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Musculoskeletal problems in Iranian hand-woven carpet industry: Guidelines for workstation design

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Abstract

Long hours of static work with awkward posture at traditionally designed looms can cause high prevalence of musculoskeletal disorders (MSDs) among carpet weavers. A comprehensive study was conducted in this industry with the objectives of determination of MSDs symptoms prevalence; identification of major factors associated with MSDs symptoms in carpet weaving occupation; and development of guidelines for weaving workstation design. In the present paper, this ergonomics study is presented.

The study consisted of two phases. In the first phase, MSDs symptoms in nine Iranian provinces were surveyed by questionnaire among 1439 randomly selected weavers.

Working posture and weaving workstations were ergonomically assessed as well. The

Loading [MathJax]/jax/output/SVG/jax.js tions from the musculoskeletal system occurred

in high rate among weavers with the prevalence significantly higher than that of the general Iranian population ($P < 0.001$). It was found that the majority of ergonomics shortcomings originated from ill-designed weaving workstation. Based on the findings, some general guidelines for workstation design were presented. In the second phase, considering the general guidelines, an adjustable workstation was designed and constructed. To develop quantitative guidelines for optimizing workstation set-up, in the laboratory, nine sets of experimental conditions were tested, and working posture and weavers' perceptions were measured. The results of this lab work showed that working posture was acceptable for both the researchers and the weavers when the weaving height was adjusted 20 cm above the elbow height and a high seat with forward slope was used.

By combining the results of the two phases, guidelines for weaving workstation design were presented. In this ergonomics-oriented workstation, loom is vertical. Seat, loom and weaving heights are adjustable. There is enough leg room under the loom. The seat with 10° forward slope is adjusted 15 cm above the popliteal height of the weaver. Weaving height is set at 20 cm above the elbow height. It is believed that the recommended workstation improves working posture and results in reduced postural stress on weavers' bodies and, consequently, reduced prevalence of MSDs symptoms.



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Keywords

Hand-woven carpet industry; Musculoskeletal problems; Weaving workstation design

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