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Effect of ergonomic intervention on work related musculoskeletal disorders in tailors around Loni

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Abstract
Background: Tailoring machine operators experience more chronic neck or shoulder pain than other working populations. Because of working in a constant and iterative position injuries occur in shoulder, neck, back, and lower extremities of tailors holding the left upper arm up and, bending the body, head and ankle at non-optimum level roots these injuries or makes the situation more serious. WMSDs may also called over injuries, soft tissue disorders, cumulative trauma disorders, repetitive strain injuries, repetitive motion injuries. The high rate of WMSDs is characterized by a sitting posture with the worker's shoulders flexed and abducted, head and trunk flexed forward in this condition of job activities MSDs occurrence is expected.
Objective: To study the effect of ergonomic intervention on work related musculoskeletal disorder in tailors around Loni.
Method: 20 tailors were given ergonomic intervention for work related musculoskeletal disorders and assessment of working posture among tailors were seen. Ergonomic intervention was given for 3 days per week for 3 weeks. The various working postures of the tailors were assessed by using RULA scale and Nordic musculoskeletal questionnaire was given to assess the pain.
Result: Using paired t-test the mean ± SD value of pre and post RULA 6.250± 0.7164 and 3.250± 0.4443 respectively. The p value < 0.0001 which is extremely significant.
Conclusion: The study concluded that the ergonomic intervention on work related musculoskeletal disorder had a great effect on tailors around Loni.

Keywords: WRMSD, RULA assessment, ergonomic interventions

1. Introduction

Increasing environment has a numerous brand of clothes and styles that demands greater efforts in the tailoring industries. Workers tangled in the tailoring activities involves altogether cutting, drafting, attaching sari fall and embroidery existing may be at a risk of developing musculoskeletal problem [1]. Tailoring involves tiresome, highly repetitive tasks like cutting, assembly, pressing and finishing, performed in a sitting working posture with upper back curved and head bent over the machine. Working in this difficult posture for a long duration rises the chance of developing work-related musculoskeletal disorder in the tailoring industry of India, typically run by private establishments. It offers employment for both men and women, popular from the lower socioeconomic classes. The people barely ever benefit from occupational health-and-safety provisions. They lack any type of social security, so their ill-health and scarcity go hand-by-hand and create astonishing pressure from which they can hardly come out.[2]While in health and safety high occurrence of musculoskeletal complaints of neck and shoulder have been found in studies of tailoring work, and likewise among several other groups of performing repetitive work. This job involves monotonous, highly repetitive tasks performed in a sitting working posture with upper back curved and head bent over the machine. The work is visually demanding and requires a high degree of concentration and accuracy [3]. tailors perform high-speed precision tasks that require sustained non-neutral joint postures and highly repetitive movements. A number of studies have looked at the occurrence of work-related musculoskeletal disorder (WRMSD) symptoms in the population. Tailoring operators commonly experience problems in their necks, shoulders, arms, hands, and backs and at times, in the lower extremities such as the knees.

They can experience pain that is severe enough to interfere with one or more of their daily activities [4].

It has been reported that tailoring machine operators experience more chronic neck or shoulder pain than other working populations. In a cross-sectional study of 224 tailors, 67% reported neck or shoulder pain; based on physical examinations, 24% were diagnosed with tension neck syndrome and 20% with cervical syndrome. In another study, physical examinations were performed on tailors and hospital workers randomly sampled from age-matched strata. Tailoring operators received diagnoses of cervical syndrome, cervicobrachial fibromyalgia, and rotator cuff syndrome more often [5]. Because of working in a constant and iterative position injuries occur in shoulder, neck, back, and lower extremities of tailors holding the left upper arm up and, bending the body, head and ankle at non-optimum level roots these injuries or makes the situation more serious. At work station, the body posture is constrained by (1) The eyes for visual control of the work (2) The hands for directing the material (3) The feet for control of machine (some machines utilize a knee operator mechanism for raising and lowering the tailoring foot near the needle). A typical workstation includes work surfaces, space for all activities and components of the task, seating for operator; desk for tailors; pedal for foot. Long duration of work and

unchanged sitting posture also helps the spine the most vulnerable region to pain. A few studies show that change in posture and work-related habits can cause a significant change in the pain they experience [6].

