The Influence of Indoor Environment Quality on Psychosocial Work Climate Among Office Workers

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Background : *There is increasing concern about psychosocial problem in workplaces and indoor environmental quality (IEQ) is alleged to be among the major causes of this problem.*
Purpose : *To investigate the influence of indoor environmental problems on psychosocial effect among office workers in Bangkok, Thailand.*
Study design : *Cross-sectional descriptive study.*
Method : *Study subjects were 1,262 office workers selected by cluster random sampling from 5 air-conditioned buildings in Bangkok. The data were collected by self-administered questionnaires during February 2004.*
Results : *Office workers in an unhealthy climate group were significantly younger, had longer weekly working hours and higher educational levels. The prevalence rates of all categories of IEQ complaints were higher in the unhealthy climate group. In crude analyses, the odds ratios of having an unhealthy psychosocial work climate were significantly associated with the number of IEQ complaints in a dose-response manner. After adjusting for a set of confounding factors (sex, age groups, education, job category and working hours), temperature, noise and dust are the aspects of IEQ complaints significantly associated with having an unhealthy psychosocial work climate.*
Conclusion : *Good workplace IEQ would have beneficial effects on psychological well-being of employees.*

Keywords : *Indoor environmental quality, Psychosocial work climate, Office worker*

J Med Assoc Thai 2004; 87 (Suppl 2): S202-6
e-Journal: *http://www.medassocthai.org/journal*

Nowadays, rapid changes in work environment, work structure and work organization are causing an increased psychosocial stress among almost all employees during their working life. This work-related psychological problem is becoming more prevalent, especially in the service provider sector[1,2]. Its attributable factors include factors intrinsic to the job, interpersonal factors, macro-organizational structure, career development and individual factors [3]. Among these, physical environment - an aspect of factors intrinsic to the job-is traditionally a major factor that contribute to this problem.

In this decade, as many workers spend most of the day indoors rather than outdoors, there are increasing concerns about the workplace indoor environment. It has been proved that indoor environmental quality (IEQ) has an impact on occupants' well-being [4]. Office workers are particularly prone to IEQ problems, but these problems have been relatively neglected. The office environment has changed, and modern technology has modified most functions. Furthermore, the physical structure of office buildings has been transformed, new building materials have been used, and air-conditioning systems have become widespread. All of these various changes affect the IEQ. The Building occupants expressed dissatisfaction with IEQ, especially in the work environment where a number of coexisting factors influence their sense of personal well-being and ability to do their jobs[5,6].

Although a number of studies have documented the impact of physical working conditions on psychosocial problems in many industrial settings, such evidence is limited for office settings where working conditions differ. Therefore, the present study aimed at determining the influence of indoor environmental problems on psychosocial effects among office workers in 5 air-conditioned buildings in Bangkok.

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Method

Study design

A cross-sectional study data were obtained

from office workers in 5 air-conditioned public buildings in Bangkok. Study subjects were selected by cluster random sampling (treating each floor of the building as a cluster) from each building. The data were collected in February 2004 from 1,262 office workers with more than 1 month of work duration at the building.

Material and Method

The study protocol was approved by the ethical committee of the Faculty of Medicine, Chulalongkorn University. Data were collected by using a self-administered questionnaire which was constructed for studying the health status of office workers. The content validity of questionnaire was approved by 3 experts in occupational medicine and industrial hygiene, and its reliability was verified by test-retest method among office workers who worked in the same buildings but were not the study subjects.

Content of the questionnaire included personal demographics (the covariates), perceptions of the IEQ problems (the determining factors), and psychosocial status(the outcomes). Perceptions of the IEQ problems during the past month were assessed by 13 question items. These items were classified into 7 categories: poor ventilation, temperature (too hot, too cold, and variable temperature), humidity (stuffy and dry air), lighting (bright light, dim light, and glare), dust, noise and odor (environmental tobacco smoke and unpleasant odor). Problems were determined to exist if they occurred weekly during the past month. The IEQ index was constructed with its value ranges from 0-7, depending on the number of the IEQ problem categories perceived by each worker.

