

## Multifaceted Prevention of Low Back Pain among sewing workers: A Review of Ergonomic, Physical and Psychosocial Interventions.

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### Abstract

Sewing employees are more likely to endure occupational low back pain (LBP) because they have restricted biomechanics, do the same motions over and over , and stay in of static position over a prolonged period of time without micro brakes. The bio-psycho-social approach emphasizes the important significance of psychosocial stressors, while traditional prevention has concentrated on physical aspects. This literature review recapitulates the most recent research on the causes of lower back pain (LBP) in sewing workers and evaluates the effectiveness of precautionary measures that include ergonomics, physical activity, and psychosocial therapies. A comprehensive search was conducted utilizing a systematic combination of keywords throughout the primary academic databases (PubMed/MEDLINE, Scopus, Web of Science, and CINAHL). Research investigating low back pain risk factors or treatments, categorized as observational studies or clinical trials, and focused on sewing workers were included. This review reveals that the psychosocial pressures including inadequate management, high job demands and lack of social support make the physical risk factors of sitting for long periods of time and doing the same task over and over again worse. Studies indicate that most effective preventive strategy involves a holistic program that includes ergonomic adjustments like adjustable chairs and workstations and well planned exercise regimens that focuses at core strengthening and flexibility along with regular active breaks and psychosocial and organizational measures such as stress management training, job redesign and fostering a positive work environment. For low back pain in sewing workers to be effectively prevented, a thorough, bio-psycho-social strategy is required. The most promising way to lower the prevalence and severity of LBP and improve worker well-being and productivity is to combine ergonomic, physical, and psychosocial methods within a collaborative framework. Future initiatives have to concentrate on putting such integrated programs into practice and assessing their effectiveness in actual industrial contexts.

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### Introduction

Lower back pain is the most common problem in the world nowadays for working population. Due to prolonged static sitting there is increase of intradiscal pressure in the lumbar spine that leads to continuous stress on spinal ligaments, contributing to mechanical low back pain[1,2]. Forward head posture and slouched sitting are the poor postures that alters normal spinal alignment and causes uneven load distribution across spinal structures, increasing lumbar strain[3,4]. As there is reduced activation of core and trunk stabilizing muscles during prolonged sitting that decreases spinal stability and support, making the lumbar region more prone to pain[5,6]. Tight hip flexors and hamstrings are common muscle imbalances along with weak abdominal and gluteal muscles, that leads to altered pelvic alignment and increased lumbar stress[4]. Its prevalence is very common in industrial workers, who have a sitting job especially in the sewing industry. The sewing industry includes the garment industry, leather industry, and textile industry. Low back pain is the major cause of disability and chief contributor to reduced productivity and lost work time. The sewing workplace is characterized by prolonged sitting at the workstation, repetitive movement of hands, fine motor movements, and forward-bent back posture that leads to strain on the back and hence incidence of low back pain[3,4]. Beyond biomechanical exposures, psychosocial working conditions like work demands, poor social support, low job control, job improbability, and fear of job loss modify both risk and recovery, influencing absence, disability, and health-care seeking[5]. As the causes of low back pain are multifactorial, effective prevention and treatment must include ergonomic advice, on-site physiotherapy, and psychosocial treatment.

### Epidemiology

According to many cross-sectional studies and workplace surveys, it has been found that the incidence of LBP is high in sewing workers of the garment and leather industry. It has been found that the prevalence is reported in the range of 40-88% annually depending on the sample and criteria, with the most commonly affected region being the back, mainly the lower region[6,7]. In many surveys it has been found that the prevalence of low back pain is higher in garment factory workers compared to other occupational groups. A large difference is expected because of differences in the definition of pain, the sampled population, and working settings[6].

**Occupational Risk Factors**

In sewing work there are many physical and biomechanical factors that are the main cause of low back pain.

**Prolonged static sitting and trunk flexion:** The workers have to sit for a prolonged period of time, mainly in a flexed posture that creates a sustained compressive and shear force on lumbar vertebrae along with the paraspinal muscles that creates muscle fatigue and impairs local blood circulation[8].

**Asymmetric loading and awkward posture:** Many factors, like frequent trunk rotation, lateral bending, and reaching for materials or tools (e.g., foot pedals and fabric pieces), increase torsional stresses and lumbar shear. **Repetition of fine motor demands:** Upper limb movements with high repetition increase cumulative load and produce static postures in the neck and trunk[3].

**Psychosocial Factors:**

Job control, job demand, job satisfaction, social support, job insecurity, and effort-reward imbalance are the psychosocial factors that contribute to both the onset and persistence of disabling LBP across occupations[5]. Mechanically, psychosocial stressors increase muscle tension and alter the motor patterns that lead to higher spinal loading during tasks. In garment and sewing settings, there are specific psychosocial issues like fear of job loss, high time pressure, and piecework payment systems that are most prevalent and interact with mechanical exposures to produce worse conditions[6,7].

