

Abstract

## Occupational Stress and Risk Factors for Cardiovascular Diseases

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**Objectives:** The aim of this study was to elucidate the relationship between occupational stress and risk factors for cardiovascular diseases.

**Method:** The study subjects were 169 male workers aged over 40 who were employed in the ship-building industry. A self-reported questionnaire was used to assess the respondents' sociodemographics and occupational stress. Eight domains of occupational stress according to the Korean Occupational Stress Scale (KOSS) were used. We included blood pressure, lipid level (total cholesterol, triglyceride, HDL cholesterol), coagulation factors, pulse wave velocity and heart rate variability as possible cardiovascular risk factors.

**Result:** In multiple regression analyses, job demand was associated with triglyceride level, pulse wave velocity and heart rate variability. Interpersonal conflict was related to total cholesterol. Job insecurity was related to heart rate variability. Organizational system was associated with blood pressure, total cholesterol, pulse wave velocity and heart rate variability. Lack of rewards was related to systolic blood pressure and pulse wave velocity.

**Conclusions:** These results indicate that occupational stress is associated with cardiovascular risk factors.

**Key Words:** Job stress, Cardiovascular disease

41% ,  
가 (globalization)가  
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36%  
(Braunwald, 1977).

(Belkic, 2000).

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(Piper, 1989; Schnell, 1992).

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(Harlan Manolio, 1992; Ishizaki,

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(Krantz Manuck, 1984; Rozanski, 1988),

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(Karasek, 1988;

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46.7 , 40 ~ 44 가 26.9%,  
45 ~ 49 가 50.3%, 50 ~ 54 가 19.2%, 55  
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Table 2. Mean value of Job stress by general characteristics

	Physical environment	Job demand	Insufficient job control	Interpersonal conflict	Job insecurity	Organizational system	Lack of reward	Informal climate
Age								
40~44	48.15 (14.79)	48.24 ( 9.34)	44.89 (16.48)	39.07 (14.63)	60.62 ( 7.93)	48.57 (11.69)	43.95 (11.23)	63.52 (10.55)
45~49	54.48 (17.41)	50.25 (10.97)	46.02 (14.04)	39.94 (12.88)	62.53 (11.51)	48.93 (13.76)	47.96 (12.04)	63.33 (13.17)
50~56	51.97 (13.87)	53.49 (12.60)	48.82 (13.04)	39.52 (12.35)	57.17 (13.92)	44.13 (10.61)	43.52 (12.56)	58.33 (14.01)
≥ 55	50.00 (20.79)	50.69 (10.35)	48.89 (13.11)	41.67 (17.48)	59.26 (17.09)	39.68 (13.36)	45.56 (13.26)	63.33 ( 9.50)
Occupation								
Office	45.80 (18.62)	46.75 (10.44)	34.31 (10.28)	38.01 (13.57)	58.81 ( 9.70)	44.13 (10.38)	42.14 (10.61)	62.80 (11.95)
Field	54.31 (14.95)	51.47 (10.81)	50.22 (13.48)	40.26 (13.22)	61.60 (11.92)	48.64 (13.33)	47.15 (12.21)	62.22 (12.87)
Education								
Primary	57.69 (18.06)	51.76 (10.75)	51.79 (12.69)	42.63 (15.51)	62.39 (15.66)	47.07 (13.82)	48.08 (14.40)	62.50 (17.52)
Middle	53.44 (14.36)	51.17 (10.68)	49.09 (13.62)	40.40 (13.01)	61.50 (10.95)	50.10 (12.42)	46.96 (10.87)	61.81 (11.32)
High	46.18 (17.42)	47.53 (10.89)	35.63 (12.28)	35.94 (11.29)	57.99 ( 9.35)	41.82 (11.46)	42.88 (12.40)	63.80 (10.92)
College	30.56 (18.98)	43.75 (10.49)	30.00 ( 8.61)	27.08 ( 7.98)	66.67 ( 4.54)	32.14 ( 5.99)	31.94 (10.52)	75.00 (11.79)
Smoking								
Non-smoking	50.43 (17.11)	47.68 (11.56)	45.00 (15.73)	39.42 (14.21)	59.40 (13.27)	49.58 (14.42)	45.86 (11.43)	63.07 (13.57)
Smoking	53.07 (16.62)	51.37 ( 9.85)	48.46 (13.95)	39.93 (13.10)	62.19 (10.74)	46.97 (12.58)	45.83 (12.44)	62.82 (13.10)
Ex-smoking	52.96 (15.05)	51.68 (11.22)	44.49 (13.63)	39.67 (12.81)	60.75 (10.17)	45.93 (10.89)	45.93 (12.22)	60.93 (10.78)
Alcohol								
Yes	51.66 (16.08)	50.03 (10.44)	46.27 (14.60)	40.49 (13.13)	61.61 (11.06)	46.97 (12.93)	46.01 (11.82)	62.56 (13.25)
No	54.51 (17.25)	51.43 (12.68)	46.24 (14.19)	36.29 (13.70)	57.89 (12.73)	49.84 (11.98)	45.21 (12.92)	61.49 ( 9.29)

**Table 3-1.** Mean values of cardiovascular risk factors by job stress

Unit: Mean (S.D.)

