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Musculoskeletal Complaints among Itinerant Tailors in Lenteng Agung, Jakarta

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ABSTRACT IN ENGLISH

Itinerant tailors in urban Indonesia often work in prolonged static postures within mobile workstations lacking ergonomic support. This study examines the prevalence of musculoskeletal complaints and postural risks among 30 male itinerant tailors in Lenteng Agung, South Jakarta. Using a mixed-method approach, quantitative data were collected through the Nordic Body Map (NBM) and Rapid Entire Body Assessment (REBA), while qualitative insights were obtained via semi-structured interviews. Results showed that 100% of participants fell into high or very high ergonomic risk categories, with prevalent discomfort in the buttocks, lower back, and hips. No statistically significant correlation was found between age or work duration and complaint severity, indicating that workstation design plays a more critical role. Interview findings revealed self-adapted seating modifications and a strong demand for portable ergonomic improvements. The study highlights the urgent need for anthropometrically informed seating solutions compatible with mobile informal labor settings. These findings inform context-sensitive design strategies that prioritize adjustability, user comfort, and occupational health in underserved worker populations.

Keywords:
Itinerant Tailors;
Ergonomics;
Musculoskeletal Disorder;
Nordic Body Map (NBM);
Rapid Entire Body Assessment (REBA)

1. INTRODUCTION

Itinerant tailors who utilize modified pedicabs represent a distinct form of informal employment that plays a vital role in urban service economies, particularly in areas like Lenteng Agung, South Jakarta. These tailors operate independently without formalized workspaces or labor protections, relying on their modified carts as both transportation and mobile workstations, an example of vernacular, adaptive strategies in response to economic limitations [1]. Despite their social and economic contributions, this profession exposes workers to significant occupational health risks due to long working hours in static seated postures, repetitive motions, and poorly designed work environments.

Tailors in Lenteng Agung typically engage in more than eight hours of work daily in non-ergonomic seated positions, often using improvised folding chairs without proper back support. Such working conditions are closely associated with the development of Work-Related Musculoskeletal Disorders (WMSDs), particularly in the lumbar region, neck, and shoulders [2], [3]. Poorly supported postures can increase spinal pressure and muscle fatigue, leading to chronic pain, discomfort, and reduced physical function over time [4], [5]. Prolonged sitting, especially without variation in posture, has also been shown to weaken abdominal muscles and disrupt spinal curvature, compounding ergonomic risk [6].

These risks are further exacerbated by the informal nature of the occupation. Tailors in this sector generally share similar socio-economic backgrounds, working to support their families without access to ergonomic tools, health insurance, or formal occupational safety mechanisms [7], [8]. Economic necessity often discourages investments in better seating or workstations, despite persistent physical discomfort. While several studies have examined musculoskeletal complaints among informal workers, few focus specifically on itinerant tailors using mobile workstations in dense urban contexts. Moreover, most ergonomic research in this area remains limited to observational or survey-based tools, lacking insights from the workers' own lived experiences.

To address this gap, the present study investigates musculoskeletal complaints and postural risks among itinerant tailors in Lenteng Agung by combining quantitative ergonomic tools with qualitative data. Standardized instruments, namely the Nordic Body Map Questionnaire (NBM) and the Rapid Entire Body Assessment (REBA), are employed alongside semi-structured interviews that explore the tailors' subjective experiences of pain, perceived causes, and expectations for improved workstation design. By integrating both empirical measurements and user narratives, this study seeks to develop a context-sensitive understanding of ergonomic vulnerability in informal labor and contribute to inclusive, anthropometrically informed design interventions.

1.1 Literature Review

1.1.1 Informal Tailoring and Urban Labor Contexts

Informal labor plays a central role in the survival strategies of many urban populations in Southeast Asia. In Indonesia, the profession of itinerant tailoring has persisted across decades, especially in areas experiencing rapid urbanization such as Jakarta. These tailors operate with minimal formal support, often without business licenses, regulated income, or ergonomic infrastructure [7]. Many of them are male migrants from rural areas, drawn by the prospect of city-based income and working through kinship-based recruitment networks [8]. Their modified bicycle carts function both as transport and as makeshift workstations, illustrating a form of vernacular innovation that prioritizes practicality over safety or comfort [1].

1.1.2 Working Postures and Musculoskeletal Disorder (MSD) Risks

Sewing, as an activity, involves repetitive upper limb motions, sustained focus, and prolonged static sitting. These factors collectively contribute to the development of work-related musculoskeletal disorders (WMSDs), particularly in the lower back, neck, and shoulder regions [2], [3]. Static muscle loading, especially when seated postures are not well supported, increases spinal compression and leads to localized fatigue and long-term strain [4]. In a study by Punnett & Wegman [9], prolonged static work was strongly linked with cumulative trauma disorders across various occupational settings.

