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Surveying the role of didactic interventional Ergonomic-Safety Program on workers' productivity (Case-series study of electrical assembling industry)

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Abstract

Introduction: Occupational health is one of the important issues that can affect productivity and economic development of an organization .This study aimed to determine the effect of didactic interventional Ergonomic-Safety Program on workers' productivity of an assembling industry.

Methods and Materials: This interventional study was conducted among 54 workers of assembling part of an electronic industry. First, QEC method was used for the ergonomic assessment of workplace and Hersey-Goldsmith questionnaire was applied for assessment of productivity. Then, a comprehensive program was provided using findings of first stage assessment and identifying of existing failures. Second, assessment of ergonomic conditions and productivity was, for a second time, done using the similar tools, QEC method and Hersey-Goldsmith questionnaires after three month of interventions. Data was analyzed using R software.

Results: Mean total productivity score and mean whole body score of QEC were 75.24 and 99.40, respectively, before intervention phase. In the after intervention phase, mean total productivity score and mean whole body score of QEC were 80.16 and 97.92, respectively. Data analysis by paired-samples t-test showed that difference of productivity score in before and after intervention phase was significant (P-value<0.05). But, difference of whole body score of QEC score in before and after intervention phase was not significant (P-value>0.05).

Conclusion: Implementing the Ergonomic-Safety intervention had a positive effect on the productivity score whereas had no significant effect on the general conditions of body limbs.

Keywords:

Ergonomic-safety intervention, Productivity, QEC, Education and training

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1. Introduction

Paying attention to the productivity of human sources and improving conditions will increase efficiency and effectiveness in the organization (1). One of the important factors in organizational productivity is the physical and mental health of workers. In this regard, we can point to the effect of musculoskeletal disorders related to work (2). The purpose of interventions and application of ergonomic knowledge is to achieve a proper and logical relationship between employees and their environment, machine, work and work organization; in this situation the employees can have the desired production and productivity (3). Productivity improvement is an easy way to persuade management to spend money on planning and using ergonomic interventions (4). Not paying attention to the principles of ergonomics in the workplace can cause physical and emotional stress, low productivity and poor quality of work. The results of the studies show that ergonomic applications in tool design, environment, workstations and work organization have a great impact on mental health, job satisfaction, increased efficiency, safety and health (5). Providing working, machine and environmental adaptation