	Physical environment			Job demand			Insufficient job control			Interpersonal conflict		
	Low group	High group	p value	Low group	High group	p value	Low group	High group	p value	Low group	High group	p value
Systolic blood pressure	123.3 (18.0)	124.9 (13.9)	0.52	123.6 (15.6)	125.0 (16.1)	0.59	124.0 (15.8)	125.4 (15.9)	0.64	121.3 (13.8)	127.8 (17.2)	0.01
Diastolic blood pressure	81.2 (10.5)	82.4 (10.3)	0.45	81.8 (10.3)	81.9 (10.4)	0.94	81.5 (10.5)	83.4 (9.9)	0.33	80.3 (9.5)	83.7 (11.0)	0.04
Hemoglobin	14.9 (0.8)	14.7 (0.8)	0.18	14.7 (0.8)	14.8 (0.8)	0.82	14.8 (0.8)	14.5 (0.8)	0.11	14.8 (0.8)	14.7 (0.8)	0.41
Glucose	98.4 (23.5)	98.7 (27.1)	0.94	96.6 (21.7)	100.9 (29.6)	0.29	98.5 (25.4)	99.7 (26.2)	0.81	98.0 (27.3)	99.5 (23.5)	0.70
Homocystein	11.6 (5.4)	11.2 (4.6)	0.67	11.2 (4.8)	11.6 (5.2)	0.63	11.2 (4.7)	11.6 (5.6)	0.68	11.2 (5.5)	11.4 (4.2)	0.83
Total cholesterol	188.8 (40.9)	198.2 (35.9)	0.11	190.1 (38.2)	199.6 (38.1)	0.11	193.1 (38.5)	196.7 (37.7)	0.61	190.0 (35.2)	198.4 (41.3)	0.16
HDL cholesterol	47.3 (10.2)	46.6 (10.1)	0.67	47.5 (10.2)	46.1 (10.0)	0.36	47.7 (10.6)	44.4 (7.7)	0.07	47.2 (10.8)	46.6 (9.3)	0.72
LDL cholesterol	115.2 (33.3)	120.1 (30.3)	0.31	115.9 (33.8)	120.7 (28.4)	0.33	119.8 (32.4)	110.7 (27.3)	0.11	115.2 (31.3)	120.6 (31.6)	0.27
Triglyceride	122.6 (78.8)	144.2 (70.2)	0.06	126.9 (71.7)	145.3 (77.5)	0.11	136.2 (79.0)	131.2 (59.2)	0.71	137.8 (78.8)	131.7 (70.1)	0.61
Coagulation factor VII	109.2 (20.2)	112.5 (19.8)	0.29	111.4 (18.7)	110.7 (21.6)	0.83	111.7 (21.2)	109.3 (15.7)	0.51	110.3 (19.3)	112.1 (20.9)	0.59
Coagulation factor VIII	76.1 (36.5)	79.1 (23.5)	0.52	75.6 (24.0)	80.7 (36.0)	0.27	76.4 (26.0)	82.6 (40.2)	0.26	79.3 (28.6)	76.1 (31.4)	0.49
Pulse wave velocity(Rt)	1411.5 (154.7)	1391.1 (109.6)	0.40	1378.1 (126.5)	1429.8 (134.5)	0.03	1393.5 (139.1)	1423.9 (103.8)	0.29	1388.5 (145.4)	1416.9 (111.8)	0.26
Pulse wave velocity(Lt)	1414.5 (143.9)	1394.5 (116.8)	0.40	1379.5 (124.3)	1435.5 (131.1)	0.02	1399.2 (136.7)	1419.5 (103.6)	0.48	1392.0 (136.7)	1419.1 (111.46)	0.26
Heart rate variability	38.9 (8.2)	38.8 (10.6)	0.94	40.0 (8.9)	37.4 (10.2)	0.11	39.7 (10.3)	36.5 (7.1)	0.09	40.2 (10.3)	37.1 (8.5)	0.06

