IMPACT OF AGE AND HORMONAL INFLUENCE ON WORK-RELATED MUSCULOSKELETAL DISORDERS (MSDs) AMONG MALE AND FEMALE TAILORS: AN OBSERVATIONAL STUDY

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Abstract : **Background:** Tailoring involves prolonged sitting, repetitive hand movements and sustained forward-bent posture, which puts workers at high risk of work-related musculoskeletal disorders (MSDs). Age-related change and hormonal shifts (menopause in women, testosterone decline in men) may add to this risk, but most studies of tailors look only at posture and work habits. **Aim:** To assess the impact of age and hormonal influence on work-related MSDs among male and female tailors. **Methods:** This observational study included 197 tailors (106 women, 91 men) aged 40–58 years (mean 47.0 ± 5.5) with at least one year of tailoring experience. Data were collected with a demographic and occupational proforma, the Nordic Musculoskeletal Questionnaire (NMQ), the Visual Analogue Scale (VAS), the Rapid Entire Body Assessment (REBA), the Menopause Rating Scale (MRS) for women and the Aging Males' Symptoms (AMS) scale for men. **Results:** The 12-month prevalence of symptoms was very high across all nine body regions (78.2–94.9%), highest in the neck (94.9%), low back (90.9%) and shoulder (90.4%). Participants reported symptoms in a mean of 7.75 of 9 regions. Pain intensity (VAS) differed significantly across age groups ($p = 0.048$), while REBA scores and the number of affected regions did not. MRS scores rose significantly with age in women ($r = 0.285$, $p = 0.003$), but AMS scores were unrelated to age in men. Neither MRS nor AMS correlated with pain intensity. Only two regions differed by sex: low back pain was more common in women (98.1% vs 82.4%, $p < 0.001$) and elbow pain in men (87.9% vs 74.5%, $p = 0.028$). On REBA, 78.7% of participants were at medium postural risk and 21.3% at low risk; none were at high risk. **Conclusion:** Tailors in this sample showed a high, multi-regional burden of MSDs. Age was modestly associated with pain intensity, whereas hormonal symptom scores were not associated with pain. Occupational posture and continued exposure appear more relevant than hormonal status. The findings support whole-body physiotherapy assessment, ergonomic workstation changes and age- and sex-specific management.

IndexTerms **-** work-related musculoskeletal disorders, tailors, age, menopause, andropause, NMQ, REBA

I. INTRODUCTION

Musculoskeletal disorders (MSDs) are a group of conditions that affect the muscles, joints, ligaments, tendons, nerves and supporting soft tissues. They present mainly as pain, stiffness, swelling, muscle weakness, numbness or tingling and reduced range of movement, and they interfere with routine work and daily activities. When they arise or are aggravated by a person's job they are described as work-related musculoskeletal disorders (WMSDs). Worldwide, WMSDs are among the leading causes of occupational illness, sick leave, reduced productivity and permanent work disability. Their development is multifactorial: physical risk factors include repetitive movements, sustained or awkward postures, prolonged static loading, forceful exertion and inadequate rest; workplace factors include poorly designed workstations, long hours and time pressure; and individual factors such as age, sex, body mass index, fitness, previous injury and hormonal status influence how the body tolerates and recovers from repeated strain [1].

Tailoring is a skilled, labour-intensive occupation that, in small and unorganised units, is often carried out for long hours with little attention to ergonomics. It demands repetitive, precise movements of the fingers, hands and wrists, sustained sitting, forward bending of the neck and trunk, elevated or unsupported arms and foot-pedal operation [2,3]. Fixed chairs and tables, poor lighting, cramped spaces and few breaks in busy seasons make matters worse. Tailors therefore report a high prevalence of pain in the neck, shoulders, back, wrists and hands. Repeated mechanical strain causes micro-trauma that the tissues may not recover from between work periods, leading to inflammation, muscle fatigue, stiffness, degenerative change and eventually chronic pain and functional limitation.

