RISK ASSESSMENT AND DEVELOPMENT OF AN ERGONOMICALLY - DESIGNED PORTABLE WORKSTATION FOR SHOEMAKERS

THESIS

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ABSTRACT

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Shoemaking is a high risk occupation for developing work-related musculoskeletal disorders (WMSDs). The study aimed to assess the risk and develop an ergonomically-designed portable workstation for shoemakers. The Define-Measure-Analyze-Design-Verify (DMADV) approach was used in undertaking this study.

The define phase shows the determination of the demographic and anthropometric measurement of the shoemakers; the identification of the frequency and the severity of the work-related musculoskeletal disorders; the identification of the level of risk associated to the working posture of the shoemakers; the evaluation of the current workstation of the shoemaker; and the identification of the problem they experienced. A survey in the form of questionnaire was designed and administered as pre-treatment measure to determine the necessary data needed on the study. Thirty (30) shoemakers were selected as participants. This study was conducted at selected cities and municipalities of Cavite only. The resulted average age was 44 years old, have an average normal Body Mass Index of 22.56, all were male and have an average working period of 8 hours. In terms of posture, Rapid Entire Body Assessment (REBA) was used. The assessment showed that majority of the shoemakers (73.3%) was working at very high risk. The result calls for an engineering and/or work method changes.

The measure phase involves correlation analysis to determine if the current workstation has a significant effect on the development of WMSDs. Correlation analysis showed that the shoulder of the shoemaker experienced muscle pain and the arm experienced strain when there is no proper arm rest. In terms of back, the shoemakers experienced muscle pain when there is no proper back rest. The legs of the shoemaker experienced nerve tension for having no proper chair. Lastly, the shoemakers also experienced muscle pain in neck for having no proper table.

The analyze phase shows the analysis of the considered factors thru the identification of customer requirements and were evaluated with respect to the technical requirements using quality function deployment (QFD).

Designing and developing a new workstation was the method done by the researchers to reduce the occurrence of WMSDs. For the design, the concept appearance and function of the product were based on the factors chosen in the analyze phase. The workstation was made to be ergonomically-designed for suitability purposes: it has a chair with foldable characteristics and table with extendable features for wider working area, made from standard materials for durability or good condition, and involves creative and unique feature for ease of use such as door panel with storages, rotational *plantilya*, pull bars and separate thread holder for easy sewing.

The developed ergonomically-designed portable workstation for the shoemaker has a positive feedback from the respondents. Although the chair got a fair rating, other factors got a high rating of good, very good, and excellent.

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An undergraduate thesis submitted to the faculty of the Department of Industrial Engineering and Technology, Cavite State University, Indang, Cavite in partial fulfillment of the requirements for the degree of Bachelor of Science in Industrial Engineering with Contribution No. _____. Prepared under the supervision of Ms. Mary Joyce P. Alcazar.

INTRODUCTION

The United Nations Educational, Scientific and Cultural Organization (UNESCO) defines ergonomics as searching for alternatives in work design which prevent fatigue and exhaustion on the part of the working subject in order to promote human productivity (Encyclopaedia of Occupational of Health and Safety, 2012). Optimal ergonomic design can be achieved through assessment and design of workplaces, environments, job tasks, equipment, and processes in relation to human capabilities.

According to Haile, Taye, and Hussen (2012), it is difficult to accommodate differences in the height or arm length of workers due to improper workstations. Workstations should be tailored to match human anthropometric measurements to minimize extreme postures, to improve task efficiency, and to provide a safe working environment. The physical design and layout of workstation can significantly affect performance, health, safety, product quality, and production efficiency.