1.1.3 Ergonomics and the Problem of Static Sitting

Although sitting reduces cardiovascular strain and energy expenditure compared to standing, it introduces its own set of risks, especially when postural variation is restricted. According to Hartanto et al. [6], sitting beyond four continuous hours per day is associated with significant increases in musculoskeletal complaints. Unsupported lumbar regions and improper seat height may cause postural collapse, shifting the load from active muscles to passive tissues. The REBA (Rapid Entire Body Assessment) method has been widely used to assess such postural risks and has proven effective in both formal and informal sectors [10]. However, it remains underutilized in Southeast Asian studies involving mobile or temporary work settings.

1.1.4 The Role of Design in Mitigating Ergonomic Risks

Despite recognition of these occupational risks, few studies have explored how ergonomic *design interventions,* particularly in mobile work environments, might mitigate them. Research tends to conclude with general

recommendations for "adjustable seating" or "postural corrections," but rarely advances to user-centered design solutions [11]. In practice, tailor carts are not optimized for body dimensions, lack lumbar support, and often force workers into asymmetrical postures. This underscores the need for anthropometrically-informed seating systems tailored to users' daily habits, postures, and constraints.

Integrating users' subjective experiences into ergonomic analysis is increasingly recognized as a valuable strategy. Semi-structured interviews, for example, can surface tacit knowledge that standard observational tools might overlook [12]. By combining standardized assessment tools (such as NBM and REBA) with user interviews, a richer understanding of ergonomic vulnerability can emerge, one that is grounded in real-world use rather than abstract design standards.

1.1.5 Identified Gap and Research Positioning

While previous studies have successfully demonstrated the correlation between non-ergonomic work conditions and musculoskeletal disorders, little attention has been paid to mobile tailors operating in urban informal settings, especially in Southeast Asia. Furthermore, few studies combine quantitative ergonomic assessment with qualitative narratives from the workers themselves. This study seeks to address both gaps by applying a mixed-method approach in a geographically and socially relevant context, while also informing future design strategies based on users' lived experiences.

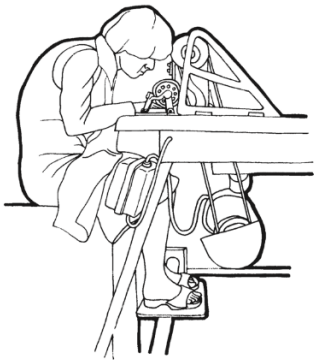

Figure 1 - Tailors and sewing machines from Murray Sinclair [4]

A study on vegetable street vendors in Latur, India, revealed a high prevalence of musculoskeletal complaints significantly correlated with age over 35 years and female gender ($p < 0.05$), with the adult age group exhibiting a 1.46 times higher risk. However, prolonged work duration (>15 years) was not identified as an independent risk factor ($p = 0.403$), contrasting findings from previous research. Similarly, other variables such as body mass index (BMI), daily working hours, repetitive movements, and sitting duration showed no significant correlation [13]. These findings underscore the urgent need for ergonomics interventions and health education programs to mitigate musculoskeletal risks among informal workers, who play a critical role in the local economy but remain marginalized in occupational health policy frameworks.

2. METHOD

This study employed a mixed-method approach, combining observational-quantitative and qualitative components to assess musculoskeletal complaints and ergonomic risks among itinerant tailors. The research was conducted in Lenteng Agung, a subdistrict in Jagakarsa, South Jakarta, Indonesia. This urban area is known for its relatively high concentration of itinerant tailors who utilize modified bicycle carts both as transportation and as mobile workstations.

Lenteng Agung was purposively selected due to the unique working conditions and socio-economic homogeneity of the tailoring community in this area. These tailors typically operate in the informal sector, where working hours are long and workplace ergonomics are often neglected. The combination of prolonged static postures, repetitive hand movements, and suboptimal seating arrangements significantly contributes to the risk of musculoskeletal disorders (MSDs). Moreover, most tailors in the area share similar economic motivations—to support their families through manual labor in low-regulation environments. Such socio-economic patterns are consistent with informal labor frameworks described in the literature [8], [1].