Age is one of the most important individual factors. With advancing age there is a gradual decline in muscle mass and strength [4], reduced elasticity and healing capacity of tendons and ligaments, loss of intervertebral disc height and hydration, cartilage degeneration and reduced bone density. Tailors who have worked for many years also carry the cumulative effect of exposure, so age and duration of work together raise the likelihood of chronic and recurrent symptoms. Hormones also help maintain bone, muscle, cartilage and connective tissue. In women, the fall in oestrogen after menopause is associated with accelerated bone loss, reduced muscle strength, increased tendon and ligament stiffness and a greater tendency toward joint pain and soft-tissue complaints [5,6]. In men, testosterone supports muscle mass, strength and bone density, and its gradual decline with age contributes to

sarcopenia and slower recovery from tissue strain [4]. Examining age and hormonal status together, in male and female tailors, may therefore give a more complete picture than occupational exposure alone.

Although the ergonomic risks of tailoring are well recognised [7–9], little research has examined how age and hormonal factors influence MSDs in male and female tailors. Many tailors work in the unorganised sector, where preventive care, ergonomic guidance and early physiotherapy are rarely available, so symptoms are often ignored until they become disabling. The present study examined the impact of age and hormonal factors on work-related MSDs among male and female tailors.

1.1 Need of the study

The number of tailors suffering from MSDs is growing every year, yet most studies look only at posture and work habits and do not study the effect of age and hormones. Understanding these factors can help physiotherapists identify high-risk groups early, plan targeted preventive and rehabilitative strategies, improve workplace set-up, offer sex-specific treatment and improve the quality of life of tailors.

1.2 Aim and objectives

The aim was to assess the impact of age and hormonal influence on work-related MSDs among male and female tailors. The objectives were (i) to determine the prevalence of work-related MSDs in male and female tailors; (ii) to analyse the effect of age on the occurrence and severity of MSDs; (iii) to evaluate the influence of hormonal changes (menopause in women, testosterone decline in men) on MSDs; (iv) to observe how body pain and joint problems differ between male and female tailors of different ages; and (v) to provide physiotherapy and ergonomic recommendations based on the findings.

II. Materials and Methods

2.1 Study design and participants

This observational study was carried out over six months in tailoring shops. After permission from the shops and ethical approval, eligible tailors were selected, the study was explained to them and written informed consent was obtained. The final sample was 197 tailors (106 women and 91 men).

2.2 Eligibility criteria

Male and female tailors aged 40–60 years who were actively working as tailors with at least one year of experience, worked at least 4–5 hours a day in tailoring tasks and were willing to give informed consent were included. Tailors with recent trauma or fracture, congenital or structural deformity of the spine, hip or knee, systemic inflammatory or autoimmune conditions (e.g. rheumatoid arthritis, ankylosing spondylitis), major musculoskeletal surgery in the previous year, or who were unwilling or unable to consent were excluded.

2.3 Outcome measures

A combined proforma recorded demographic and occupational details (age, sex, working days per week and hours per day) and comorbidities. The following instruments were used: (a) the Nordic Musculoskeletal Questionnaire (NMQ) [10], recording 12-month symptoms (yes/no) in nine regions (neck, shoulder, elbow, wrist/hands, upper back, low back, hips/thighs, knees, ankle/feet); (b) the Visual Analogue Scale (VAS), a self-rated pain intensity score from 0 to 10; (c) the Rapid Entire Body Assessment (REBA) [11], an observational postural risk score from 1 to 15 (low 1–3, medium 4–7, high 8–10, very high 11–15); (d) the Menopause Rating Scale (MRS) [12] for women (none/little 0–4, mild 5–8, moderate 9–16, severe ≥17); and (e) the Aging Males' Symptoms (AMS) scale [13] for men (none <27, mild 27–36, moderate 37–49, severe ≥50). Test–retest reliability reported for these tools is 0.70–0.89 for the NMQ [14], up to 0.99 for the VAS [15], 0.80–0.95 for the MRS [16], 0.84–0.92 for the AMS [17] and 0.74–0.92 for REBA [18].

2.4 Statistical analysis

Data are presented as mean ± SD or n (%). Sex differences in the prevalence of symptoms in each region were tested with the chi-square test of independence with Yates' continuity correction. Pain intensity, REBA score and number of affected regions were compared across four age groups (40–44, 45–49, 50–54, 55–58 years) by one-way ANOVA. Relationships between age, working hours, VAS, REBA, MRS and AMS were assessed with Pearson's correlation coefficient, and a gender × age-group interaction on VAS was tested. A p-value below 0.05 was considered significant; for the nine regional comparisons the Bonferroni-adjusted threshold ($p < 0.0056$) is also reported.

