2
47.9% 가 , Karasek
가 65.5%가
285.7% , 가
16.1%, 40.9%, 52.4% 가
(Table 5). 45.7%가
199.4% 4
가 48.3% 가 , Karasek
가 160 60.0%가
11.8%, 261.7% 3
32.8%, 48.8% 가 48.3% 가 33.3%가 가
(Table 5). 145.4% (Fig. 1, Table 6).
2. 가 , 가
1) 가 (pruning) , 1~2
36.4% 158.6%
(Fig. 1, Table 6). 가
가 0.193 (Table 7).
가 (Gain 2)
index) 가 , 가
REBA 가 Karasek
65.9% , 가 287.7%
(Fig. 1, Table 6).
REBA 가 Karasek 가 REBA ,
41.2%가 가

Table 4. REBA and OWAS action categories by company and union number (%)

		Parent company			Subcontract	Total
		Non-unionist	Unionist		company workers	
			General	Core*		
REBA †§						
Level	1	25 (26.9)	25 (6.6)	9 (11.0)	25 (5.2)	84 (8.1)
	2	43 (46.2)	124 (32.5)	26 (31.7)	76 (15.8)	269 (25.9)
	3	15 (16.1)	149 (39.1)	39 (47.6)	165 (34.2)	368 (35.5)
	4	10 (10.8)	83 (21.8)	8 (9.8)	216 (44.8)	317 (30.5)
OWAS†						
Level	1	19 (20.4)	64 (16.8)	14 (17.1)	63 (13.1)	160 (15.4)
	2	20 (21.5)	73 (19.2)	10 (12.2)	35 (7.3)	138 (13.3)
	3	12 (12.9)	58 (15.2)	11 (13.4)	68 (14.1)	149 (14.4)
	4	42 (45.2)	186 (48.8)	47 (57.3)	316 (65.6)	591 (56.9)
		93 (100.)	381 (100.)	82 (100.)	482 (100.)	1038 (100.)

* Core ; Experienced unionist as representative or executive members of union

† REBA: Rapid Entire Body Assessment

‡ OWAS: Ovako Working Posture Analyzing System

§ ²-test, p-value 0.000

(Analysis structural equation modeling) ((NIOSH, 1977),
) Fig. 2 Table 8 . (Park , 2003; Kim , 2003; Kho ,
 REBA (.054) 2000)
 2003
 가 , 가 가
 (.313), '(.172), '(-.095),
 (.092), '(.061)
 (Kim, 2003),
 (KCTU, 2003).
 (MOL, 2003; KSOEM, 2003),
 1996 506 2002 1,827 가 (Sherri, 1977, Park &
 , 44% , Bae, 2003)
 가
 (Francesco, 2000),
 가
 가 (Skov , 1996; Krause ; 1997,
 Ariens , 2001; Devereux , 2002; Hoogendoorn
 ; 2002, Halford , 2003; Gunnarsdottir ,
 2003; Nahiti , 2003),

Table 5. Karasek 's job strain model by company and union number (%)

	Parent company			Subcontract company workers	Total
	Non unionist	Unionist			
		General	Core*		
Karasek 's group [§]					
Low strain	23 (24.7)	46 (12.1)	6 (7.3)	82 (17.0)	157 (15.1)
Passive	32 (34.4)	105 (27.6)	21 (25.6)	231 (47.9)	389 (37.5)
Active	23 (24.7)	74 (19.4)	12 (14.6)	73 (15.1)	182 (17.5)
High Strain	15 (16.1)	156 (40.9)	43 (52.4)	96 (19.9)	310 (29.9)
Social (senior & colleague) support [§]					
Both high	49 (52.7)	139 (36.5)	24 (29.3)	171 (35.5)	383 (36.9)
Se /Co [†]	4 (4.3)	13 (3.4)	2 (2.4)	13 (2.7)	32 (3.1)
Se /Co [‡]	11 (11.8)	125 (32.8)	40 (48.8)	65 (13.5)	241 (23.2)
Both low	29 (31.2)	104 (27.3)	16 (19.5)	233 (48.3)	382 (36.8)
Total	93 (100.)	381 (100.)	82 (100.)	482 (100.)	1038 (100.)

