



Ergonomic Analysis of the Work Environment of Weavers in Manipur

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ABSTRACT

Women constitute a significant proportion of the work force in diverse industrial activities and due to lack of strict adherence to work environment standards and legislation are subjected to various work hazards. The existing work practices, conditions of work and incompatible man-machine design exert varying work stresses on the operator stated Singleton way back in 1966. Till now, this problem has never been resolved. The study was conducted to analyse working environment of the handloom weavers in Manipur. A total of 42 participants (14 from each weaving on the three different looms namely Loin loom, Throw shuttle loom and Fly shuttle loom) were selected from Imphal East and Imphal West districts of Manipur. A checklist was used to evaluate the work environment. The analysis brought to light the elements of vector found not satisfactory in the weaving sheds for the set four indices namely General Conditions (GWC), Work Station (WD), Working Posture (WP) and Hand Tools (HT) and need attention for all types of looms users, the plight of the loin loom users, further stands out attracting attention for necessary action.

Key Words: Ergonomics, Handloom, Weavers, Women, Work environment.

INTRODUCTION

The handloom industry is the largest unorganized sector among the textile industries and constitutes an integral part of the rural life of the country with great potential for the utilization of human resources to absorb considerable manpower and solve the high rate of unemployment by providing opportunities to utilize both urban and rural labour resources. This most ancient cottage industry in India's decentralized sector, gains significance as a major representative of the country's culture and heritage and the fertile employment-provider to over ten million people. Manipuri women's role in the socio economic and cultural life of Manipur is significant. Manipuri women do not stay behind the veil. They are active and they know the craft of spinning and weaving of fabric. They also are experts in marketing of their products.

Manipur is the only state where women have an exclusive market. The daily market of 'Ima

Bazar' (Women's market) has a population of more than 2000 sales women selling their own products (<http://www.e-pao.net> and <http://www.ashanet.org>). The existing work practices, conditions of work and incompatible man-machine design exert varying work stresses on the operator has never been resolved. With this background kept in mind, the present study was undertaken with the objective to analyse working environment of the handloom weavers in Manipur.

MATERIALS AND METHODS

The study was conducted in Imphal East and Imphal West districts of Manipur. Purposive sampling method was used for the study. A published Ergonomics checklist (Choobineh *et al*, 2004) was administered on the 14 participants each using the three type of loom (Loin loom, Fly shuttle loom and Fly shuttle loom) to assess the working conditions in weaving workshops as a first step in identifying

$\text{GWC index} = \frac{\text{GWC}}{13} \times 100 (\%)$	$\text{WD index} = \frac{\text{WD Score}}{9} \times 100 (\%)$
$\text{WP index} = \frac{\text{WP Score}}{9} \times 100 (\%)$	$\text{HT index} = \frac{\text{HT Score}}{6} \times 100 (\%)$
$\text{Ergonomic index} = \frac{\text{Total Score}}{37} \times 100 (\%)$	
<p>Box 1: Calculation of Scores for the Elements of Vector</p>	

major ergonomic problems and setting priorities and corrective measures. The tool suggested for a carpet weaving population was slightly modified for this study.

Calculations were made on the basis of the suggestions put forth by Choobineh *et al* (2004) as given in Box(1).

RESULTS AND DISCUSSION

Ergonomic Assessment of the Weaving Area

This aspect of the study elicited details on the elements of vector found unsatisfactory in the weaving area, on the basis of the checklist administered. The findings pointed to the following details as presented in Table (1).

The analysis brought to light the elements of vector found unsatisfactory in the weaving sheds for the set four indices. Scores recorded for the individual elements of vector for all the three looms was consolidated and were presented in Table.2

General Working Conditions (GWC)

Three elements each for lighting and thermal conditions were found not to be satisfactory in the weaving areas by all the weavers. Evidently the general working conditions index for all areas (for all the three looms) was a uniform 53.8, which was comparatively a better rating.

Work Station (WD)

Out of all the nine given statements, loin loom weavers felt dissatisfaction with seven pointers, while the other two groups stated of six making the WD index 22.22 for loin loom users and 33.33 for the other two groups.

Working Posture (WP)

A majority of 93, 50 and 94 per cent of Loin loom, Throw shuttle loom and Fly shuttle weavers had not undergone any eye tests. Hence, the factors stated as unsatisfactory for working posture was either four or five out of nine by the samples, hence the Working posture index also was 44.44 or 55.55.