Work related musculoskeletal disorders are a major concern worldwide [7]. WMSDs is defined as "multi –factorial when the environment and the performance of work contribute significantly, but as one of number of factors, to the causation of disease".[8]Musculoskeletal disorders is a highly prevalent and costly health problem among working population, that constitutes a major cause of physical injury and disability in both developed and developing countries [9]. They can be exacerbated by work place exposures, and they can impair work capacity. It is important to remember that personal, environmental and socio cultural factors usually play a major role for risk factor of the diseases [10]. WMSDs occur in two ways, which include constant fatigue and exhaustion caused by the frequency of long duration of muscular effort, and sudden injury caused by severe activities or unpredictable movements [11]. WMSDs include a wide range of inflammatory and degenerative disorders affects the muscles, tendons, ligaments, joints, peripheral nerves, and supporting blood vessels. These include clinical syndromes such as tendon inflammations and connected conditions such as tenosynovitis, epicondylitis, bursitis, nerve compression disorders, carpal tunnel syndrome, sciatica, and osteoarthrosis, in addition to less standardized conditions such as myalgia, low back pain and other regional pain syndromes not attributable to known pathology. Body regions most commonly involved are the neck, shoulder, forearm, and hand, legs are commonly affected [12]. The major risk factor for the development of MS disorder for long time adopting sedentary working style with wrong postures. In MSD the common symptoms are muscle tightness, joint stiffness, swelling numbness, redness skin color changes and decreased sweating in hands [13] Assessing which WRMSD is responsible for this large increase has been difficult because of lack of standardized measure. There is a directed effort to better categorize specific conditions to identify upper limb and neck symptoms and risk factors that may contribute, though it is evident that both are primary contributes to overall problem [14].

Work activities which are recurrent and repeated or activities with awkward postures cause these disorders which maybe painful during work or at rest. This create many challenges to diagnose and treat them, to establish their relationship to activity and, to create work environments to minimize their occurrence. Men and women working as tailors involving highly repetitive work are prone for WMSD's and these risks acts as a precursor to determining relationships between work exposure and musculoskeletal health [15]. A high prevalence of the work-related musculoskeletal disorders (MSDs) have been recorded among workers who are exposed to manual work, work in unusual and restricted postures, repetitive and static work, vibrations and poor psychological and social conditions it has been described as the most common causes of severe long term pain and physical disability that may affect hundreds of millions adopted of people across the world (Aweto *et al*., 2015). The economic loss due to those disorders affects not only the individual but also the organization and the society as a whole (Choobineh & Tabatabaee, 2009). Musculoskeletal disorders (MSDs) were known as having occupational etiologic factors as primary as the beginning of the 18th century [16]. It has been recognized that workers with work tasks, or those maintaining fixed postures for long periods, have an increased risk of developing WRMD. Most of the studies have focused on work situations. The presence of individual risk factors in development to occupation musculoskeletal problem is sparsely documented. Low muscle strength was risk factor for development of shoulder, arm, neck disorder in group which is frequently exerted high-level external forces [17].

This have emerged as major health problem among workers in developing countries especially in the rural population. Several epidemiological studies have reported a high percentage of neck and upper limb disorders among workers in general. Work task and physical activity modification such as task reallocation and recreational physical activity may be important for improvement of neck and arm pain. There is also evidence that older age maybe associated with slow recovery from shoulder disorder and psychosocial work-related factors including a perception of high demand, high control, lack of social support may delay the recovery. Establishment of work-related disorders requires both the qualification of exposures involved work of determination of health outcomes and recent review papers have called for better exposure measures (Hagberg 1992, stock 1991). Moore *et al* (1991) suggested mechanism based on upper limb disorders such as carpel tunnel syndrome, tendon related disorders and muscle disorders [15].