III. Results and Discussion

3.1 Participant characteristics and work exposure

The 197 tailors (106 women, 53.8%; 91 men, 46.2%) had a mean age of 47.0 ± 5.5 years (range 40–58); women and men were of near-identical age (Table 1). They worked on average 4.3 ± 1.1 days per week and 4.1 ± 1.1 hours per day (range 2–7). This exposure is much lower than in the Kermanshah study, in which 64% of tailors worked more than 10 hours a day [7]; many shops in our setting were small units working about 4–5 hours a day. Because the range of exposure was narrow, the absence of correlation between hours per day ($r = −0.097$, $p = 0.175$) or days per week ($r = −0.104$, $p = 0.145$) and pain intensity is not surprising. Longer working hours have been linked to more complaints [7,19], but our sample contained too few long-duration workers to test this.

Table 1: demographic and occupational characteristics of the sample

Characteristic	Female (n = 106)	Male (n = 91)	Overall (N = 197)
Age, years	46.64 ± 5.65	47.46 ± 5.28	47.0 ± 5.5 (40–58)
Working days/week	4.38 ± 1.10	4.16 ± 1.01	4.28 ± 1.06 (2–6)
Working hours/day	4.21 ± 0.99	4.05 ± 1.21	4.14 ± 1.10 (2–7)
VAS pain score (0–10)	4.66 ± 1.47	4.57 ± 1.48	4.62 ± 1.48
REBA score	4.59 ± 1.41	4.77 ± 1.48	4.68 ± 1.44

Values are mean ± SD (range).

3.2 Prevalence of work-related MSDs (Objective 1)

The 12-month prevalence of symptoms was very high in every region, from 78.2% (wrist/hands) to 94.9% (neck) (Table 2, Figure 1). The neck, low back (90.9%) and shoulder (90.4%) were most affected. Participants reported symptoms in a mean of 7.75 ± 1.53 of the nine regions; 84 of 197 (42.6%) reported all nine and 95.4% reported five or more, so strain was multi-regional rather than confined to one site. This agrees with Kazemi et al. [7], Jamro et al. [8] and Shah and Joshi [9]. The most affected regions were also the same as in the Kermanshah study, where the waist (65.33%), neck (64.66%) and shoulder (56%) led, and trunk, neck and shoulder predominance has been reported in female sewing-machine operators in Turkey [2] and in Iranian sewing-machine workers [3]. The anatomical explanation is simple: sewing involves a sustained forward-flexed head and trunk with the shoulders held in static elevation and the hands making fine repetitive movements. Static loading of the cervical extensors and upper trapezius reduces circulation and causes early fatigue, sitting with a flexed lumbar spine loads the posterior spinal structures, and foot-pedal use loads the lower limbs, which may explain the high prevalence at the hips, knees and ankles.

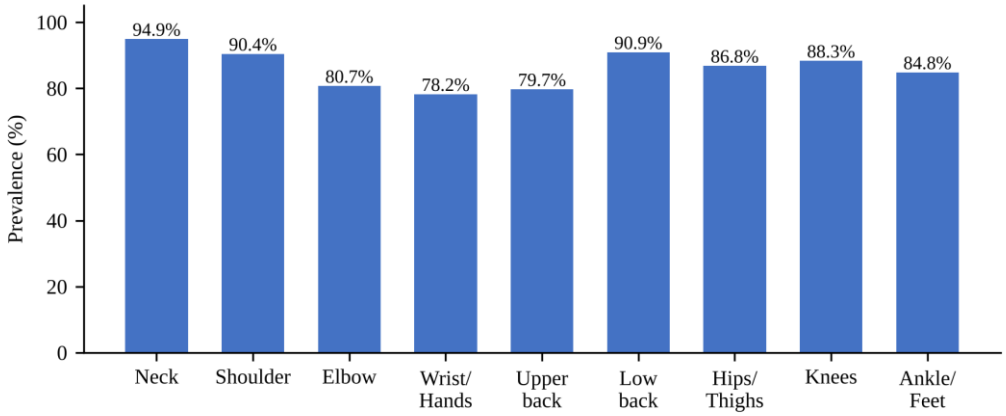

Figure 1: twelve-month NMQ pain prevalence by body region (N = 197)

