

Research Article

Application of Ergonomics to Improve Seating Posture in the Classic Arm Chair

Shriram Sane, Varsha Karandikar* and Jaydev Patwardhan

Industrial and Production Engineering, Vishwakarma Institute of Technology, Savitribai Phule Pune University, Pune, India

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Abstract

The purpose of this research paper is to investigate and identify the problems and causes associated with the use of the classic wooden arm folding chair produced by Royal Bharat Ltd. whose sample photograph is provided below. The research paper addresses the ergonomic issues and the resulting musculoskeletal problems that may arise if not worked upon. The users were consulted in order to get an insight into the problems faced while using the chair. The chief intention of the study is to address the ergonomic faults. The methodology adopted for the purpose mentioned above has been described in detail in the forthcoming sections of the abstract.

Keywords: Postural Analysis, Engineering Anthropometry, Ergonomic Analysis, Product Design

Introduction

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Shriram Madhukar Sane, Varsha Karandikar, *et al.* (2004) discussed the application of principles of Ergonomics in the design of Classroom Bench as well as Wheelchair for hospital.

Robert Norman and Richard Wells (1998) mention that the work-related portion of the injuries and resulting disability is potentially preventable and it is important to identify interventions for reducing work-related musculoskeletal disorders (WMSD). There are many approaches to intervening in the workplace to reduce initial incidence (primary prevention) and disability (secondary prevention). For example workstation design changes, employee training, back schools, wrist splints and back belts, job rotation and stress management are commonly used approaches.

Samata Satish Mujumdar, Varsha Karandikar, *et al.* (2013) suggest that, generally both for a modification of an existing industrial workstation and design of a new industrial workstation, the designer is constrained

by the financial and technological factors, such as extent of modification, available space, environment, individual equipment size and their frequencies of use, task sequence and targeted population. The ergonomic guidelines and principles are meant to provide an orientation towards the physiological needs of the operator.

Varsha Karandikar, Shriram Sane, *et al.* recently defined Posture-State Variation Report (P-SVR) Method of postural analysis to highlight the areas for improvement in work processes for operator comfort and to find out quantitative value of severity of work based upon postural video analysis. In a compressor manufacturing unit, different processes were studied for different activities like assembly, testing, material handling, inspection, disassembly, cleaning, etc. These processes were evaluated for the severity of work postures involved considering the elemental time and frequency of various postural severities. For reducing work severity, using P-SVR analysis, we can find out the work elements with highest postural severity and the longest duration. The scope of this paper is limited to highlighting the work elements where modifications in the processes can bring down the P-SVR index value leading to work simplification.

Methodology

For any kind of design intervention, it is of vital importance to consider the ideal user group for that particular object or service. This applies to the arm chair in question. It is often observed that the arm chair is mainly used by persons of the age groups

*Corresponding author: Varsha Karandikar

above 50. The method utilised has been given below in brief.

- 1) Anthropometric data was collected for arriving at the appropriate set of dimensions for the chair so as to make it the most suitable for the user base. This data constituted of various age groups so that the study is not termed as biased or incomplete. A total of 619 samples have been collected, which have been divided on the basis of **2 age groups; 1:17 years to 21 years; 2:21 years to 65 years.**
- 2) Relevant dimensions of the human body were considered. Design principles were applied with the aim of accommodating the maximum number of individuals. Appropriate dimensions of the chair were decided considering the user data so as to avoid development of any undesirable physical conditions in the future for the users.
- 3) Based on these, the chair was modified so as to suit the users. Further modifications were carried out in order to iron out any other imperfections.
- 4) The arm chair was provided for use to the members of the target user base.

Ergonomic issues and improvements

The problems associated with the arm chair have been presented as follows:

Present chair design



Lack of support around the cervical region



Reduced height of the back rest



Suppression in thighs due to excessive height

Conclusion

The research paper focuses on the process of identifying postural problems caused by the design faults in the arm chair and systematically eliminating them by applying various ergonomic tools and techniques. Since the methodology adopted is scientific in nature and has a specific procedure the results obtained are found to produce desired outcomes. The problems relating to inappropriate postures while using the chair are addressed and rectified to a certain extent by means of design intervention. The resulting design has been tested by the concerned user base.

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