Psychosocial status was assessed by 4 question items. These items were translated from those developed by a Swedish research group and widely used in Nordic indoor climate studies [7-9]. They measured work satisfaction, work stress, personal control at work and social support in the past one month. Four possible answers for each aspect included: never (score = 1), seldom (score = 2), sometime (score = 3) and, often (score = 4). Psychosocial index was constructed by summing all the scores with a possible range of 4-16. Summed scores of the study subjects were then transformed into binary psychosocial index by using the group's median as the cut-off-point. Scores less than or equal to 8 were classified as "healthy" psychosocial work climate, while those higher than 8 were classified as "unhealthy" psychosocial work climate according to a previous study [9].

Statistical analyses

Categorical data were described by frequency and percentage. Chi square tests were utilized in the comparison between groups of workers with healthy and unhealthy psychosocial work climates, with the level of statistical significance at p value < 0.05. Simple logistic regression was utilized in the univariate analyses to determine the strength of association between the outcome and each determining variable [10]. Consequently, multivariable analyses were then conducted by multiple logistic regression adjusted for confounding factors such as sex, age groups, education, job category and working hours per week. Stepwise forward regression procedures were used in the statistical modeling. Appropriateness of the final model was checked by Wald and Hosmer-Lemeshow goodness-of-fit tests [11]. All the data entry and analyses were conducted by using Statistical Package for Social Sciences (SPSS) version 11.5.

Results

A total of 1,064 questionnaires were returned by the office workers, yielding the response rate of 84.3 percent. The demographic data of office workers were shown in Table 1. Worker groups with healthy and unhealthy psychosocial work climates (or healthy and unhealthy climate groups respectively) were similar according to sex and job category distributions, but different according to age, educational level, and working hour distributions. Workers in the healthy climate group were significantly older, had shorter weekly working hours, but had lower educational levels.

The IEQ complaints among the healthy and unhealthy climate groups were described in Table 2. Complaints about temperature were the most prevalent in both groups. The prevalence rates of all categories of IEQ complaints were higher in the unhealthy climate group. The greatest difference between these two groups was the prevalence of complaints about dust.

Univariate analyses showed that higher educational levels, longer weekly working hours, and all categories of IEQ complaints were significantly associated with having unhealthy psychosocial work climate (Table 3). However, the magnitudes of the odds ratios(ORs) for almost all factors were confined within 2.0. The exception was higher than bachelor degrees of education, of which the OR was 3.02 (95% confidence interval or CI=1.80-5.06). The ORs of having unhealthy psychosocial work climate were significantly associated with the number of IEQ complaints in an incremental manner with the p-value of <0.001 (Fig. 1).

Table 1. Demographic features of the study population with healthy and unhealthy psychosocial work climates

Variables[a]	Unhealthy Climate		Healthy Climate		Total	
	n	%	n	%	n	%
Sex						
- male	103	30.7	230	32.5	333	31.9
- female	233	69.3	478	67.5	711	68.1
Age groups **						
- < 30 years	28	8.4	76	11.1	104	10.2
- 30-39 years	134	40.2	209	30.5	343	33.7
- 40-49 years	120	36.1	242	35.3	362	35.6
- ≥ 50 years	51	15.3	158	23.1	209	20.5
Education ***						
- lower degree	42	12.5	157	22.2	199	19.1
- Bachelor degree	247	73.8	492	69.7	739	71.0
- Higher degree						
Job category	46	13.7	57	8.1	103	9.9
- Manager/professional/technician	146	43.5	289	41.4	435	42.1
- Clerk or others	190	56.5	409	58.6	599	57.9
Working hours per week *						
- ≤ 40 hours	241	71.3	550	77.8	791	75.7
- > 40 hours	97	28.7	157	22.2	254	24.3

[a] total numbers of subjects for each variable were unequal due to missing data
* p value < 0.05, ** p value < 0.005, *** p value < 0.001

