

original article

Macroergonomic conditions and job satisfaction among employees of an industry

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ABSTRACT

Aims: The aim of this study was to investigate the relationship between macroergonomics score and job satisfaction among industrial employees.

Materials and Methods: This cross-sectional study was done among 83 employees from a factory affiliated with Iran Khodro Company. Two questionnaires including Minnesota Job Satisfaction and Macroergonomics Condition have been used. Finally, the collected data was evaluated and analyzed through SPSS 10 software program.

Results: The mean age of the subjects in this study was 30.8 and the work experience of 56.6% of them was between 4 and 7 years. The average macroergonomics score in the whole group in this study was 59.8. The maximum score given to this condition was 85, and the minimum score was 30. Also, the mean of job satisfaction score among the subjects was 60.5. The highest job satisfaction score was related to supervisors, which was about 69.2. There was a significant relationship between the general area of macroergonomics and job satisfaction. ($r = 0.638$, P -value < 0.001).

Conclusions: This study showed the higher macroergonomic scores, the better the work conditions, and, therefore, the employee's job satisfactions improve.

Key words: Human factors, job satisfaction, macroergonomics.

INTRODUCTION

Ergonomics is a science dealing with the relationship between human-machine and the environment. It is primarily made up of two parts: macroergonomics and microergonomics. Macroergonomics is the latest part of this science, which aims to optimize the work system and change the organizational culture.^[1,2] This optimization will affect the health, safety

and ergonomics and their integration in the work system. The most important designing principles for industries, machines, facilities and tools are met in microergonomics; and in macroergonomics, the adjustment of optimal ergonomics between the each part of the system and the work system has been outlined.^[3]

A microergonomic attitude will more probably create a system, which has a negative effect on the productivity, motivation, commitment and job satisfaction of the employees, while macroergonomics has been considered to have a noticeable impact on the organization performance, safety practice, job satisfaction, the work quality and productivity.^[4] Different microergonomic factors such as light, sound, temperature, humidity, good equipment design, and appropriate layout along with macroergonomic

Access this article online	
Quick Response Code: 	Website: www.ijehe.org
	DOI: 10.4103/2277-9183.100135

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This article may be cited as:

Habibi E, Zare M, Amini NR, Pourabdian S, Rismanchian M. Macroergonomic conditions and job satisfaction among employees of an industry. *Int J Env Health Eng* 2012;1:34.

factors such as work system, job rotation, procedures and training, job satisfaction and job security all are the required elements for having desired workplaces.^[5] At the moment, productivity, quality, reliability and availability are the important factors among industries in our country and the other developing countries.^[6] Application of macroergonomics in developed countries showed that this approach has had a successful experience for creating a proper workplace in which motivation is high and people tend to contribute for increasing productivity.^[7,8] Therefore, the interest in macroergonomics has improved during past decades.^[9] Dul and Neumann in their study mention that the contribution of macroergonomics on the company policy and strategies is the main factor in entrepreneurs.^[10] Many literatures are available about the macroergonomics and how to design and improve the organizational system, particularly in the first stage of system establishment. Zink in his study states that ergonomic approach will not be successful if the focus would only be on the machines, while a comprehensive management policy that creates a change in the organizational culture is required.^[11] Participatory ergonomics, which is the first step of macroergonomics, has various benefits such as developing self-confidence among workers, increasing commitment, reducing stress and feeling of satisfaction because of participating in risk reduction.^[12]

As different studies have shown, industries are exposed to various safety, health and ergonomics problems and the focus of safety professionals are mostly on microergonomics factor to improve the workplaces, while macroergonomics approach would give the best achievement. Therefore, the aim of this study is to evaluate the macroergonomics approach in an industry and obtain the relationship between it and job satisfaction.

MATERIALS AND METHODS

This is a cross-sectional study in which the subjects include 83 employees from the different parts of the industries affiliated with car manufacturing. The samples were chosen randomly. All the samples were informed about the aim of this study and have consented to participate in this study.

