

Study on Application of Ergonomic Principles for Work related Injuries in Construction Projects

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ABSTRACT: The research to identify the ergonomic risk factors and manipulate pragmatic approaches and effective control measures to mitigate these ergonomic risk factors. In a workstation the workers gets affected due to discomforts and several other factors such as forceful exertion, repetition, awkward and static postures, tools and materials. The factors are identified from the questionnaire survey among the workers in various construction projects. The ranking of the factors will be done by SPSS. The key factors affecting the workers have to be recognized from the results suitable suggestion will be given to the companies for humanizing their ergonomic techniques in worksite.

Keywords: Ergonomics, Construction, risk factors, Priority, Workers.

I. INTRODUCTION

Construction industry is an ancient human activity. It is a significant part of industrial culture, a exhibition of its diversity and complexity which can produce a widely varied built environment to serve the diverse needs of society. It is a complex process and is considered dangerous and risky job. Despite advances in technology, it remains a physically strenuous occupation. Construction is a labor intensive as well as craft based activity and thus behavior of people has an enormous influence upon the organization and performance of firms. Construction jobs are so exciting physically on a person's body, a variety of wounds can occur. First, the paper will describe the unique of the building and construction industry. Then an over view is given of the attention of ergonomist for this industry. Overall conclusions are drawn from these studies in relation to ergonomics, but also to company performance. The study aims to identify and evaluate the main factors affecting the workers and give the possible endorsements to improve ergonomics of construction projects.

II. ERGONOMICS

Ergonomics deals with designing and classify things so that people can use easily and safely. Adapting the job to fit the personnel can help reduce ergonomic stress and eliminate potential ergonomic disorder (e.g. carpel tunnel syndrome, trigger finger). Ergonomics target on the work environment and components such as the design and function of workstations, controls, safety devices, tools and illumination to fit the employee's physical requirements, efficiencies and limitations to ensure his and her wellbeing.

III. RESEARCH OBJECTIVE

- To study about the ergonomic aspects among constructions workers.
- To suggest suitable safety and comfort working environment for the workers.
- To improve work efficiency by suggesting a safer approach

- To identify possible measures to minimize waste in construction site.

IV. SCOPE OF THE WORK

In the present scenario construction, industry has complexity in its nature because it contains large number of parties as clients, contractors, consultants and others. The failure of any construction project is mainly related to the problems and failure in workers' productivity. So this study is important to identifying and to evaluating the main factors affecting the workers of construction projects and to improve the ergonomic condition for the labours and also improve the workers safety in construction sector.

V. REVIEW OF LITERATURE

The following are the summary of literatures collected from previous research and studies. The most noteworthy of them are relevant to the present study are being revised.

Tuti et al (2016) describes the productivity is an important issue in the construction industry. The result of this research prove that labor productivity achieved by the application of ergonomic work method increased significantly, especially for job that rely on skill and physical capability of labor.

Saurabh et al (2016) states that Construction jobs are so demanding physically on a person's body, a variety of injuries can occur. Therefore it is important for employers to provide a safe environment for their construction workers. Ergonomics is a momentous factor in achieving and maintaining high level of worker productivity and healthy.

Manikandan et al (2014) assess the ergonomic hazards mostly occur for the construction workers but they did not aware about the ergonomic hazards. The best solution is creating cognizance to the workers and provides proper training to work in a safe way.

Atishey et al (2013) research deals with the ergonomic risk control in construction industry. The study will highlight five

significant ergonomics risk controls. Better communication and administration control will enhance ergonomics implementation in workplace. It is followed by the proper ergonomics design, organization training and education. The outline goal of the paper to reduce the ergonomic risk factors in construction industry.

Alireza et al (2013) aims to control ergonomic risk factors in construction operation and also monitor access the process of program implementation to prevent or cutout ergonomic risk factors in construction Industry

Shabin et al (2013) conducted research study to identify the major ergonomic factors and prioritize them based on its severity and consequences. To undertake that Likert scale questionnaire is prepared for the survey work and FMEA methodology is chosen. Followed by the FMEA risk priority number is computed for prioritizing factors. Analysis is carried out and the result is to minimizing the hazardous work in the construction industry.

Ayat et al (2005) identifies the ergonomics is a significant factor in achieving and maintaining high levels of worker productivity and also eliminate hazards in construction industry. The aim of this study is to measure and understand the level of ergonomic awareness in the industry and identify the current safety measures.

Byung (1998) sorts out the rigorous literature review deals with the characteristics of occupational deaths and injuries in the construction industry of South Korea. The national statistics of industrial fates in the years 1991±1994 were removed from the annual publications of the Ministry of labor. These data analyzed in terms of the size of firm, age of injured person, accident type, wound type, injured part of body, and agency of accident.