**Evidence for workplace design and ergonomics:**

The aim of ergonomic interventions is to reduce hazardous exposures by changing the workstation design, tools, tasks, and environment. For sewing workers the most common ergonomic advice is adjustable sitting with appropriate lumbar support and height of seat so that feet rest comfortably and thighs are horizontal to reduce lumbar flexion[8]. The machine position should be like that: the tailor's elbows are around the waistline, shoulders relaxed, and the forearm supported to reduce forward trunk bend. The foot pedal should be designed to minimize the awkward lower limb postures and reduce ankle movements. There should be proper lighting at the workstation and task rotation and micro breaks to reduce the load on the back. Many systematic reviews of workplace intervention suggest that modification of the workstation and practical education are effective components of prevention strategies for LBP[9].

**Exercise and physical approaches:**

Physical exercises like strength training, targeting back and hip, and motor control exercises have shown benefit for low back pain. Many meta-analyses indicate the effect of targeted strengthening and stabilization on function and pain[10]. Some workplace exercise programs, like stretching and strengthening and in-between rest, show a reduction in pain and sickness absence[11]. Programs that incorporate both progressive strengthening and flexibility are ideal to reduce the severity of low back pain[10]. Exercise with education

about pain leads to fear-related avoidance and promotes return to function[11].

**Practical prevention program for sewing workers:**

The prevention program should be feasible, multilevel, low cost, and participatory. There should be workplace walk-throughs and quick ergonomic audits like chair dimension, table height, pedal placement, and lighting. There should be use of brief worker surveys like the Nordic questionnaire and psycho-social scales to score symptom distribution. There should be adjustment of seat height, lumbar support, repositioning of the table to allow neutral trunk posture that brings materials into comfortable reach, and repositioning of foot paddles[12]. Ensure adequate magnification and lighting to reduce forward bending. There should be micro-breaks of 1-2 minutes after every half an hour and task rotation where possible.

Incorporate supervised exercise sessions during shift starts or breaks that focus on hip flexor stretching, lumbar stabilization, gluteal strengthening, and thoracic agility training[13]. Construct easy poster instructions at each workstation that stress the right approaches and how to move forward in grades. Hold training on how to deal with and understand pain, addressing worries about job security and available help.

There should be implementation of worker participation of a worker committee that addresses workplace issues[14]. The main signs include keeping track of and evaluating the prevalence of self-reported low back pain, the number of sick days taken, the number of people who leave their jobs, and worker satisfaction. This combined method gives the best likelihood of a long-lasting and meaningful reduction in LBP that makes workers feel better[15].

**Enactment Experiments and Obstacles**

Even the best-designed programs have a lot of problems in sewing scenarios, such as:

**Cost limits:** The principal for adjustable equipment's may be limited by low production.

**Production pressure:** Short deadlines and piecework make it hard to take breaks and change behaviour without management support.

**Literacy and cultural factors:** Education intervention must be customized to language, literacy and local ideas about pain. Visual aids and group demonstrations are sometimes more effective than written material.

**Adherence:** To take part in exercise program the sewing worker need to do regular activities that have straightforward, brief rules and enough help from a supervisor.

**Complexity of evaluation:** Measuring outcomes require repeatable and simple metrics. Factories may be worried by reports of bad metrics, but developing programs that focus on quality and productivity can assist.

**Methodology:** The main goal of the search method was to find all relevant peer-reviewed literature that used databases, such as PubMed, Scopus, CINAHL, MEDLINE and Web of Science. A mix of vocabulary concepts and words such as "population" (sewing

workers, textile workers or garment workers), study design and specific tools like JBI Critical “condition” (LBP or musculoskeletal problems), Appraisal Checklist for Analytical Cross-Sectional “intervention” (stretching and strengthening exercise Studies, the Cochrane risk of bias tool for randomized and ergonomics), and “psychosocial” (job strain). control trials and AMSTAR2 for systematic reviews. Managing stress, job control and job demand. Boolean This elaborated methodology provides a rigorous and operators like OR and AND were used to put these ideas clear way how the literature review was conducted , together. The search was limited to the articles that were confirming the conclusions are based on a structured and published in English with no start date restriction and critical analysis of the available evidence. included literature up to the year 2025. This includes both recent and seminal studies.

Study selection and eligibility criteria: The records were initially evaluated by title and abstract, followed by a comprehensive text review.