Hand Tools (HT)

Throw shuttle and Fly shuttle loom weavers could pinpoint only one factor as not satisfactory. Contrarily for Loin loom weavers there were three factors mainly because of the unwieldy weight of the beater (2.00 kg) that they used for closing warp yarn while weaving and pinch grip they had to apply on the spindle. Both the tools were not found to be satisfactory as their hand and figure positions (wrist too) had to be adjusted alternatively while weaving. Therefore, the HT index recorded by Loin loom weavers was only 50.00 as against 83.33 for the other two groups.

Ergonomic Analysis of the Work Environment

Table 1. Elements of Vector in the Work Places found Inadequate.

Elements of Vector	Statement	Percent Responding		
		Weaving Workshops		
		LL(Loin loom)	TSL(Throw shuttle loom)	FSL(Fly shuttle loom)
General Working Conditions (GWC) Lighting Thermal condition	Light colours not used for ceilings	100	100	100
	Operators eyes are not free from indirect glare	100	100	100
	Improper general contrast in the visual field	100	100	100
	Air temperature not suitable for the activity (21 – 25°C) during peak winter and summer	100	100	100
	Humidity not suitable (40 – 60%) during rainy seasons	100	100	100
	Air velocity not suitable	100	100	100
Workstation (WD)	It is not a vertical loom	100	100	100
	Space not free enough for legs under the loom	100	100	100
	Weavers cannot adjust their workstation dimensions to fit them	100	100	100
	Adjusting mechanism not easy to handle	100	100	100
	Weaving height not adjustable (so the weavers can't adopt healthy postures)	100	-	-
	Height of the chair not easily adjustable	100	100	100
	Chair does not have a backrest	100	100	100
Working Posture (WP)	Upper arms mostly not in a convenient neutral posture so there is shoulder flexion	100	100	100
	Weavers not able to adopt several healthy postures while working	100	100	100
	Task not performed with the trunk upright. The neck is also slightly inclined forward (<20°) at an awkward angle	100	100	100
	Weavers stretch during their breaks to reduce the soreness and stiffness related to fixed, static work postures	100	100	100
	Weavers have not undergone eye examinations	93	50	94
Hand Tools (HT)	Hand tools not comfortable and safe to use	100	-	-
	Sharp edges and pinch points are there in hand tools	100	100	100
	Weight of the weaving comb (beater/sword) not acceptable, comfortable to/for the weaver	100	-	-

Table 2. Scores for the Elements of Vector in Workplaces.

Sr. No.	Weaving workshop	Scores for the Individual Parameters (in %)			
		GWC	WD	WP	HT
1.	LL	53.8	22.22	44.44 to 55.55	50.00
2.	TSL	53.8	33.33	44.44 to 55.55	83.33
3.	FSL	53.8	33.33	44.44 to 55.55	83.33

Ergonomic Index

The Ergonomic Index for the three weaving workshops, given as a cumulative score for 37 points stated in the checklist was 43.24 or 45.94 for Loin loom and a uniform 51.35 or 54.0 for Throw and Fly shuttle loom respectively. Though the ergonomic index computed for all the three types of looms was unsatisfactory, the plight of the loom users, further stands out attracting attention for immediate action. The scores thus obtained was categorized for the loom-wise ergonomic index as given below (Table.3).

Inference of the ergonomic status of the work place is based on the index of action categories suggested as under:

4 – Further investigation is needed. Corrective measures are required soon; 3 – Further investigation is needed. Corrective measures are required; 2 – Further investigation is needed. Corrective measures may be needed; 1 – Working conditions are acceptable.

Action categories obtained for loom looms based on ergonomic index emphasize the need for further investigation and requirement for corrective measures. Throw and fly shuttle looms needed some corrective measures. It was evident therefore, most of the conditions for all the three looms studied based on indices, namely GWC, WD, WP and HT, require

corrective measures. To be more specific the index obtained for HT for loom loom was found to be lower than the other two, warranting more investigation in-depth for incorporating corrective measures with hand tool used by loom weavers. This further buttressed the need for a focussed study of the loom loom. All the looms warrant attention focussing on priorities, with corrective measures to be implemented.

CONCLUSION

The type of health risks women faced is associated with their specific working conditions. Little research leads to a blinkered view of women’s health problems at work – they are put down to getting old or the menopause or hysteria. Women’s problems are seen as unreal. So there is little incentive to do research or to suggest any prevention.

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Table 3. Ergonomic Index Vs Three Types of Looms.

Sr.No.	Loom used	Index calculated (%)				Ergonomic index	Action Categories
		GWC	WD	WP	HT		
1.	Loin loom	53.8	22.2	44.44 to 55.55	50	43.24 to 45.94	3
2.	Throw shuttle loom	53.8	33.33	44.44 to 55.55	83.33	51.35 to 54.0	2
3.	Fly shuttle loom	53.8	33.33	33.3 to 44.44	83.33	51.35 to 54.0	2