For collecting data, we used one questionnaire for evaluating the condition of macroergonomics approach, and another questionnaire for job satisfaction. The macroergonomics questionnaire consists of various areas including the evaluation of ergonomic factors, physical factors, situation and organizational structure, procedures, accountability, rules of training, and peoples work stress in the organization. This questionnaire consists of 30 multiple-choice questions with a limit score of 0 to 60, which was changed to 0 to 100 for more clarity. The score of macroergonomics questionnaire and its areas are divided into four categories including unacceptable (score lower than 50), acceptable (50–74), good (75–89), very good (90–100).

Validity of this questionnaire has been determined by 3 ergonomic and occupational health professionals who have reviewed and evaluated each question and decided on the clarity of items, content validity and face validity. As well, the questionnaire reliability was evaluated using statistical test in which Cronbach coefficient for this questionnaire was 72%.

The second questionnaire is the standard Minnesota Job Satisfaction questionnaire, which is used in most studies as a tool for evaluating job satisfaction. This questionnaire consists of 100 multiple-choice questions with a score limit of 100–400 that is changed into 0–100. The score of job satisfaction was also divided into four categories. The first category was very dissatisfied employees whose score was 25 or lower. The second group whose score was in the range of 25–50 was categorized as dissatisfied with their job. The third group whose score were in the range of 50–70 was satisfied employees, and the fourth group is those who are very satisfied with their work environment and their evaluation score was within the range of 75–100. Cronbach coefficient for this questionnaire was 92%.^[13]

Data analysis was done by the statistical software SPSS 10. In order to measure the different variables, statistical tests such as Pearson correlation test, variance analysis, and Spearman test were used.

RESULTS

The average age of the subjects in the study was 30.8 (± 5.1). The mean work experience among the study population was 6.13 years (4 ± 14), but the maximum work experience was 27 years and the minimum was 2 years. Also, 56.6% of the subjects had a diploma, and only 7.2% of them had a degree lower than diploma [Table 1].

The macroergonomics questionnaire assesses different factors in the work system. Table 2 shows the average scores of various areas of the macro ergonomics. The more average

Table 1: Demographic characteristics of the study population

Age % (n)	≤ 25 years	9.6 (8)
	26–30 years	44.6 (37)
	31–35 years	36.2 (30)
	36–40 years	4.8 (4)
	> 40 years	4.8 (4)
Duration of employment % (n)	Less than 4 years	28.9 (24)
	4–7 years	56.6 (47)
	7–15 years	10.9 (9)
	15 + years	30.7(119)
Educational attainment% (n)	Lower diploma	7.2 (6)
	Diploma	56.6 (47)
	Higher diploma	12 (10)
Salary % (n)	Bachelor’s degree and higher	24.1 (20)
	Lower than 249 \$	30.4 (118)
	249–373 \$	0.1 (3)
	373–498 \$	1.3 (5)
	More than 498 \$	65.2 (253)

Table 2: The mean score of macroergonomics and its different areas

	Mean (SD)	Score distribution among different areas of macroergonomics			
		Lower than 50 Unacceptable % (n)	50–74 Acceptable % (n)	75–89 Good % (n)	90–100 Very good % (n)
Macroergonomics	59.8 (13.4)	24.1 (20)	60.2 (50)	15.7 (13)	0 (0)
Ergonomics factors	56.5 (19.5)	26.5 (22)	54.2 (45)	16.9 (14)	2.4 (2)
Physical factors	63.1 (21.5)	25.3 (21)	43.3 (36)	16.9 (14)	14.5 (12)
organizational structure	71.8 (19.1)	9.6 (8)	37.4 (31)	25.3 (21)	27.7 (23)
Procedures and accountability	61.6 (15.1)	15.7 (13)	41 (34)	43.3 (36)	0
Rules of training	62.9 (26.6)	27.7 (23)	33.7 (28)	2.5 (17)	18.1 (15)
Work stress	47.7 (20.1)	50.6 (42)	38.6 (32)	8.4 (7)	2.4 (2)

score shows the better situation in that area. As shown in Table 2, the situation and organizational structure have the highest average score, and job stress has the lowest average score among the others. The mean score of microergonomics areas was 56.5, which is acceptable, while the mean score of work stress has obtained 47.7 that is unacceptable. The other areas mean score and overall, the mean of macroergonomics score were more than 50 and they have been considered acceptable.