**Table 3-2.** Mean values of cardiovascular risk factors by job stress

	Job insecurity			Organizational system			Lack of reward			Informal climate		
	Low group	High group	p value	Low group	High group	p value	Low group	High group	p value	Low group	High group	p value
Systolic blood pressure	127.5 (14.3)	123.6 (16.1)	0.24	121.5 (14.0)	128.3 (17.7)	0.01	122.5 (14.5)	130.8 (18.2)	0.01	126.7 (15.5)	123.8 (15.9)	0.35
Diastolic blood pressure	82.8 ( 9.4)	81.7 (10.5)	0.60	80.5 ( 9.8)	83.9 (11.0)	0.04	80.8 ( 9.7)	85.9 (11.6)	0.01	82.9 (11.2)	81.8 (10.2)	0.57
Hemoglobin	14.7 ( 0.9)	14.7 ( 0.8)	0.99	14.7 ( 0.9)	14.7 ( 0.8)	0.96	14.8 ( 0.8)	14.7 ( 0.8)	0.62	15.0 ( 0.9)	14.7 ( 0.8)	0.07
Glucose	99.9 (30.3)	98.5 (24.3)	0.79	92.9 (20.5)	107.6 (30.1)	0.01	96.3 (23.6)	107.9 (30.4)	0.01	97.9 (23.9)	99.5 (26.3)	0.75
Homocystein	10.3 ( 3.2)	11.5 ( 5.2)	0.22	11.5 ( 5.1)	11.2 ( 4.9)	0.74	11.2 ( 5.2)	12.1 ( 4.2)	0.33	9.9 ( 2.4)	11.9 ( 5.5)	0.05
Total cholesterol	184.6 (43.9)	195.8 (36.8)	0.15	191.6 (36.8)	196.6 (41.0)	0.41	191.0 (36.7)	200.8 (42.9)	0.16	185.6 (37.0)	195.9 (38.7)	0.15
HDL cholesterol	45.8 ( 8.1)	47.1 (10.5)	0.53	47.2 (10.1)	46.2 (10.5)	0.55	46.4 (10.2)	47.8 (10.4)	0.46	47.8 ( 9.7)	46.5 (10.4)	0.52
LDL cholesterol	113.0 (36.6)	118.6 (30.3)	0.39	117.6 (30.2)	117.1 (33.9)	0.91	115.1 (30.0)	123.7 (35.8)	0.13	111.6 (30.4)	119.0 (31.9)	0.21
Triglyceride	135.7 (99.6)	130.3 (67.1)	0.10	136.1 (76.9)	133.3 (73.5)	0.82	136.7 (74.5)	132.3 (79.2)	0.75	124.9 (69.9)	138.9 (76.8)	0.32
Coagulation factor VII	117.3 (15.2)	109.8 (20.7)	0.06	109.7 (22.3)	113.1 (16.2)	0.31	110.8 (21.3)	112.4 (16.8)	0.67	108.2 (17.7)	112.1 (20.9)	0.31
Coagulation factor VIII	74.3 (24.2)	78.6 (31.0)	0.48	78.8 (35.4)	77.0 (20.0)	0.71	79.1 (33.5)	75.7 (17.2)	0.54	74.4 (18.9)	79.3 (32.8)	0.36
Pulse wave velocity(Rt)	1405.2 ( 97.6)	1399.7 (137.8)	0.87	1386.9 (144.3)	1423.3 (109.8)	0.15	1392.7 (131.8)	1429.9 (132.5)	0.20	1403.7 (111.3)	1401.0 (137.7)	0.93
Pulse wave velocity(Lt)	1398.5 (106.8)	1404.5 (133.4)	0.86	1384.5 (137.8)	1434.5 (113.4)	0.04	1397.9 (137.8)	1424.5 (130.9)	0.35	1394.1 (121.0)	1407.9 (132.5)	0.63
Heart rate variability	42.8 ( 9.7)	38.2 ( 9.5)	0.04	40.5 ( 9.7)	36.5 ( 9.0)	0.02	39.9 ( 9.7)	35.8 ( 9.1)	0.03	38.9 ( 9.1)	38.8 ( 9.8)	0.93