Table 2. Number and percentage of respondents in healthy and unhealthy climate groups who reported that workplace indoor environmental problem(s) existed every week

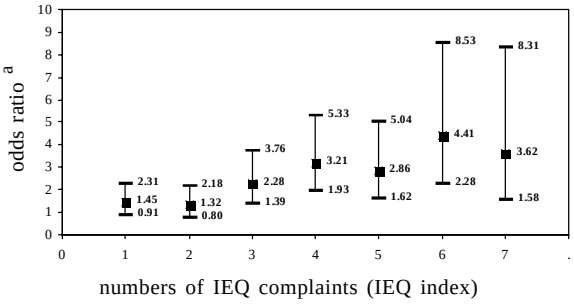
Environmental complaints[a]	Unhealthy Climate		Healthy CliImate		% difference
	n	%	n	%	
Ventilation	146	44.6	212	31.2	13.4
Temperature	249	74.6	422	60.7	13.9
Humidity	126	38.4	172	25.0	13.4
Lighting	78	24.1	107	15.7	8.4
Dust	170	51.2	247	35.6	15.6
Noise	122	37.3	161	23.3	14.0
Odor	83	25.0	118	17.1	7.9

[a] total numbers of subjects for each variable were unequal due to missing data

After adjusting for sex, age groups, education, job category and working hours, the IEQ complaints which were still significantly associated with having unhealthy psychosocial work climate were temperature, noise and dust (Table 4).

Discussion

As manufacturing jobs are declining and are being replaced by office and service jobs, concern about psychosocial work climate are becoming more central to occupational health. Physical factors are alleged to influence psychosocial well-being in the workplace, but little information exists nowadays about their relationship in an office setting. The present study results showed the association between indoor



[a] persons without complaint were used as the reference group

Fig. 1 The relationship between odds ratios of having unhealthy psychosocial work climate and numbers of IEQ complaints (IEQ index)

Table 3. Crude odds ratio and 95 % confidence intervals of having unhealthy psychosocial work climate for each determining factor and covariate

Factors[a]	Crude odds ratio	95%CI	p value
Sex			
- male	1.00		
- female	1.09	0.82-1.44	0.55
Age groups			
- < 30 years	1.00		
- 30-39 years	1.74	1.07-2.83	0.02
- 40-49 years	1.35	0.82-2.19	0.23
- ≥ 50 years	0.88	0.52-1.50	0.63
Education			
- lower degree	1.00		
- Bachelor degree	1.89	1.29-2.73	<0.005
- Higher degree	3.02	1.80-5.06	<0.001
Job category			
- Manager/professional technician	1.00		
- Clerk or others	0.92	0.71-1.20	0.53
Working hours per week			
- ≤ 40 hours	1.00		
- > 40 hours	1.41	1.05-1.89	0.02
Environmental complaints			
Ventilation			
- No	1.00		
- Yes	1.78	1.36-2.34	<0.001
Temperature			
- No	1.00		
- Yes	1.90	1.42-2.53	<0.001
Humidity			
- No	1.00		
- Yes	1.89	1.42-2.49	<0.001
Lighting			
- No	1.00		
- Yes	1.71	1.23-2.37	<0.005
Dust			
- No	1.00		
- Yes	1.90	1.46-2.48	<0.001
Noise			
- No	1.00		
- Yes	1.96	1.47-2.60	<0.001
Odor			
- No	1.00		
- Yes	1.61	1.17-2.22	<0.005

[a] total numbers of subjects for each variable were unequal due to missing data

Table 4. Adjusted odds ratios and 95 % confidence intervals of having unhealthy psychosocial work climate for variables in the final fitted model

Factors	Adjusted odds ratio[a]	95 % CI	p value
Education[b]			
- Bachelor degree	1.60	1.04-2.46	0.03
- Higher degree	2.45	1.38-4.37	<0.005
Environmental Complaints[c]			
- temperature	1.61	1.17-2.22	<0.005
- dust	1.51	1.10-2.07	0.01
- noise	1.50	1.08-2.09	0.01

[a] The reference groups were: [b] lower degree, [c] persons without complaint
adjusted for sex, age groups, education, job category and working hours

environment and psychosocial work climate in such a setting.