* Core ; Experienced unionist as representative or executive members of union

[†]Se /Co : senior support is high and Colleague support is low

[‡]Se /Co : senior support is low and Colleague support is high

[§] ²-test, p-value 0.000

가
(Kim, 2004).
가 1997
IMF

가 가
가 가

(KCTU, 2003).

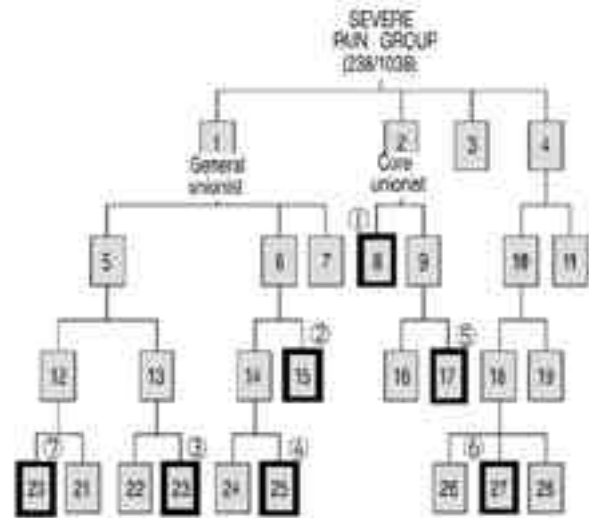


Fig. 1. Tree formation of severe pain group by predictor

Table 6. Gains chart of predictor variable by decision tree method

Node no	Node* n (%)	Gain [†] n (%)	Resp %	Gain Index [‡] %	Description about node
8	47 (4.5)	31 (13.0)	66.0	287.7	Core [§] unionists - REBA score; very high
15	29 (2.8)	19 (8.0)	65.5	285.7	General unionists - Karasek group; active high strain - Outsourcing; changed
23	25 (2.4)	15 (6.3)	60.0	261.7	General unionists-Karasek group; passive - Overtime work; no - total income;160
25	140 (13.5)	64 (26.9)	45.7	199.4	General unionists - Karasek group; active high strain - Outsourcing; no changed - Work hours; no change
17	17 (1.6)	7 (2.9)	41.2	179.6	Core unionists - REBA score; medium low - Karasek group; active high strain
27	22 (2.1)	8 (3.4)	36.4	158.6	Subcontract workers - Sleeping; sufficient - Social support group; both low - Drinking; 1-2 times/month
20	12 (1.2)	4 (1.7)	33.3	145.4	General unionists - Karasek group; passive - Overtime work; yes - Schoolchildren; no

* Node n(%); node number, % to 1,038

[†] Gain n(%), gain number, % to 238

[‡] Gain index (%):==287.7% in node 7

[§]Core ; Experienced unionist as representative or executive members of union

Table 7. Risk chart (misclassification matrix) of severe pain group

Pain score group	Actual category	Actual category		Total
		No / Mild	Severe	
Predicted category	No / Mild	774	155	909
	Severe	46	83	129
Total		800	238	1,038

$$\text{Risk estimate} = 0.193 \left(\frac{46+155}{1,038} \right)$$

가 (Chae, 2002) 가
 가 (MOL, 2003),

Table 8. Standardized Regression Weights of pain score by related factors variable

Dependent variable	Predictor variable	Regression Weights	Standardized Regression Weights	Critical Ratio	p-value
Pain score	Supervisor support	-1.366	-0.095	-2.846	0.004
Pain score	Decision latitude	-0.214	-0.052	-1.715	0.086
Pain score	Working duration	0.605	0.046	1.248	0.212
Pain score	Overtime work	2.949	0.053	1.915	0.056
Pain score	REBA score	1.000	0.054	-	-
Pain score	Coworker support	1.052	0.061	1.994	0.046
Pain score	Sleeping	10.343	0.092	3.293	0.000
Pain score	Job demand	1.380	0.172	6.029	0.000
Pain score	Company-Union	14.977	0.313	8.134	0.000

