Relationship between macro-ergonomics and occupational stress in casting industry

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Abstract

Introduction: Macro-ergonomics is an important factor that affects behavior, favorable performance and personnel's efficiency that can cause conformity of employees by increasing labor and efficiency and in result decreasing employees' stress amount. The aim of the present study was to investigate relationship between Macro-ergonomics and occupational stress in employees working in one casting industry in Isfahan.

Materials and methods: This study was analytical-descriptive and of the type sectional that was conducted on 100 employees. To determine Macro-ergonomics status score, the Macro-ergonomics status evaluation questionnaire and the standard questionnaire of occupational stress (HSE) was used. Data were analyzed using SPSS software, version 20 and using Pearson correlation tests and regression analysis and couple-t.

Results: Pearson correlation test showed that there was negative relation between Macro-ergonomics score and occupational stress ($r= -0.62$, $P<0.05$). Also results showed that there was adverse relation between occupational stress with all of Macro-ergonomics areas ($r= -0.598$, $P<0.05$).

Conclusion: According to the results, Ergonomic factors have important role in occupational stress among employees. The more effect on decrease of occupational stress was observed when using suitable strategies and correction of this aspect of the organization.

Keywords: Macro-ergonomics, Occupational Stress, Ergonomics factors, Efficiency

Introduction

Stress can treat physical and mental health of labor force and imposes heavy cost to organizations (1). In fact, stress is physical and mental reaction that a person experiences in result of changes and life needs (2). Based on report of the year 2002 issued by AMICOS (the biggest Ingland private section union) ,work places in Britain become more stressful each day and among 2000 agencies of health and care union, half of them believe that stress is the biggest problem during 5 recent years and has increased significantly during 12 past months. Based on reports issued by Health and Care committee in 2001-2002, 9.32 million work days due to occupational diseases are resulted from lost stress. State official diagrams indicate that more than one million individual claimed for loss due to occupational stress and more than 200000 complainers are added each year (2). Occupational stress

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are resulted from work or become worse by work. Identification of factors related to stress problem needs study of different levels of organization. Identification of these factors to increase work efficiency, to decrease occupational depression and in one word to preserve work force to service society is duty of each organization (2). Factors that cause stress in the work environment are high volume of work, insufficient ability and skill, lack of ability to control condition and lack of supporting others (3). Research conducted in one of the automobile industries shows that occupational stress has significant relation with unsafe stress and occupational events (4). According to ILO statistic, annually 250 million events occur in the world that 335000 individual's loss their life in them (2). A report by Natingham research states that occupational stress in the first degree depends organizations design and work environments management (5). This is inferred that Macro-ergonomics with its organizational approach can decrease this problem. Macro-ergonomics is one up to down attitude for organization design and design of human-machine, human-environment and human-occupation intermediates and this means that Macro-ergonomics interfere all levels of one organization (6, 7). In fact, Macro-ergonomics is a type of comprehensive attitude to ergonomics (8). It is a program performed by workers and is supported by managers (9). The aim is to improve condition of one organization in all levels (10). In other words, Macro-ergonomics is implementation of quality management principles in whole organization (11). Performed studies show that employees have to cooperate the technical set of organization by implementing ergonomics that this causes occupational stress and dissatisfaction (6). Initial efforts to use ergonomics in order to design work stations first seemed effective but also some effects of stress and dissatisfaction is observed in systems by passing time (12) and in fact micro ergonomics has not been significantly able to utilize employees' immunity and to decrease stress amount. A Significant study in the field of studying relationship between these two parameters has not been conducted. Several studies like study of Dehghan et al. have approved relationship between occupational stress and muscular skeletal disorders (14). Study conducted by Tahere Yektaei et al. also approved effect of ergonomics interventions on decrease of occupational stress (15). Study of Shariati et al. has approved relation between physical factors and occupational stress (16). Study of Ghaseminezhad and Dr. Siadat showed that there is significant relation between organizational environment and occupational stress (17). The present study investigated relation of Macro-ergonomics and analyzed relation of its subareas with occupational stress so that managers tries to decrease occupational stress of their employees and to regard Macro-ergonomics and ergonomics interventions in their planning when designing organization and changing its design.