The range of 50–74 (acceptable) in the areas of ergonomic factors, physical factors, organization design, rules of training, procedures and accountability has the highest frequency, while in the job stress and mental pressure areas the majority of the people showed the score below 50. Table 3 indicates that the average score of employees’ job satisfaction is 60.5. The closer this number is to 100, the more satisfied the employees are. The average score of job satisfaction among most of the employees (57.8 percent) was within the range of 50–75 who are satisfied in their workplace. The highest job satisfaction score was 90.5 (middle managers) and the lowest score was 28.25, which is related to production workers [Table 3].

The average score of macroergonomics and job satisfaction in each part of the industry were compared. There was a significant relationship between the mean score of macroergonomics and job satisfaction in all working groups ($P < 0.001$). This relationship was mainly between the two groups of senior managers and supervisors and technicians. As well, a statistically significant relationship has been observed between the different areas of macroergonomics and job satisfaction ($P < 0.001$).

The employees holding higher diploma (67.7%) showed the highest job satisfaction score. Moreover, there was no significant relationship between job satisfaction and education ($r = 0.102$; $P = 0.179$).

Our results indicated that the relationship of job satisfaction with age, salary and work experience was statistically significant ($P < 0.05$). The subjects whose age was between 36 and 40 years showed the highest job satisfaction. Furthermore, the more experience people get over time, the higher the rate of job satisfaction.

Table3: Job satisfaction score among the study population

Job satisfaction	Number	Percentage
Very dissatisfied	0	0
Dissatisfied	18	21.7
Satisfied	48	57.8
Very satisfied	17	20.5
Total	83	100
Mean	60.5	
SD	14.2	
Maximum	90.5	
Minimum	28.25	

DISCUSSION

There is a similarity between job satisfaction results of this research and the results of similar studies such as those on Swedish employees.^[14] As different studies showed, various factors influence the employee’s job satisfaction among which the various areas of macroergonomics as well as demographic factors of the employees such as age, work experience, education and salary are the most important element.^[15]

Some of the employees in the present investigation indicated the score of macroergonomics condition of their work environment lower than 50. This means that in the employees’ opinion, the condition of work in this factory has been in the unacceptable range.

The evaluation score of 15.7% of the employees was 75–90, which shows that they have evaluated the condition of macroergonomic factors in their work environment as good. The evaluation score of macroergonomic conditions was not evaluated within the range of 90 to 100 by any of the employees. This shows that no one has given a very good score to various factors regarding the domains of macroergonomics. In fact, it is worth noting that the production-line personnel have given the lowest score to this evaluation due to the inappropriateness of some conditions regarding the various areas of macroergonomics. In contrast, the official personnel and senior managers have given the highest score to this condition.

Regarding job satisfaction, nobody’s score was lower than

25, which indicates that none of the employees were very dissatisfied with their job. The score of 21.7% of the employees were in the range of 25–50 (dissatisfied), 57.8% in the range of 50–75 (satisfied) and 20.5% of them were in the highest range of 75–100 (very satisfied). The employees whose job satisfaction score were within the range of 75–100 were those who had given the highest score to macroergonomic conditions.

CONCLUSION

In conclusion, Pearson correlation test proved a significant relationship between macroergonomic score and job satisfaction score among the study population. In other words, if macroergonomic condition score is higher, it indicates a better work condition, and therefore the employee's job satisfaction is higher.

ACKNOWLEDGMENTS

The authors thank all of the supervisors and coworkers who assisted doing this study, and we are so grateful for their cooperation. Also, we should appreciate the research vice chancellor of Isfahan Medical University for their granting.

Grant sponsor was the Research Department of Isfahan University of Medical Sciences.

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Source of Support: Isfahan University of Medical Sciences, **Conflict of Interest:** None declared.