Table 2: twelve-month NMQ prevalence by body region and sex, with chi-square test of independence

Body region	Overall n (%)	Female n (%)	Male n (%)	χ^2	p-value
Neck	187 (94.9)	102 (96.2)	85 (93.4)	0.33	0.566
Shoulder	178 (90.4)	96 (90.6)	82 (90.1)	0.00	1.000
Elbow	159 (80.7)	79 (74.5)	80 (87.9)	4.81	0.028*
Wrist/hands	154 (78.2)	85 (80.2)	69 (75.8)	0.32	0.571
Upper back	157 (79.7)	89 (84.0)	68 (74.7)	2.04	0.153
Low back	179 (90.9)	104 (98.1)	75 (82.4)	12.70	<0.001*
Hips/thighs	171 (86.8)	89 (84.0)	82 (90.1)	1.12	0.289
Knees	174 (88.3)	97 (91.5)	77 (84.6)	1.64	0.201
Ankle/feet	167 (84.8)	87 (82.1)	80 (87.9)	0.88	0.348

Statistically significant at $p < 0.05$ (Yates' continuity correction applied)

Prevalence in every region exceeded that of Kazemi et al. [7] (Table 3), most strikingly at the elbows (80.7% vs 12%) and hips/thighs (86.8% vs 31.33%). Several explanations are possible. Our participants were older (mean 47.0 vs 41.9 years) and the 40–58 year range reflects accumulated tissue strain. The NMQ records any ache, pain or discomfort in the previous 12 months, a low threshold for a positive answer, and our sample consisted of experienced tailors aged 40 years or more. Exclusion criteria, work experience, task mix and machine type also differ between studies [7]. Finally, prevalence is near its ceiling in several regions, and because the NMQ is binary it cannot discriminate between individuals, so cross-study comparisons should be made cautiously.

Table 3: twelve-month prevalence (%) of symptoms, present study versus Kazemi et al.

Body region	Present study (N = 197)	Kazemi et al. (N = 150)
Neck	94.9	64.66
Shoulder	90.4	56.00
Elbow	80.7	12.00
Wrist/hands	78.2	53.33
Upper back	79.7	Not assessed
Low back (waist)	90.9	65.33
Hips/thighs	86.8	31.33
Knees	88.3	55.33
Ankle/feet	84.8	49.33

3.3 Effect of age on occurrence and severity of MSDs (Objective 2)

Mean VAS differed across the four age groups (4.38, 4.92, 4.41 and 5.12 for 40–44, 45–49, 50–54 and 55–58 years; ANOVA $p = 0.048$; Table 4). The oldest group had the highest pain, but a dip in the 50–54 band meant that the linear correlation with age was weak and not significant ($r = 0.111$, $p = 0.121$); the age effect on pain intensity is therefore modest and borderline. REBA

scores (4.62 to 5.04) and the number of affected regions (7.63 to 8.00) also rose numerically across age groups but not significantly (age vs REBA r = 0.088, p = 0.218; age vs number of regions r = 0.127, p = 0.074; ANOVA for regions p = 0.834).

Table 4: pain intensity, postural risk and MSD burden by age group

Age group (years)	n	VAS	REBA	NMQ regions affected
40–44	71	4.38 ± 1.47	4.62 ± 1.36	7.63 ± 1.85
45–49	50	4.92 ± 1.43	4.60 ± 1.60	7.56 ± 1.58
50–54	51	4.41 ± 1.37	4.65 ± 1.48	7.96 ± 1.20
55–58	25	5.12 ± 1.64	5.04 ± 1.24	8.00 ± 0.91

Values are mean ± SD. VAS differed significantly across age groups (ANOVA, p = 0.048); REBA and number of regions did not (p > 0.05).

Pain intensity may increase with age without any change in the number of regions affected for several reasons. First, there was a ceiling effect: 95% of participants had symptoms in five or more regions, leaving little room for further spread. Second, ageing brings sarcopenia [4], reduced tendon and connective-tissue resilience and years of cumulative micro-trauma, all of which can raise pain without involving new regions. The dip at 50–54 years may reflect a survivorship effect, in which the most affected tailors leave the occupation first [20], or simply chance variation in small subgroups. Published evidence on age is mixed. Kazemi et al. [7] found no significant relationship between age and pain in any of the regions examined, in line with studies of working populations [1], but they analysed presence of pain rather than intensity and their sample covered a broader age range (mean 41.9 ± 13.1 years), which may dilute age-related differences. In tailors aged 40 years and above, pain severity rather than the number of painful sites appears more sensitive to ageing. Because REBA did not differ across age groups, older tailors seem to adopt similar postures to younger ones but may feel more pain for the same postural load.