**Table 4.** Correlation between job stress and cardiovascular risk factors

	Physical environment	Job demand	Insufficient job control	Interpersonal conflict	Job insecurity	Organizational system	Lack of reward	Informal climate
Systolic blood pressure	.086	.079	.016	.159*	-.038	.304**	.191*	-.070
Diastolic blood pressure	.100	.024	.007	.120	.048	.264**	.157	-.030
Hemoglobin	-.079	-.012	-.123	-.058	-.026	.059	-.046	-.109
Glucose	.046	.092	.048	.045	-.048	.195*	.210**	.044
Homocystein	-.064	.034	.099	.015	.031	.021	-.027	.031
Total cholesterol	.086	.152	.040	.138	.143	.186*	.068	.021
HDL cholesterol	-.059	-.047	-.170*	.047	-.057	-.007	.067	-.097
LDL cholesterol	.046	.076	-.075	.080	.035	.169*	.036	-.031
Triglyceride	.103	.157*	.037	-.067	.051	-.014	-.034	.162*
Coagulation factor VII	.082	.017	-.089	.022	.030	.051	-.007	.112
Coagulation factor VIII	.030	.013	-.001	.019	.012	-.021	.030	.063
Pulse wave velocity(Rt)	-.017	.211*	.116	.103	-.055	.199*	.240**	.032
Pulse wave velocity(Lt)	-.011	.202	.099	.060	-.050	.247**	.174	.018
Heart rate variability	-.096	-.184	-.158*	-.153	-.231**	-.203*	-.156	-.014

\* : p < 0.05

가 가  
(Braun

Hollander, 1988; Karasek Theorell, 1990).

**Table 5.** Multiple regression analysis on heart rate variability

Variables	Heart rate variability(SDNN)	
	Beta	T
Physical enviroment	-0.09	-1.13
Job demand	-0.19	-2.23*
Insfficient job control	-0.16	-1.88
Interpersonal conflict	-0.17	-1.94
Job insecurity	-0.26	-3.01*
Lack of reward	-0.21	-2.34*
Organizational system	-0.18	-2.02
Informal climates	-0.02	-0.20

Adjusted variable; age, occupation, smoking, alcohol, BMI  
SDNN; Standard deviation of all NN interval,  
\*: p < 0.05

**Table 6.** Multiple regression analysis on pulse wave velocity

Variables	Pulse wave velocity(left)		Pulse wave velocity(right)	
	Beta	T	Beta	T
Physical enviroment	-0.02	-0.23	-0.02	-0.18
Job demand	0.24	2.59*	0.23	2.49*
Insfficient job control	0.14	1.44	0.11	1.18
Interpersonal conflict	0.11	1.22	0.07	0.74
Job insecurity	-0.04	-0.48	-0.03	-0.36
Lack of reward	0.20	2.08*	0.24	2.57*
Organizational system	0.25	2.67*	0.17	1.88
Informal climates	0.04	0.42	0.02	0.22

Adjusted variable; age, occupation, smoking, alcohol, BMI  
\*: p < 0.05

**Table 7.** Multiple regression analysis on blood pressure

Variables	Systolic blood pressure		Diastolic blood pressure	
	Beta	T	Beta	T
Physical enviroment	0.10	1.24	0.12	1.46
Job demand	0.10	1.22	0.04	0.50
Insfficient job control	0.08	0.09	0.01	0.02
Interpersonal conflict	0.14	1.74	0.12	1.47
Job insecurity	-0.03	-0.37	0.05	0.64
Lack of reward	0.30	3.77*	0.15	1.87
Organizational system	0.18	2.29*	0.27	3.30*
Informal climates	-0.07	-0.95	-0.04	-0.49

Adjusted variable; age, occupation, smoking, alcohol, BMI  
\*: p < 0.05

가 (Niaura, 1992; Muldoon, 1995; Siegrist, 1997).

(preclinical stage) (Schulte, 1993).

가 (hydrostatic pressure) 가 ,

(athrosclerosis) 가 (Jern, 1991; Putterson, 1993; Muldoon, 1995).

가 가

(Dimsdale Herd, 1982; Sapolski Mott, 1987). LDL

가

가 (Smith, 1987; Freeman, 1990; Theorell, 1993), (가, ) (Henry, 1986; Pieper, 1989; Reed, 1989; Greenlund, 1995).

MRA(Magnetic Resonance Angiography) MRA

가 (pulse wave velocity, PWV) 가 (Cortez-Cooper, 2003; Kubo, 2002).

가 (Fang, 1995) 가 (Lehmann, 1997). Blacher (1999)

**Table 8.** Multiple regression analysis on total cholesterol and triglyceride

Variables	Total cholesterol		Triglyceride	
	Beta	T	Beta	T
Physical enviroment	0.09	1.21	0.11	1.41
Job demand	0.15	1.83	0.18	2.27*
Insfficient job control	0.01	0.12	0.02	0.22
Interpersonal conflict	0.16	2.02*	-0.05	-0.72
Job insecurity	0.14	1.81	0.03	0.36
Lack of reward	0.07	0.89	0.01	0.02
Organizational system	0.19	2.34*	-0.04	-0.55
Informal climates	0.01	0.09	0.16	1.95

Adjusted variable; age, occupation, smoking, alcohol, BMI

\*: p < 0.05

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