The association between physical factors and psychosocial work climate seemed to be related to the perception of IEQ among the occupants. The present findings demonstrated the dose-response relationship between the perception of IEQ and psychosocial work climate, indicating a greater risk of having an unhealthy psychosocial work climate with an increasing number of environmental complaints. After adjusting for confounding factors (education), lack of control over the thermal comfort, presence of dust and noise problems in the workplace were significantly related to having unhealthy psychosocial work climate. These findings were supported by Baron [12]. His study showed that exposure to adverse physical conditions in the workplace quite often played a role in an unsatisfactory psychosocial work environment.

This may be explained by a concept of the influence of negative affectivity and control on the level of psychological problems. Those people who are on a high scale of negative affectivity are more likely to express distress and dissatisfaction. Negative affectivity may operate in several ways simultaneously to increase problem reporting. Most obviously it may simply exert a direct influence on the tendency to report problems. Alternatively it may act indirectly, either by influencing a person's perception of environment or by increasing his/her vulnerability to environmental stressors [13].

The incremental risk of a psychosocial problem with higher degrees of education may be due to more awareness of psychosocial problems among workers with higher education. Educated people also tend to carry out preventive health measures and avoid unhealthy behavior. This behavioral pattern which has long been linked to individual perception of health status is termed "locus control" [13].

However, the present study has some limitations. The retrospective manner of data collection method might have produced recall bias. The assessment of the psychosocial outcomes by only four question items might not cover the whole scope of psychosocial work climate. Lastly, environmental exposure assessment by relying on personal perception rather than environmental monitoring results might be too subjective and have resulted in a certain degree of non differential exposure misclassification, which biased the odds ratio estimates toward the null [14].

In the short term, the occupants deal with poor environmental quality by rapid physiological and psychological adaptation. However, if this condition exists continuously, illness could occur. In conclusion, good workplace IEQ would have beneficial effects on psychological well-being of employees, social atmosphere at work, and productivity of businesses.

Acknowledgment

The authors wish to thank the office workers who participated in the study. We wish to thank Professor Dr. Pornchai Sithisarankul for helpful discussion and suggestion in this study.

References

1. Aziah BD, Rusli BN, Winn T, Naing L, Tengku MA. Prevalence and risk factors of job strain among laboratory technicians in Hospital Universiti Sains Malaysia. Singapore Med J 2004; 45: 170-5.
2. MacDonald LA, Deddens JA, Grajewski BA, Whelan EA, Hurrell JJ. Job stress among female flight attendants. J Occup Environ Med 2003; 45: 703-14.
3. Sauter SL, Murphy LR, Hurrell JJ, Levil L. Psychosocial factors, stress and health. In Stellman, J.M. (ed.), Encyclopaedia Occupational Health and Safety. 4thed. Geneva: International Labour Office, 1998: 34.1-34.77.
4. Kumar S, Fisk WJ. IEQ and the impact on building occupants. ASHRAE Journal 2002; 44: 50-2.
5. Klitzman S, Stellman JM. The impact of the physical environment on the psychological well-being of office workers. Soc Sci Med 1989; 29: 733-42.
6. Donald I, Siu OL. Moderating the stress impact of environmental conditions: the effect of organizational commitment in Hong Kong and China. J Environ Psychol 2001; 21: 353-68.
7. Reijula K, Sundman-Digert C. Assessment of indoor air problems at work with a questionnaire. Occup Environ Med 2004; 61: 33-8.
8. Lahtinen M, Sundman-Digert C, Reijula K. Psychosocial work environment and indoor air problem: a questionnaire as a means of problem diagnosis. Occup Environ Med 2004; 61: 143-9.
9. Andersson K, Fagerlund I, Norl n U, Nygren M. The association between SBS symptoms and the physical and psychosocial environment of school personnel (online). Skolfastigheter i Stockholm AB; 1999 (cited 2004 Jan 3). Available from: URL: http://www.sisab.se/the_association.htm.
10. Chan YH. Biostatistics 201: Linear regression analysis. Singapore Med J 2004; 45: 55-61.
11. Chan YH. Biostatistics 202: Logistic regression analysis. Singapore Med J 2004; 45: 149-53.
12. Baron RA. How environmental variables influence behavior at work. In Collett P. and Furnham A. (eds.), Social Psychology at Work: Essays in Honour of Michael Argyle, New York: Routledge, 1995: 176-205.
13. Spurgeon A, Gompertz D, Harrington JM. Modifiers of non-specific symptoms in occupational and environmental syndromes. Occup Environ Med 1996; 53: 361-6.
14. Armstrong BG. Effect of measurement error on epidemiological studies of environmental and occupational exposures. Occup Environ Med 1998; 55: 651- 6.