Materials and methods

The present study is of the descriptive-analytic type that was conducted in 2012. The studied society includes 100 employees working in one of the casting industries of Isfahan province working in the administrative section that were determined through census. The studied individuals were in the age range of 30-55(with the age mean of 40 years, standard deviation of 25 years) and their work record was 7-23 years (with the mean of 18 years, standard deviation of 16 years). Inclusion Criterion includes personnel of administrative section and computer operators. Exclusion Criteria includes all persons that did not complete questionnaire or completed it incompletely. Instrument to collect data was questionnaire. Among 100 samples of occupational stress and macro ergonomics questionnaire, 94 samples were completed. To determine ergonomics score, the macro

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ergonomics status evaluation questionnaire was used (12). This questionnaire includes 33 three-point questions in the area of ergonomic factors, physical factors, status and structure of organization, instruction and description of duties and training regulations. Macro ergonomics evaluation score was divided as below:

(A) Score less than or equal to 25 indicates bad status of the environment.
(B) 25-50 score indicates intermediate status of the work environment.
(C) 50-75 score means good status of the environment.
(D) 75-100 indicates very good status of the environment.

The mentioned questionnaire has acceptable validity and reliability in the scientific communities (12). To measure the occupational stress amount, HSE questionnaire was used that was evaluated by Azadmarz abadi in 2000 (18). To separate the occupational stress score, 0-33 score indicated low stress, 34-66 the intermediate stress and 67100 score indicated the high stress. This questionnaire includes 35 (5-option) questions in the areas of demand, authorities' support, colleagues' support, changes, role and relationship. In the level of descriptive statistic, data were analyzed using statistical specifications like frequency, mean and standard deviation and Pearson's correlation coefficient, regression analysis and couple t were used in the inferential statistic level. It should be noted that the Excel software and SPSS version 20 were used to analyze data.

Results

Frequency distribution of total score of occupational stress and Macro-ergonomics and each of their areas along with Pearson's correlation coefficient to determine relationship between them are presented. Frequency distribution of total Macro-ergonomics score showed that 25.5% of individuals were in the intermediate status, 68.1% in the good status and 6.4% of individuals were in the very good status. Also mean and standard deviation were 53.5 and 11.3 respectively. Frequency distribution of total occupational stress score showed that 1.1% of individuals had low stress, 97.8% had intermediate stress and 1.1 had high stress. Mean of total occupational stress score was 51.2 and standard deviation was 5.8. The below table shows mean of Macro-ergonomics subbranchs in the mentioned table.

Table 1. Mean of macro-ergonomics areas score.

Macro-ergonomics areas	Score	
	Mean	SD
Ergonomic factors	54.04	7.6
Physical factors	54.8	8.7
Organization structure and status	52.7	7.5
Duties description	54.3	9.5
Training regulations	53.4	9.1

Pearson's correlation coefficient showed that there is significant inverse relationship between Macro-ergonomics and occupational stress score ($r=-0.624$, $p<0.001$). In other words, individuals that had better Macro-ergonomics status had lower occupational stress. In the below table, Pearson's correlation coefficients between occupational stress and Macro-ergonomics areas are presented.

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Table 2. Pearson's correlation coefficient (r) between occupational stress score and macro-ergonomics areas.

Macro-ergonomics areas	Occupational stress score	
	r	*P* value
Ergonomics factors	-0.598	<0.001
Physical factors	-0.577	<0.001
Organization structure and status	-0.493	<0.001
Duties description	-0.45	0.001
Training regulations	-0.369	0.01

Results of the above table indicate that the occupational stress score has inverse relationship with all Macro-ergonomics areas and has the highest relationship with ergonomic factors and the lowest relationship with training regulations.