Ergonomics play a significant role in making the workplace as effective, safe and comfortable as possible and at the same time boosts human performance. Effective suggestion of ergonomics in work system design can achieve a balance between worker arrivals and task demands, enhancing worker productivity, provide worker security, physical and mental well-being and fulfilment. Work Related Musculoskeletal Disorder (WMSD's) are a collection of painful disorders of muscles, tendons and nerves. Work activities which are recurrent and constant or activities with difficult postures origin these disorders which maybe painful throughout work or at rest. This create many encounters to diagnose and treat them, to establish their connection to activity and, to produce work environments to minimize their occurrence. Men and women working as tailors relating highly repetitive work are on the verge of WMSD's and these dangers acts as a precursor to determining relationships among work exposure and musculoskeletal health [6]. This WMSD's disorder could be outcome of the culmination of repetitive use injuries or specific acute events that increase indirect costs, as well as directly affecting the health-related quality of life by reducing their ability to perform activities of daily living [14].

The word ergonomics is derived from the Greek words ergon (work) and nomos (laws). A succinct definition would be that ergonomics aims to design appliances, technical systems and task in such a way as to improve human safety, health, comfort and performance. Ergonomics is the discipline concerned with understanding the connections among humans and other fundamentals of the system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance [6].

Ergonomics is the information of designing the job, equipment and work place to fit the worker. Appropriate

ergonomic design is essential to prevent repetitive strain injuries, which can change overtime & can lead to long term disability. The ergonomically designed things make the life style better with the increasing awareness of ergonomics, the emphasis is shifted from the largely accepted policy of "fitting man to his machine by means of collection and training" to "fitting the machine to the majority of people who work with them." The recent approach however is conceding nature "fit man and machine together [1].

2. Materials and Methods

Type of Data: Data was primary collected by principal investigator
Study Design: Experimental
Sample size: Sample size for the study of 20 tailors
Study population: age of 25-50 years
Sample method: simple convenient sampling
Outcome measure: RULA (rapid upper limb assessment) Standard Nordic Questionnaire
Study Duration: 3 weeks

Materials to be used

- Consent form
- Data collection sheet
- Recording Sheet
- Pen
- Pencil

Selection criteria

- **Inclusion criteria:** Participants included will be:
  - Male and female tailors.
  - Age group of 25-50 years.
  - Experience more than 2 years.
  - Those willing to participate.
- **Exclusion criteria:** Participants excluded will be:
  - Pregnant females.
  - Participants with recent surgical history.
  - Participants with history of trauma.

3. Procedure

The study received ethical approval from Institutional Ethical Committee Dr. APJ Abdul Kalam College of Physiotherapy (PIMS/CPT/IEC/2018/571) Participants were screened according to inclusion and exclusion criteria. The informed written consent was taken from the participant regarding the procedure prior to the study. Each participant was analyzed by RULA (rapid upper limb assessment) scale on work posture Nordic Musculoskeletal Questionnaire to check the symptoms of musculoskeletal disorder.

4. Results

In this study 20 participants were taken in which 13 were males and 7 were females. Using paired t-test for RULA scoring the mean ± SD value of pre and post RULA 6.250± 0.7164 and 3.250± 0.4443 respectively. The p value < 0.0001 which is extremely significant.

Table 1

	Mean ±SD	Mean Difference	t Value	p value
PRE	6.250± 0.7164	3.000	7.333	p< 0.0001 Extremely significant
POST	3.250± 0.4443			