3.4 Influence of hormonal changes on MSDs (Objective 3)

In women, the MRS score averaged 9.94 ± 4.17 (range 4–17) and rose significantly with age (r = 0.285, p = 0.003); the mean MRS increased from about 9.1 in the 40–44 group to 12.9 in the 55–58 group. Of 106 women, 47 (44.3%) had mild, 46 (43.4%) moderate and 11 (10.4%) severe menopausal symptoms, and only two (1.9%) had none or little. This is the expected pattern through the menopausal transition. Menopause is generally detrimental to musculoskeletal health, increasing the risk of osteoporosis, osteoarthritis and sarcopenia [5], and experimental data suggest that oestrogen benefits muscle strength in women [6]. Despite this biological rationale, MRS was not significantly correlated with VAS (r = 0.121, p = 0.217). In men, the AMS score averaged 22.16 ± 4.15 (range 15–31); of the 90 men with AMS category data, 78 (86.7%) had no symptoms and 12 (13.3%) mild symptoms, and none had moderate or severe symptoms. AMS was unrelated to age (r = 0.067, p = 0.530) or VAS (r = −0.084, p = 0.432) (Table 5). Hormonal symptom burden was therefore not associated with pain intensity in either sex, and the hormonal hypothesis was not supported by these data.

Table 5: gender-specific hormonal-symptom scores and their correlations

Score	n	Mean ± SD	Range	vs age (r, p)	vs VAS (r, p)
MRS (female)	106	9.94 ± 4.17	4–17	0.285, 0.003*	0.121, 0.217
AMS (male)	91	22.16 ± 4.15	15–31	0.067, 0.530	−0.084, 0.432

Statistically significant at p < 0.05

Before concluding that hormones are unimportant, several limitations of the measurement should be considered. MRS and AMS are symptom scales covering somatic, psychological and sexual or urogenital complaints; they do not measure hormone levels, and musculoskeletal items carry little weight in the total score. Heavy occupational loading (95% with neck pain and a mean of 7.75 painful regions) may mask subtle hormonal effects. Menopausal status (pre-, peri- or post-menopausal) was not recorded, so age and MRS served as proxies. In men there was a floor effect: about 90% reported minimal symptoms and the oldest participant was 58 years, leaving little variation in which to detect an effect of testosterone decline, which is gradual in most men. Psychosocial factors such as stress, sleep and mood were not measured and could influence both MRS and pain perception. Larger samples, menopausal staging and, where possible, serum hormone levels are needed before firm conclusions are drawn.

3.5 Sex- and age-related differences in body pain and joint problems (Objective 4)

Of the nine regions, only two differed significantly between sexes (Table 2). Low back pain was more frequent in women (98.1% vs 82.4%; $\chi^2 = 12.70$, p < 0.001) and elbow pain in men (87.9% vs 74.5%; $\chi^2 = 4.81$, p = 0.028). Overall VAS (4.66 ± 1.47 in women vs 4.57 ± 1.48 in men), REBA (4.59 vs 4.77) and mean number of painful regions (7.81 vs 7.67) were similar. In the Kermanshah study knee and ankle pain were more common in men [7], as also reported by Aghili et al. [21], but this pattern is not seen in all studies, probably because of differences in work allocation and machines. Several factors may raise low back pain in women: women of this age often combine tailoring with domestic duties, which adds cumulative spinal loading; sitting tolerance and spinal endurance may differ between sexes; and menopause is linked to osteoporosis, osteoarthritis and sarcopenia [5], which may contribute to low back symptoms. The higher male prevalence of elbow pain is harder to explain. Men may do more cutting, pressing and ironing, which stress the forearm extensor and flexor origins, whereas women may do more continuous machine stitching; task type, machine type and handedness were recorded but not analysed, so this explanation is speculative. Because nine unadjusted comparisons were made, the low back finding passes the Bonferroni threshold (p < 0.0056) but the elbow finding (p = 0.028) does not and should be regarded as exploratory.