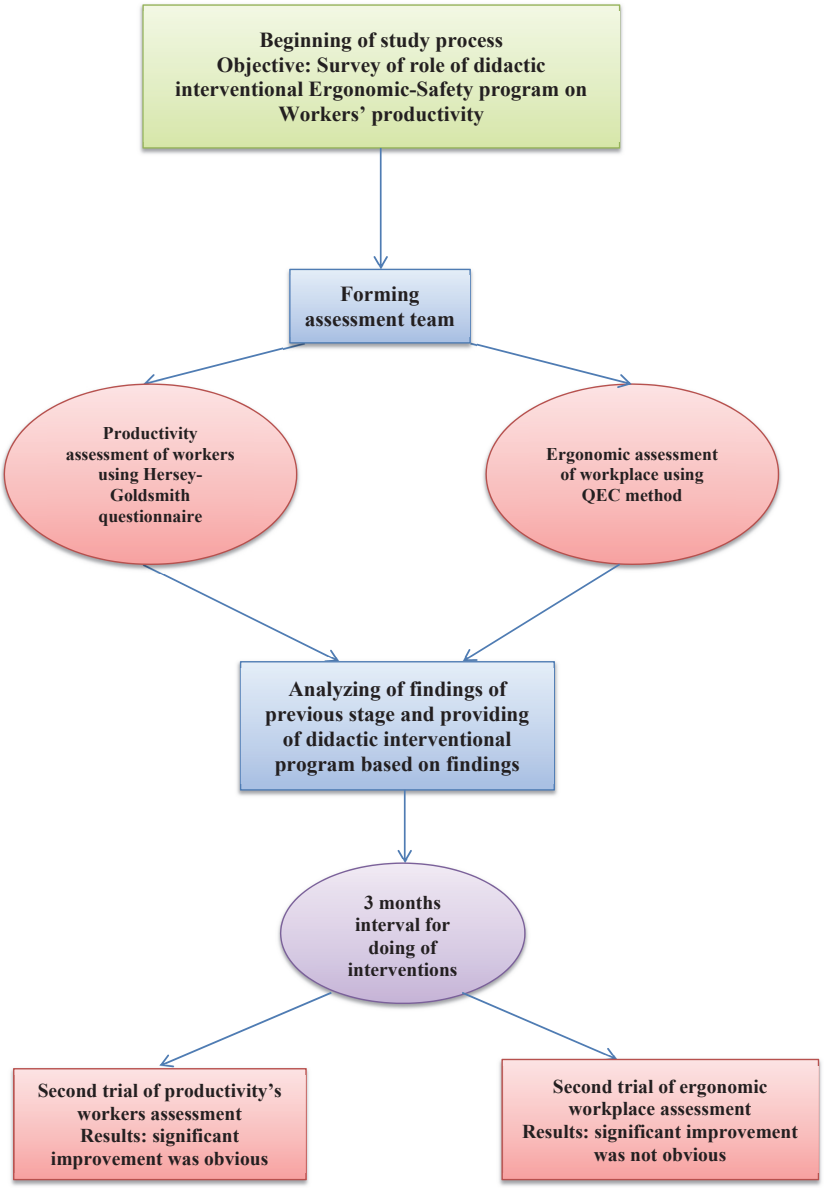

Fig. 1. The main stages of the study

conditions with human physical and mental abilities is one of the basic steps to improve management and increase productivity in any organization (6). This study aimed to determine the effect of didactic interventional Ergonomic-Safety program on workers' productivity of an assembling industry.

2. Methods and Materials:

This interventional study was conducted among 54 workers of assembling part of an electronic industry that had similar working condition. Exclusion criteria were some occasions such as having second job, existence of inherited illness and disorders that could disrupt the procedure of study, lack of tendency of subjects to continue the study. First, QEC method was used for Ergonomic assessment of work place and Hersey-Goldsmith questionnaire was applied for assessing of productivity (7). Then, a comprehensive program was provided with aid cooperation of operational project team and using findings of first stage assessment and identifying of existing failures. The program includes education and training, displaying videos and poster installation, partial technical actions such as changing tools arrangement. Second, assessment of Ergonomic condition and productivity was done again using QEC method and Hersey-Goldsmith questionnaires after three month of interventions. Data was analyzed using R software and statistical tests such as paired-samples t-test(8).

3. Results:

Mean total productivity score and mean whole body score of QEC were 75.24 and 99.40 in before intervention phase, respectively. In after intervention phase, mean total productivity score and mean whole body score of QEC were 80.16 and 97.92, respectively. Data analysis by paired-samples t-test showed that difference of productivity score in before and after intervention phase was significant (P-value<0.05) and therefore productivity became optimized. But, difference of whole body QEC score in before and after intervention phase was not significant (P-value>0.05). On the subject of ergonomic conditions, the data analysis showed that difference of scores of variables such as difficulty keeping up with the work and work environment stress were significant (P-value<0.05) and therefore the condition of these variables had been bettered. The tables of findings can be observed below.

Table.1. Findings of experience of vibration, Difficulty keeping up with the work, stress in work; and score of neck, hand and wrist, back, shoulders and arms and statistical differences of values based on Wilcoxon and paired samples t tests

Parameters \ Study stage	Parameters levels	Before interventions	After interventions	P-value
Experience of vibration (Percent of subjects)	Less than 1 hour	24.1	24.1	>0.05
	1 to 4 hours	63	63	Based on Wilcoxon test
	More than 4 hours	13	13	
Difficulty keeping up with the work (percent of subjects)	Never is difficult	35.2	61.1	<۰,۰۰۱
	Sometimes is difficult	53.7	35.2	Based on Wilcoxon test
	Often is difficult	11.1	3.7	
Stress in work (percent of subjects)	Not at all	11.1	38.9	<۰,۰۰۱
	Low	42.6	35.2	Based on Wilcoxon test
	Medium	29.6	22.2	
	High	16.7	3.7	
Scores of studied body limbs (Mean±SD)	Back	24.85±7.1	24.51±7.24	Only was significant (P-value<0.05) for Hand/Wrist scores based on paired samples t test
	Hand/Wrist	28.66±9.23	23.44±9.17	
	Neck	12.03±3.89	13.88±2.55	
	Shoulders/arms	33.85±10.54	36.07±5.49	

Table.2. Productivity scores of Hersey-Goldsmith questionnaire, before and after interventions, and significance level of values based on paired samples t test

Productivity dimensions \ Study stages	Before interventions (Mean±SD)	After interventions (Mean±SD)	P-value
Ability	2.710.58±	3±0.54	0.011
Clarify of role	2.66±0.42	3.02±0.38	0.001
Organizational support	2.78±0.44	3.02±0.38	0.004
Incentives	2.47±0.38	2.66±0.38	0.010
Evaluation	2.99±0.25	2.95±0.29	0.406
Validity	2.96±0.32	3.08±0.32	0.095
Environment	3.85±0.36	4.09±0.37	0.005
Total score	75.24±6.69	80.16±4.66	0.001

4. Conclusions

The study showed that implementing an intervention program can significantly affect employee productivity and job performance. Establishment of Ergonomic-Safety intervention had a positive effect on productivity score whereas had not significant effect on general condition of body limbs. Hereupon with due attention to being partial of done technical actions, it seems that execution of engineering interventions alongside education and training is necessary.

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