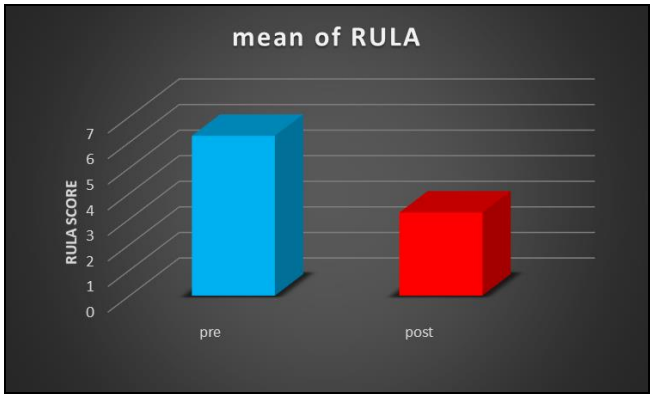

Fig 1

Demographic data

Table 2

Age	25-50 Years
Gender	No. Of Tailors
Males	13
Females	7

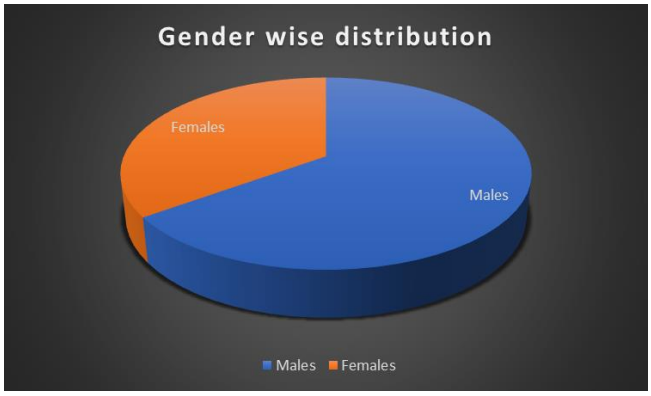

Fig 2

5. Discussion

The present study aims at finding effect of ergonomic training in work related musculoskeletal disorders and assessment of working posture among tailors. Ergonomic intervention includes exercise, stretching, ergonomic advice, work place modifications for 3 weeks was given. The various working postures of the tailors were assessed by using RULA scale and then data analysis was done. The result of the study showed that the ergonomic intervention was effective in terms of reduction in pain in the tailors and some working posture needed correction with the help of modified work place designs and educating the tailors about the ergonomics and how to apply during working time. Frequency of musculoskeletal pain was found to be reduced receiving the ergonomic intervention along with work place training and improvement in working posture. Pain is often associated with stress, depression, fatigue anxiety, work load heavy weight lifting and awkward postures. The pre-intervention scores of RULA in participants were 6.250± 0.7164. The post intervention values were 3.250± 0.4443. The mean difference of pre and post intervention on RULA score was 3.000. On comparing the pre and post intervention values of RULA in participants with ergonomic intervention, it was observed that the difference was

extremely significant ($p<0.001$). The Nordic questionnaire was given before and after the ergonomic intervention that showed great improvements. The current study showed that over time work, over use and prolonged adopted position are also the risks of WMSDs. The elevated prevalence of shoulder and neck symptoms were found among tailors which correspondence with the results of many studies among workers performing repetitive or sustained static work with theirs arms and hands.

This study showed the effectiveness of a tailored physical activity program, for tailors to reduce WRMD-related pain symptomology in the upper extremities and the neck region by increasing strength and flexibility in the arms, shoulders, hands, and neck. The personalized approach used in the physical activity program seemed to induce a distinct reduction of pain, especially for the shoulders and wrists though no improvements were found in other sites (ie, elbow and neck). In addition, a reduction in upper limb disability was shown with increases in grip strength and shoulder flexibility. Results of our study similar to study done by Anne mary joseph (February 2017).

In this current study, it assesses the high prevalence of musculoskeletal disorders especially among tailors. The results showed that both work-related factors as well as personal associated with elevated prevalence of upper body WMSDs among tailors was the focus of the current study. The result reported that for many tailors, shoulder and neck indications were reversible and may be influenced by reallocation to more different work tasks. Most studies suggest that perceptions of intensified monotonous work, workload, job dissatisfaction, limited job control and low social support were risk factors for work-related musculoskeletal disorders of the shoulders, neck and upper limb area. The current study showed that over time work, over use and prolonged adopted position are also the risks of WMSDs. The elevated prevalence of shoulder and neck symptoms were found among tailors which correspondence with the results of many studies among workers performing repetitive or sustained static work with theirs arms and hands. The prevalence of neck and shoulder MS disorders were compared with the current studies. the prevalence of MS disorders of neck area, both shoulders, Upper and Lower back and both knees showed that doing tailors work for extended time in an incorrectly seated position has been causative factor due to non-standard working position including chairs and work desks causing workers to bend their back excessively and sit on the chair improperly in order to more leading upon their work. It was shown that the number of complaints from musculoskeletal disorders was very high. It was established that the number of complaints from disorders of neck, back and upper part of body by workers was very high.

6. Conclusion

There was elevated prevalence of musculoskeletal disorders among tailors in this study. Most of the participants were suffering from musculoskeletal disorders. The main complain in this study was pain and muscular weakness due to overuse and over time work. Therefore, this ergonomic intervention is promoting operator's involvement and efforts to improve workplace condition and to promote motivation and increase the ability to perform work properly.

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