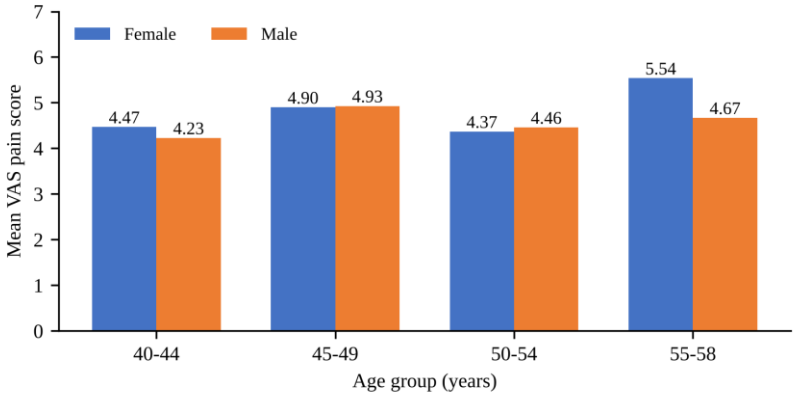

Figure 2: mean VAS pain score by age group and sex

When age and sex were examined together, mean VAS in the 55–58 year group was 5.54 in women (n = 13) and 4.67 in men (n = 12) (Figure 2), and the age–VAS correlation was larger in women (r = 0.173, p = 0.076) than in men (r = 0.040, p = 0.709). This is in keeping with a compounding of occupational strain and age-related change, such as menopause, in women, and with reports that women have higher pain intensity and a greater effect of pain on sleep [22,23]. However, the subgroups were small, the correlations were not significant and a formal test found no difference in the age gradient between the sexes (gender × age group on VAS: $F(3, 189) = 0.70$, $p = 0.556$; gender × continuous age: $p = 0.383$). The apparent steeper rise in older women should therefore be regarded as a trend to investigate, not as an established finding.

3.6 Work-related ergonomic risk (REBA)

REBA scores averaged 4.68 ± 1.44 (range 2–7). No participant fell in the high or very high categories; 21.3% were at low risk and 78.7% at medium risk, with a similar split in women and men (Table 6). Under the REBA action levels a medium rating means that the workstation should be assessed and changed soon [11]. The absence of high scores is encouraging, but the predominance of medium scores shows that these tailors' working postures are far from harmless. The low upper limit of scores may reflect the short daily exposure; REBA is a single-time-point assessment that does not capture duration, repetition or cumulative load, which may explain why it was unrelated to VAS (r = 0.042, p = 0.554) or hours per day (r = −0.059, p = 0.410). It also does not explicitly address prolonged static neck flexion or repetitive hand movements, both important in tailoring [3,7], so additional tools will be needed in future studies.

Table 6: REBA postural risk category by sex

REBA risk category	Female, n (%)	Male, n (%)	Overall, n (%)
Low (1–3)	23 (21.7)	19 (20.9)	42 (21.3)
Medium (4–7)	83 (78.3)	72 (79.1)	155 (78.7)
High (8–10)	0 (0.0)	0 (0.0)	0 (0.0)
Very high (11–15)	0 (0.0)	0 (0.0)	0 (0.0)

3.7 Hypothesis testing

The null hypothesis was that age and hormonal factors have no significant effect on MSDs in male and female tailors. For age, the null hypothesis was accepted for the number of painful regions (p = 0.834) and for postural risk, but rejected for pain intensity (VAS differed across age groups, p = 0.048). For hormonal factors, the null hypothesis was accepted, as neither MRS nor AMS correlated with pain intensity. There is therefore partial support for the alternative hypothesis, for age only.

IV. Conclusion

This study of 197 male and female tailors aged 40 years and above leads to the following conclusions:

(1) Work-related musculoskeletal symptoms were widespread (78.2–94.9% across nine body regions); the neck, low back and shoulders were most affected, and tailors had symptoms in a mean of 7.75 regions, so the burden is diffuse rather than concentrated.

(2) Pain intensity increased modestly but significantly with age (p = 0.048), whereas the number of affected regions and REBA postural risk did not change significantly.

