

RISK ANALYSIS OF MUSCULOSKELETAL DISORDERS IN GARMENT INDUSTRY**Subhalakshmi Natarajan ¹, Subrata Das ², Mekala N³, Namratha H ⁴**¹UG Scholar, Department of Fashion Technology, Bannari Amman Institute of Technology,
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Sathyamangalam³Assistant Professor, Department of Fashion Technology, Bannari Amman Institute of Technology,
Sathyamangalam⁴Head, Department of Industrial Engineer, Alpha Garments Limited, Bangalore**ABSTRACT**

Indian Garment industry is one in the largest of Asian industries. Studies show that the occupational hazard can cause human, social and economic losses. When the workers are made to work in ergonomically unacceptable work places, they become potent to Musculoskeletal Disorders (MSD). Preventing the MSDs can help reduce absenteeism, early retirement, improve productivity and promote safety at workplace. In this study, the risk of MSDs in the sewing operators was analyzed. Initially, data of the operators was collected through physical observations, interviews and video footages. Analyzing the videos and physical observation of the operators, critical postures of the operators are chosen for the assessment. A systematic scoring method called Rapid Entire Body Assessment (REBA) was used to assess a group of 43 operators. The results of the study stated that, among the 43 operators, 38 are in a medium risk level and 7 are in a higher risk level. The reasons to the risk levels included both individual and external factors. The resulting conclusions helped in understanding the risk and to convey better ergonomic intervention that can contribute to reducing the MSD in operators.

Keywords:

Garment Industry, Musculoskeletal Disorders, Sewing Operators, Rapid Entire Body Assessment

INTRODUCTION

Indian Garment industry maintains its distinctiveness with the support of a larger workforce, low-cost materials and low wages in comparison with other industries. Succeeding the information technology, garment industry in Karnataka is a leading apparel sourcing destination for global market which leads the set of export-oriented units [1].

A study has shown that the occupational hazard can cause human, social and economic losses. It has been estimated by ILO that on an average for a year, occupational hazard can cause death of 2.3 million people, 270 million people are sufferers from non-fatal injury and the work-related problems affect around 160 million people [2]. Formally, among the 780 garment units of Bangalore, 80% of the workers are women. [1]

When the workers are made to work in ergonomically unacceptable workstations, they become potent to Musculoskeletal Disorder (MSD). Carpal Tunnel Syndrome, Muscle/ Tendon Strain, Tendonitis, Thoracic outlet Syndrome, Epicondylitis and Back strain are few of the MSDs. The causes of the disorders include inclined postures, repetitive motions, sustained or excessive force, contact stress, vibration, sustained work postures and other environmental factors. The external risk factors include the external loads, the factors that influence the load, and those alter the individual's response to the particular load.

The trend of absenteeism and the early retirement is high among the workers in East Asia to which WMSD has a higher contribution. [3]. The incidence of WMSD in the industrial operators is found to be 60%. Preventing the MSDs can help reduce absenteeism, early retirement, improve productivity and promote safety at workplace.[3], [4].

The occurrence of MSDs can affect the productivity, quality, performance, cost and the business of the firm [5]. In a garment industry, in specific the sewing machine operators are required to work in a non- neutral posture with highly repeated motions where high speed, monotony and precision are needed[6]. A lot of studies have shown that the common musculoskeletal discomforts that arise in sewing machine operators are in the necks, shoulders, back and arms[7]– [10] and in the knees at lower extremities [11].

According to [2] prolonged sitting in the same posture, repetitive tasks in a higher pace and harder gripping of objects can affect the neck, shoulders, back and lower extremities. The working requirements also provide a major contribution to the existing condition of the worker [12].

[13]also state that profound research is required to study and analyze the MSDs, the causes and the symptoms of the same and thus the appropriate interventions can be suggested to reduce the MSDs in the workers. Based on the study conducted by [14] there are three categories of risk factors associated to the MSDs namely Physical, psychosocial/ organizational and individual. The objective of this study is to analyze the risk of MSD in the sewing operators in garment industry.

RAPID ENTIRE BODY ASSESSMENT(REBA)

REBA, developed by Sue Hignett and Lynn Mc Atamney is a simple test method that aims to develop an analysis system that is sensitive to MSD risks with a postural analysis. It divides the body into sections that are referred to the movement planes. It delivers a scoring system for muscle activity that involves static, dynamic, rapidly changing and non- neutral postures. This method also states that coupling is also an important factor in handling the materials in hands. It requires a minimal effort in calculating the scores with paper- pen method. Finally, it also provides the risk in action levels to be carried out [15] as shown in the table 1 below.