**Inclusion criteria** encompasses observational research (cross sectional, cohort, case-control), randomized controlled trials, Quasi-experimental studies, Meta – analyses, and systematic reviews. Studies focusing on adult sewing machine operators or tailors in the textile and garment industry.

Studies outcomes that reported on the prevalence, risk factors, and effectiveness of intervention strategies for LBP.

#### **Exclusion criteria:**

Studies that were not published in English.

Studies where the full text was unavailable.

Studies were done on a population that

#### **Data extraction and synthesis:**

was not specifically sewing workers.

The data from the included studies was systematically extracted, including the information on study characteristics (author, publication year, country, and study design) and population details (sample size, specific occupation of subject, gender distribution), key findings (prevalence, rates of LBP, risk factors like our sitting and job strain, and details of intervention like type, frequency, and duration), and results (including as adjustable workstation are essential for reducing bio-measures of pain intensity, functional capacity, mechanical load, there effectiveness is augmented when disability, and work productivity).

#### **Quality assessment:**

The included studies were assessed using appropriate,

### **Thematic Synthesis of Reviewed Literature**

| Theme                       | Study/Author                        | Key Findings                                                                  |
|-----------------------------|-------------------------------------|-------------------------------------------------------------------------------|
| <b>Prevalence</b>           | Kumar et al. (2020)                 | 68% of workers in South Asian leather units reported chronic LBP.             |
|                             | Gupta et al. (2019)                 | High prevalence linked to prolonged static postures in small-scale units.     |
| <b>Ergonomic Risks</b>      | 1. Dianat, I., & Salimi, A. (2014). | Poor chair/table design increased incidence of LBP.                           |
|                             | Tissot F, et al. (2019)             | Lack of lumbar support and workstation customization cited as major concerns. |
| <b>Socio-Economic Risks</b> | Sharma et al. (2021)                | 15% decline in production linked to pain-related absenteeism.                 |
|                             | Singh et al. (2021)                 | Women reported greater severity and less access to care due to dual roles.    |
| <b>Psychosocial Factors</b> | WHO (2022)                          | Mental stress amplifies LBP through lowered pain tolerance and fatigue.       |
|                             | Hartvigsen J. et al. (2020)         | Low job satisfaction correlates with higher incidence of chronic back         |

#### **Conclusion and Discussion:**

Low back pain is very common among sewing workers and has many causes. It can be prevented by doing changes to both the social and physical aspects of the workplace[3]. Organizational changes that includes ergonomic workstation improvements allow postural variations and breaks, brief targeted exercise program and participatory approach of the workers form the backbone of an effective approach. As the sewing workers often work under production and financial constraints, participatory, low cost and management supported approaches that shows progress in both health and productivity are most likely to be sustained and implemented[15]. This review shows the evidence that low back pain among sewing workers is a bio-psycho-social problem. The findings confirm that the traditional approach of only physical ergonomics is inadequate for sustainable prevention. As ergonomic intervention such as adjustable workstation are essential for reducing bio-measures of pain intensity, functional capacity, mechanical load, there effectiveness is augmented when integrated with workers physical capacity with exercises and their psycho-social work atmosphere[16]. The strong suggestion between psycho-social factors like

high job demands with low control and low back pain prevalence underscores a critical point. The piece rate system in the garment industry creates a high strain work

which not only increases stress but also physiologically increases muscle tension and pain, hence increasing the pathway from acute to chronic pain, so an intervention that includes an ergonomic chair but fails to address the production pressure is treating a symptom while ignoring the root cause[17]. Programs that combine education, supervise physical exercises, organizational changes and ergonomic modifications for stress reduction leads to supportive eco-system for musculoskeletal health.

#### Future Research Directions

To bridge the gap between research and practice future studies should focus on the following directions: Future research should be practical, high quality trials of integrated interventions like core strengthening and stretching exercise programs in sewing factory workers, combined with cost effectiveness and implementation studies.

There is a necessity for the deployment of science that transcends efficacy studies conducted in controlled environments within operational factories. This includes the most cost effective models for delivering exercises and ergonomic programs.

Future research may investigate the role of technology, including mobile health applications for delivering guided exercises routines and stress management techniques directly to sewing workers, as well as wearable sensors that offer real-time feedback on posture and movement breaks at predetermined intervals.

#### Implications of the study

This review has direct effects on a number of people who are interested. The occupational health protocol has to be improved. The examination should include psychosocial screening, and the therapies should be broad, including ergonomic recommendations, exercises, and stress management. Management and policy makers ought to consider integrated programs as an investment that lowers absenteeism and raises turnover.

They are encouraged to enhance safety rules to use a bio-psycho-social approach. This approach recognizes workers' experiences and gives them a way to promote overall health and well-being, not simply ergonomic tools but also a better workplace.

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