(3) Menopausal symptom severity rose significantly with age in women, but neither menopausal (MRS) nor andropausal (AMS) symptom scores were related to pain intensity in either sex.

(4) Only low back pain (more common in women) and elbow pain (more common in men) differed by sex; the steeper age-related rise in pain in older women was not confirmed by a formal interaction test (p = 0.556) and needs larger samples.

(5) All participants were at low or medium postural risk, with 78.7% at medium risk, which indicates that workstation and posture modifications should be made soon.

(6) Overall, tailoring is a high-risk occupation for MSDs, and age and continued exposure to sustained postures appear more relevant to pain than hormonal symptom burden.

4.1 Clinical implications

Assessment: screen the whole body, since symptoms were multi-regional, using the NMQ for mapping, VAS for severity and REBA for posture. Give particular attention to the neck, shoulder girdle, spine and lower limbs.

Treatment and ergonomics: postural correction, cervical and scapular stabilisation and strengthening, thoracic mobility, lumbar and core endurance exercises, and stretching of the hip flexors, hamstrings and upper trapezius. Provide an adjustable chair with lumbar support, lower table and machine heights for a relaxed neck and shoulders, good task lighting to reduce forward head posture, and a foot pedal set so that the knee and ankle are neutral. As most tailors were at medium REBA risk, these changes should be made without delay.

Work organisation: schedule micro-breaks, alternate stitching with cutting and pressing where possible, and teach tailors to self-monitor early symptoms.

Older tailors: pain intensity tends to rise with age, so tailors aged 50 years and over may need earlier and more intensive care, including strength and endurance training to counter age-related muscle loss.

Women: almost all women (98.1%) had low back pain and menopausal symptoms were common, so bone-health counselling, weight-bearing and resistance exercise and, where indicated, medical or gynaecological evaluation and osteoporosis screening should be considered [5].

Men: when the elbow and forearm are involved, eccentric and stretching programmes are appropriate. Treatment should be sex-responsive, taking into account the greater pain burden and sleep impairment in women with chronic musculoskeletal pain and the different regional profiles in the two sexes.

4.2 Limitations

- The cross-sectional design means associations are not causal and the timing of the relationship between hormonal change, age and pain cannot be established.
- All outcomes (NMQ, VAS, MRS, AMS) are self-reported and open to recall and social-desirability bias. The NMQ is binary and prevalence above 90% in several regions produced a ceiling effect that limits discrimination between participants.
- Sampling was non-random from a small geographical area, and a healthy-worker effect may have removed the most affected tailors from the workforce.
- The age range was narrow (40–58 years) and the age bands were wide, with small subgroups (for example 13 women and 12 men aged 55–58); the gender × age interaction was not significant ($p = 0.556$), probably owing to low power.
- Hormonal status was measured only with symptom scales; menopausal status, years since menopause, hormone therapy and serum hormone levels were not recorded, and the scales are not specific to musculoskeletal symptoms.
- The effect of long working hours could not be examined because exposure was restricted (mean 4.1 hours/day). REBA is a single-time-point assessment that does not reflect duration, repetition or cumulative load, and inter-rater reliability was not assessed.
- Anthropometric data, years of experience, machine type and psychosocial factors were not analysed and could confound the associations. The nine chi-square tests were not adjusted for multiple comparisons, so the elbow finding in particular should be interpreted with caution.

4.3 Future scope

- Longitudinal cohort studies following tailors over time to show how symptoms progress with age and the menopausal transition.
- Larger, probability-based, multicentre samples with pre-, peri- and post-menopausal women classified separately, and inclusion of serum hormone levels, bone mineral density and muscle strength measurements.
- A wider age range, including younger tailors, to compare age groups directly and detect earlier onset of symptoms.
- Collection of anthropometric data, years of experience, machine type, task type and psychosocial stress as covariates, with multivariable regression to identify independent predictors of pain.
- Additional tools: severity- and disability-based questionnaires, objective measures such as surface electromyography or goniometry, and instruments that capture repetition and duration.
- Randomised controlled trials of ergonomic redesign, workplace exercise programmes and sex-specific physiotherapy protocols, with pain, function and work productivity as outcomes.
- Comparative studies with other seated manual occupations such as weavers, cobblers, data-entry operators and bank staff.

V. Acknowledgment

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