Table 1: REBA Scores and Action Categories [13]

LEVEL	REBA SCORE	ACTION REQUIRED
0	1	Negligible risk
1	2-3	Low Risk, Change may be needed
2	4-7	Medium Risk, investigate further and change soon
3	8-10	High risk, Investigate and implement change
4	11+	Very High Risk, Implement change immediately

METHODOLOGY

There are three different techniques that are used to assess the risk which are Self Reports, Observational Techniques and Direct i.e., Instrumental Techniques. These are used for analyzing the risk by taking the work postures, load or force, frequency of the motions, time taken, vibrational exposure, etc. into account [16]. Choosing one from numerous techniques require the need and purpose of the study. Assessment methods such as Rapid Upper Limb Assessment (RULA) [17] and Postural Loading on Upper Body Assessment (LUBA) [18] are restricted to assessing only the upper limb of the body and not the lower extremities. Whereas, Rapid Entire Body Assessment (REBA) [17] and other methods like Ovako Working Posture Analysis System (OWAS) and NIOSH Lifting equations can assess the entire body. It is concurred that REBA stands to be an accountable and is a user-friendly method to assess the entire body posture and other factors including force, repetitions, coupling, etc.

The research was conducted in one of the largest Garment Industry in Bangalore that manufactures Formal Shirts (with 39 sub tasks). Initially walk-through investigations are conducted. Along with this, individual interviews were taken to know the work processes, job requirements and the discomforts faced by the operators. Later, the working methods and processes were recorded as videos. The videos are analyzed and the critical postures are captured as snapshots. The images are used for the further analysis using a systematic scoring method called Rapid Entire Body Assessment (REBA) in order to asses a group of 43 operators. A cloud based Ergonomic Software called ERGOPLUS INDUSTRIAL is used for the REBA assessment wherein the postural angles are fed into the database and it calculates and provides the final REBA Scores. It requires the user to simply choose the appropriate body position or postures, the load force and the coupling. The body position or postures are chosen with the help of the angles obtained from the images of the operators.

RESULTS AND DISCUSSIONS

Sewing Operators with a population of 43 (N= 43) were surveyed. All of the operators observed were female. Through the walk- through observations and the individual interviews, it was found that there was a prevalence in MSDs in the operators. The images (Fig 1a- 3b) depicted below illustrates the ergonomically unacceptable postures adapted by few of the sewing operators along with the reference lines marked on the images for the study.



Fig 1 a: Gusset Attach operator adapting an awkward posture – angles marked for neck- trunk analysis



Fig 1 b: Gusset Attach operator adapting an awkward posture- angles marked for Arm- wrist analysis

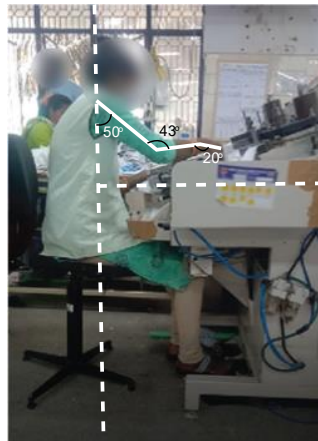


Fig 2 a: Collar forming operator adapting a trunk flexion-- angles marked for neck- trunk analysis

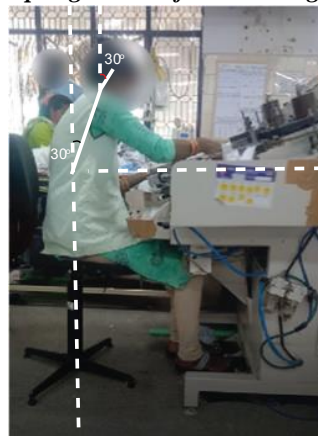


Fig 2 b: Collar forming operator adapting a trunk flexion-- angles marked for Arm- wrist analysis

. It was also evident that the sewing machine operators complained discomforts or pain in their neck, shoulder, back along with the lower extremities. The detailed reports of discomforts are depicted below in a chart (Fig 4).