* Model fit index; NFI(normal fit index) = 1.000 RFI(relative fit index) = 0.982
 IFI(incremental fit index) = 1.000 TLI(Tucker-Lewis index) = 1.009

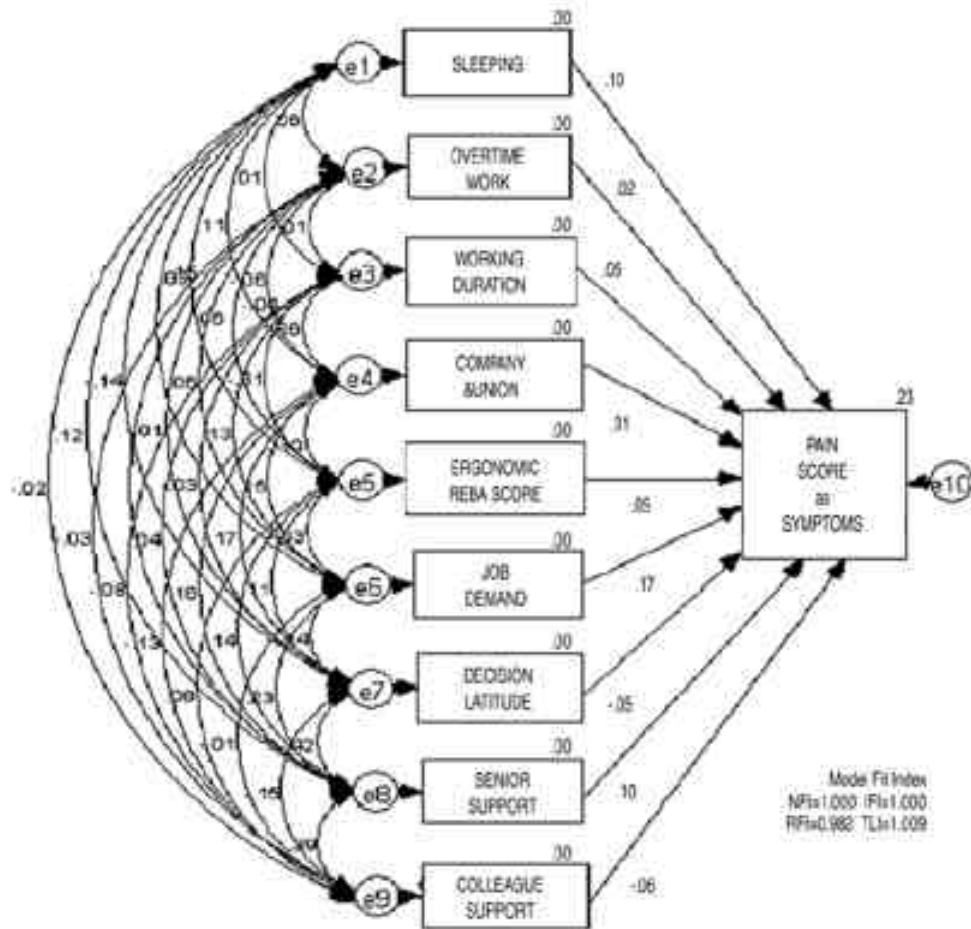


Fig. 2. Analysis structural equation modeling of pain score (e1~e10; error of variable)

(Korea Employers Federation)

Karasek

가

(KOEM, 2003),

가

(Biopsychosocial)

가

가

가
(Sherri, 1977).

가

2003)

(KCTU,

64

가

가

7.2

22.9%(238)

29

(Morse, 2003)

7.8 가

가

46.3%,

2가

35.4%,

15.1%

10.6%

4

(moral hazard)

(, 1997;

, 2002;

, 2003;

, 2003;

46.3%

10.6%

2003).

4

가

(Tree)

Karasek

가

가

REBA

(Action level)

65.5% 가

9.8%,

21.8%,

10.8%

44.8%

가

(Kho , 2004),

(Park , 2003, Kin

, 2003)

가

가

가

Karasek

가

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