Discussion

Results of the present study showed that Macro-ergonomics and occupational stress have significant inverse relationship and this means that the occupational stress can be decreased through improving the Macro-ergonomics status. The result of research showed that occupational stress is highly related with ergonomic factors and these results are consistent with the below results like Lieno study et al. and Dehghan that showed that there is significant relationship between muscular skeletal disorders and the occupational stress(14). Other similar results in study of Yektaei, Nourashkin, Roberstone, Stetler et al. showed the effect of ergonomic disorders on decrease of occupational stress in the work environment (15). Result of the present study also showed the significant inverse relationship between occupational stress and physical factors of the work environment. This result is similar to research conducted by Shariati, Lotfizadeh, Maccay, Zare, Bahrami et al. and also in other research showed that environment specifications like condition of temperature, filtration, light and lightening can affect amount of occupational stress. Of course Tarane Hedayati et al. found different result in the Gas Company of Mazandaran that its reason is the suitable physical condition (16). The present study showed the significant inverse relationship between organization status and structure and occupational stress. Of research conducted in the field of organization parameters and occupational stress, other research showed that environment of one organization has the significant relationship with occupational stress in that environment (17) that result of this research is almost similar to obtained result. The results of the present research showed that there is significant inverse relationship between the Macro-ergonomics score and occupational stress. This finding is similar to results of conducted research. In a research titled effect of Macro-ergonomics effect on performance of human, it has been approved that Macro-ergonomics can lead to decrease of mental pressures and occupational events (10). In several researches, positive effect of Macro-ergonomics on mental environment and immunity of organization has been approved (19-21). Results of the present study confirmed those results. Study of studies conducted in the field of Macro-ergonomics showed that little studies are conducted in the field of Macro-ergonomics or effect of Macro-ergonomics on the mental environment of the organization and only are referred in some articles and regarding that Iran is one of the developing countries, study of this subject is more important. Result of study showed the relationship between the Macro-ergonomics and occupational stress relationship as $p<0.001$ and this showed the significant effect of Macro-ergonomy on occupational stress and this means that control of macro-ergonomics factors

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should be preferred firstly to decrease occupational stress . When this aspect of the organization is changed and modified, valuable changes should be provided and more focus on this factor prevents occurrence or increase of occupational stress amount. In the conducted research in the field of Macro-ergonomics , implementation of one Macro-ergonomics method in special types of industries and its effect on some factors like immunity environment and work pressure are studied but in this research effect of Macro-ergonomics on each of the Macro-ergonomics areas are studied in priority and one strong inverse relationship between them is showed. Based on results of the present study, it is suggested that ergonomics aspect of organization should be more regarded when designing to promote level of Macro-ergonomics more than other subjects so that we have effective, happy and powerful workforce and finally healthier family and society by preventing occurrence of the stress. During implementation of his project it was determined that employees do not transfer their occupational and mental issues to their heads and also employees stated that their managers do not apply enough attention to the ergonomic and mental issues of their subgroups. It is clear that such actions lead to decrease of efficiency, occupational satisfaction, and quality of services. So it is suggested that in case any occupational disorder is happen, it is reported to the mangers and necessary actions are applied to remove them. Presence of costly ergonomics diseases in the organization show that managers do not pay enough attention to the Macro-ergonomics and ergonomics category and this shows that ergonomic changes in the production section especially in the developing countries have not provided useful effectiveness (22). It has been determined in a research conducted in America and titled combination of solutions to solve problems, Macro-ergonomics and public health that Macro-ergonomics can decreases MSD diseases (23). So it is suggested that by reflecting this statistic, teaching ergonomics to map drawing managers and heads and increasing implementation of similar research , discouraged managers to attend this category when designing organization.

Conclusions

Study of factors affecting occupational stress showed that the most effective factor in one organization among studied subareas was ergonomic factors. In other words correcting this aspect of organization can has the highest inverse effect on the occupational stress. We hope to approve its importance in Iran in the future research through study of Macro-ergonomics and ergonomics effect on other aspects of organization and to implement this research in more extensive work field and other types of service and production industries.

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