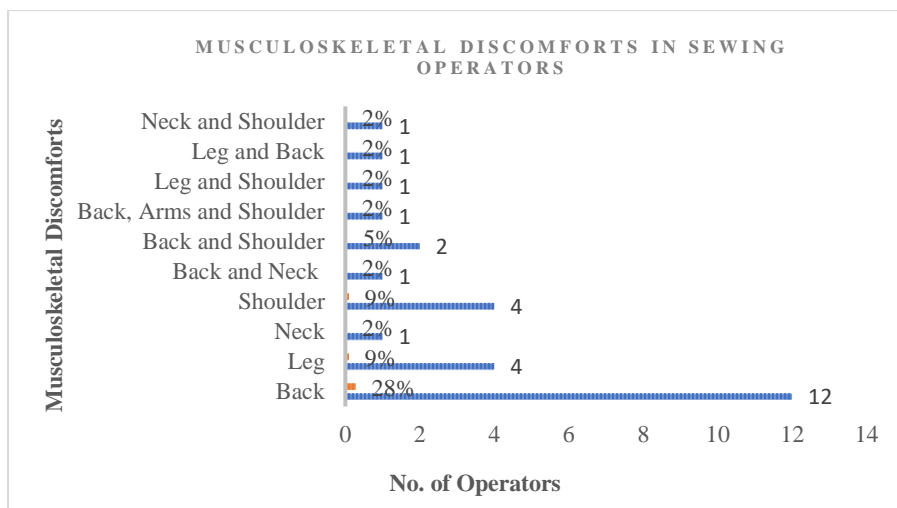
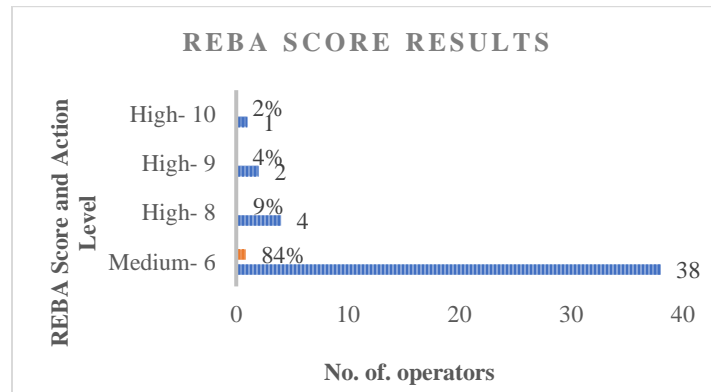


Fig 4: Musculoskeletal Discomforts in Sewing Operators

It was observed that around 1(2%) of the operators reported that they suffer from neck and Shoulder pain, 1(2%) from leg and back pain, 1(2%) from leg and shoulder pain, 1(2%) from Back, arms and shoulder pain, 2 (5%) from back and shoulder pain, 1(2%) from back and neck pain, 4(9%) from shoulder pain alone, 1(2%) from neck pain alone, 4 (9%) from leg pain alone, 12 (28%) from back pain alone and the remaining 15 (35%) operators had none of the discomforts.

**Fig 5: REBA Score results**

The REBA results are drafted in a chart given above (Fig 5). Of the 43 operators, around 84% (38 operators) were in a medium risk level and the remaining 16% (7 operators) were in a higher risk level. Also, all the medium risk level operators had a REBA score of 6 whereas the higher risk level operators were under three different scores. Of the 7(higher risk level) operators, 4 are under score of 8, 2 were under 9 and 1 was under 10. The 4 operators with REBA score 8 were found to have common ergonomic issue such as Awkward posture in the legs and unilateral weight bearing. The 2 operators with score of 9 were observed with Awkward Trunk posture and constant change in the trunk flexion respectively. One operator with a REBA score of 10 depicted improper trunk posture, constant change in trunk flexion and awkward position of the arms.

CONCLUSION

The study elucidates that the operators working conditions are to be improved in order to reduce the MSD risks. The adaptation of awkward leg postures, improper trunk flexions, constant change in their postures and others by the sewing machine operators make them vulnerable to physical and ergonomic discomforts. Although, other factors like the external load, equipment design, workplace optimization also found to contribute to the scores. Ergonomic interventions like introducing ergonomically designed chairs can help the sewing machine operators reduce their MSD risk levels. In general, operators lack from knowledge on the musculoskeletal disorders and bone strength. In such cases, providing them awareness on Musculoskeletal Disorders, training on bone strength improvement, frequent correction in their improper postures and supplementary recovery time for the muscle fatigue recovery would be more beneficial.

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