To capture representative data, 30 male itinerant tailors were recruited using purposive sampling. A minimum sample size of 30 was chosen to meet statistical adequacy standards in ergonomic studies, ensuring sufficient power and generalizability [14], [15]. This research integrated both subjective and objective instruments to triangulate the identification of ergonomic risks. The Nordic Body Map (NBM) questionnaire was used to assess self-reported discomfort across 28 musculoskeletal regions. At the same time, the Rapid Entire Body Assessment (REBA) provided observational data on postural risks during work activities. To enrich the analysis, semi-structured interviews were

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conducted with all participants, focusing on pain experiences, perceptions of current workstation comfort, and expectations for ergonomic improvements. Thematic analysis of interview data provided deeper insights into user needs and informed the interpretation of quantitative findings. A summary of demographic characteristics of the respondents is presented in Table 1 below.

Table 1 - Demographics of respondents

Category	Range	Total of respondents
Age (years old)	20 - 30	6
	31 - 40	9
	41 - 50	8
	51 - 60	6
	Total	30
Working experiences (years)	<1	3
	1-10	20
	11-20	6
	>20	1
	Total	30

2.1 Rapid Entire Body Assessment (REBA)

The Rapid Entire Body Assessment (REBA) method was used to evaluate postural risks among 30 itinerant tailors during their sewing activities. Observations were conducted directly on-site, focusing on real-time working conditions. Among the 30 tailors observed, two were selected for detailed documentation, as their postures represented the two most commonly occurring body positions adopted by all participants during sewing tasks. To ensure objectivity and scoring accuracy, each posture was photographed and analyzed by two independent evaluators trained in ergonomic assessment. The REBA scoring process was conducted independently by each evaluator, and inter-rater reliability was ensured through discussion and reconciliation in cases of discrepancy. Agreement was achieved in all scoring instances, confirming the reliability and validity of the process.

The REBA method considers neck, trunk, and limb positioning, along with load handling, grip quality, and frequency of movement. The REBA scoring protocol involves a systematic five-step process: Posture data collection, joint angle analysis, load assessment, coupling and activity evaluation, and risk scoring [17]. Final risk scores were categorized into action levels, indicating the urgency of intervention. Final REBA scores were categorized according to the standard action levels:

- 1–3 (Low Risk),
- 4–7 (Medium Risk),
- 8–10 (High Risk),
- ≥11 (Very High Risk).

These scores provided the basis for determining the urgency of ergonomic redesign concerning seating and work posture.

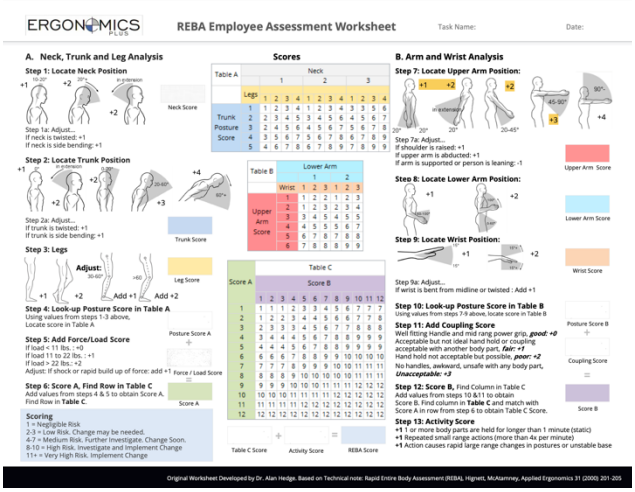
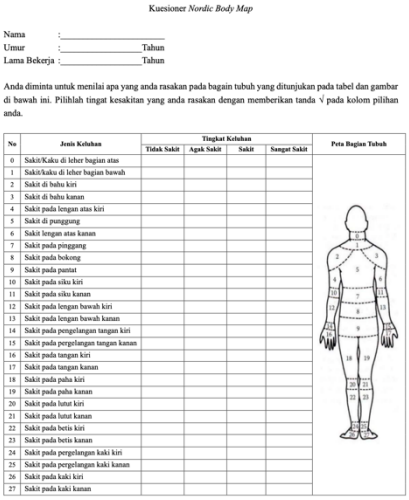


Figure 2 - REBA Employee Assessment Worksheet [18]

2.2 Nordic Body Map (NBM)

This study utilized the Nordic Body Map (NBM) questionnaire to identify the distribution and severity of musculoskeletal discomfort experienced by 30 itinerant tailors in Lenteng Agung. The Nordic Body Map Questionnaire (NBM) is a standardized and validated tool designed to identify bodily complaint points by evaluating 28 predefined muscle regions. Each region is scored on a four-point scale: (1) No Pain, (2) Slight Pain, (3) Pain, and (4) Severe Pain. While the questionnaire inherently relies on subjective self-reporting, its reliability and validity have been empirically established. A higher cumulative score directly correlates with increased severity of musculoskeletal complaints, necessitating targeted ergonomics or clinical interventions.