อิทธิพลของคุณภาพสิ่งแวดล้อมในอาคารต่อสภาพจิตสังคมในงานของพนักงานสำนักงาน

ฉัตรชัย เอกปัญญาสกุล, วิโรจน์ เจียมจรัสรังษี

ที่มาของปัญหา *: ปัญหาเรื่องจิตสังคมในงานมีแนวโน้มเพิ่มขึ้นในสถานที่ทำงาน และเชื่อว่าปัจจัยเรื่องคุณภาพสิ่งแวดล้อมภายในอาคารเป็นสาเหตุสำคัญสาเหตุหนึ่งของปัญหาดังกล่าว*

วัตถุประสงค์ *: ศึกษาผลกระทบของปัญหาคุณภาพสิ่งแวดล้อมในอาคารต่อปัญหาด้านจิตสังคมในงานของพนักงานสำนักงาน*

รูปแบบการศึกษา *: การศึกษาเชิงพรรณนา ณ จุดเวลาใดเวลาหนึ่ง*

วิธีดำเนินการ *: กลุ่มตัวอย่างประกอบด้วยพนักงานสำนักงานจำนวน 1,262 คนที่ได้รับการสุ่มเลือกด้วยวิธีสุ่มแบบกลุ่มจากอาคารปรับอากาศ 5 อาคารในกรุงเทพมหานคร และเก็บข้อมูลโดยแบบสอบถามชนิดตอบด้วยตนเอง ระหว่างเดือนกุมภาพันธ์ พ.ศ. 2547*

ผลการศึกษา *: พนักงานสำนักงานกลุ่มที่มีปัญหาจิตสังคมในงานมีอายุน้อยกว่า ระยะเวลาการทำงาน ในหนึ่งสัปดาห์นานกว่า และระดับการศึกษาระดับสูงกว่ากลุ่มที่ไม่มีปัญหาดังกล่าว อัตราความชุกของปัญหาคุณภาพสิ่งแวดล้อมในอาคารในกลุ่มที่มีปัญหาจิตสังคมในงานสูงกว่ากลุ่มที่ไม่มีปัญหา การวิเคราะห์โดยยังไม่ปรับปัจจัยตัวกวนพบว่า ความเสี่ยงของการมีปัญหาจิตสังคมในงานมีแนวโน้มเพิ่มขึ้นตามจำนวนปัญหาคุณภาพสิ่งแวดล้อมในอาคาร หลังจากปรับปัจจัยทางเพศ กลุ่มอายุ การศึกษา ลักษณะงาน และชั่วโมงการทำงานพบว่า อุณหภูมิ เสียง และฝุ่น เป็นปัญหาคุณภาพสิ่งแวดล้อมในอาคารที่มีความสัมพันธ์กับปัจจัยจิตสังคมในงานอย่างมีนัยสำคัญทางสถิติ*

สรุป *: คุณภาพสิ่งแวดล้อมในสถานที่ทำงานที่ดี จะมีประโยชน์ต่อสุขภาวะด้านจิตสังคมในงานของผู้ทำงาน*