VI. RESEARCH METHODOLOGY

The methodology is carried as per the objectives of study. The study also continued to find the key factors affecting the ergonomics of construction project. Based on the factors a questionnaire was prepared and surveyed from various firms. The collected data was analyzed using SPSS. The analysis was done to identify the key factors affecting the performance of construction project. Based on the data obtained analysis was done and conclusion was arrived

Factors Contributing to Work related Injuries

A. Forceful Strain

Force is the amount of physical exertion needed by a person to carry out a task. It is so critical to know how to apply this effort to complete our activity.

B. Awkward and Static posture

Awkward postures refer to a situation where the body is under uncomfortable and away from the unbiased position. Static loading generally means the routine of a task from one postural position for an extended duration

C. Vibration

Vibration is defined as any faction of the body in one fix point while using power tools.

D. Duration

Duration factor is considered when the task is recurring without any break.

E. Repetition

Repetition means doing the same operation or being in the same type of movement repeatedly.

F. Contact Stress

Contact stress is created by revelation to any sharp or hard object pulling contained pressure on a part of the body.

G. Extreme Temperature

Excessive heat can reinforce fatigue and heat stress. On the other hand, extreme cold can narrow the blood vessels and decline sensitivity and harmonization of the bodypart.

VII. DATA ANALYSIS

The collected data are analyzed using SPSS software. The software name formerly stood for Statistical Package for the Social Sciences (SPSS). Also SPSS Statistics is a software package used for statistical analysis. SPSS trends afford the power and flexibility required by experienced time series analyst, while at the same time being easy enough for those not familiar with time series techniques to use and master quickly. It is one of the most extensively used software programs for analyzing data in construction management and the most essential factors affecting the work related injuries are identified

A. Reliability Statistics

This kind of analysis was conducted for each huddle in order to evaluate the reliability of the questionnaire. It is called as Cronbach's alpha method and it was used for reliability analysis. Cronbach's alpha obtained for respondents are given in Table I. Cronbach's alpha value obtained is 0.838. The value must be in the range between 0.6 to 1.0 only then the data will be reliable. Hence cronbach's α was gained and found to be of adequate magnitude.

TABLE-I
RELIABILITY STATISTICS

Cronbach's Alpha	N of Items
.894	40

B.Descriptive statistics

The demographic profile in the questionnaire geographies the experience level of the respondent, their earnings level, their level of designation in the department they are working in. The total survey was conducted in 250 out of whom only 164 questionnaires could be composed. The response rate of the survey was 60 percent. The survey was conducted among workers.

TABLE II.

Descriptive Statistics Analysis

S.No	Factors	Mean	Standard deviation	coefficient of variation
1	Forceful Strain	2.50	0.825	0.72
2	Awkward and Static posture	3.12	0.694	0.65
3	Vibration	1.25	0.521	0.76
4	Duration	3.29	0.630	0.25
5	Repetition	2.24	0.812	0.71
6	Contact Stress	2.50	0.635	0.62
7	Extreme Temperature	1.36	0.621	0.25

TABLE -IV
TOTAL VARIANCE EXPLAINED

S.No.	Factors	Initial Eigen Values	Variance Explained	Cumulative Percent
1	Forceful strain	8.33	26.940	26.940
2	Awkward and Static posture	2.52	5.454	37.352
3	Vibration	3.454	4.633	40.251
4	Duration	1.184	3.928	42.956
5	Repetition	2.998	3.400	51.356
6	Contact Stress	1.614	3.903	55.268
7	Extreme Temperature	1.431	3.415	62.448

C. Principle Component Analysis

Principal components analysis is one of the variable-reduction techniques that share many similarities to exploratory factor analysis KMO determination. Its aim is to lessen a larger set of variables into a smaller set of variables called 'Principal Components', which account for most of the variance in the original variables. The outcome obtained from the principle component analysis is given in Table II, which denotes the number of variable in every factor, Eigen values of the factors affecting workers, percentage of variation and cumulative percentage of variance. Using the principle component analysis all 40 factors affecting work related injuries are grouped under 7 main factors.

Initially, all the 40 variables were castoff. After discarding those items that have insufficient loadings, we condensed to seven factors. The recognized factors explain percent of total variance.

VIII. CONCLUSIONS

The construction industry is rated as one of the key industry. It helps in developing and achieving the goal of society. Workers productivity is very important because they cause losses to the governing agencies and influence the ergonomic of the construction industry. Ergonomics is drastically reducing the work related injuries in construction projects. This research is intended to identify the cause of probable factors affecting workers in building construction. Based on the poetry a detailed questionnaire was prepared and survey was conducted from workers from various companies. The data will be analysed and suitable alternate solution will be given to the companies thus enhancing ergonomics implementation on the site.

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TABLE -III
KMO AND BARTLETT'S TEST

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.684
Bartlett's Test of Sphericity	Approx. Chi-Square	1120.3
	Df	342
	Sig.	0.000

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