Kuesioner *Nordic Body Map*

Nama :_____
Umur :_____Tahun
Lama Bekerja :_____Tahun

Anda diminta untuk menilai apa yang anda rasakan pada bagain tubuh yang ditunjukan pada tabel dan gambar di bawah ini. Pilihlah tingat kesakitan yang anda rasakan dengan memberikan tanda √ pada kolom pilihan anda.

No	Jenis Keluhan	Tingkat Keluhan				Peta Bagian Tubuh
		Tidak Sakit	Agak Sakit	Sakit	Sangat Sakit	
0	Sakit/Kaku di leher bagian atas					
1	Sakit/kaku di leher bagian bawah					
2	Sakit di bahu kiri					
3	Sakit di bahu kanan					
4	Sakit pada lengan atas kiri					
5	Sakit di punggung					
6	Sakit lengan atas kanan					
7	Sakit pada pinggang					
8	Sakit pada bokong					
9	Sakit pada pantat					
10	Sakit pada siku kiri					
11	Sakit pada siku kanan					
12	Sakit pada lengan bawah kiri					
13	Sakit pada lengan bawah kanan					
14	Sakit pada pengelangan tangan kiri					
15	Sakit pada pergelangan tangan kanan					
16	Sakit pada tangan kiri					
17	Sakit pada tangan kanan					
18	Sakit pada paha kiri					
19	Sakit pada paha kanan					
20	Sakit pada lutut kiri					
21	Sakit pada lutut kanan					
22	Sakit pada betis kiri					
23	Sakit pada betis kanan					
24	Sakit pada pergelangan kaki kiri					
25	Sakit pada pergelangan kaki kanan					
26	Sakit pada kaki kiri					
27	Sakit pada kaki kanan					

Figure 3 - Nordic Body Map Questionnaire

Table 2 - Range of Pain [16]

Likert Scale	Total Score	Risk Level	Description
1	28-49	Low	No intervention needed
2	50-70	Medium	Probably need intervention
3	71-90	High	Intervention needed
4	91-122	Very High	Immediate intervention needed

2.3 Semi-Structured Interviews

To complement the quantitative findings, semi-structured interviews were conducted with the same 30 itinerant tailors who participated in the REBA and NBM assessments. Conducted in Bahasa Sunda for clarity and comfort, each interview lasted approximately 15–30 minutes and took place immediately after the postural observations. Questions focused on: (1) pain points and work-related triggers, (2) perceived comfort of current seating, and (3) expectations for ideal workstation features. Responses were analyzed using basic thematic coding to identify patterns related to ergonomic discomfort and design needs. This qualitative insight contextualized the quantitative data and strengthened the basis for user-centered intervention. All interviews were audio-recorded, transcribed, and translated into English, preserving the original meaning.

Figure 4 - Street view of Lenteng Agung

3. RESULT AND DISCUSSION

The findings provide critical insights into the ergonomic vulnerabilities faced by itinerant tailors, revealing systemic design deficiencies in current workstations.

3.1. Rapid Entire Body Assessment (REBA)

Figure 5 - (a) Itinerant tailor 1, (b) Itinerant tailor 2

(a) The shoulder flexion (~44°) indicates a forward arm position, while the elbow flexion (~106°). The trunk inclination (~79° relative to the horizontal plane) shows a slightly forward-leaning posture. Additionally, the hip flexion (~106°) and knee flexion (~106°) reflect a stable seated position, maintaining balance during the task.

(b) The shoulder flexion (~12°) indicates minimal forward arm movement, while the elbow flexion (~141°) suggests a more extended posture. The trunk inclination (~14° relative to the vertical plane) reveals a nearly upright posture. Additionally, the hip flexion (~110°) and knee flexion (~157° and ~150° for each leg, respectively) demonstrate a seated yet asymmetrical posture.

Observations of 30 itinerant tailors identified two prevalent sewing postures: the first involves both feet placed within the table frame to operate the sewing machine pedal, while the second features one foot on the pedal and the other positioned outside the frame. These posture variations are largely influenced by the limitations of their mobile workstation design, which lacks ergonomic flexibility and leads to consistency in suboptimal postures.

REBA analysis revealed that 28 participants (93.3%) scored 9, categorized as high risk, and 2 participants (6.7%) scored 11, indicating very high risk. These elevated scores were predominantly associated with forward trunk flexion, prolonged seated positions involving hip and knee bending, absence of lumbar support, and repetitive upper limb activity. The results emphasize the urgent need for ergonomic redesigns focused on improving posture support, reducing physical strain, and accommodating individual body dimensions.

Table 3 - REBA Score Distribution Among Tailors (n = 30)

REBA Score	Risk Level	Number of Tailors	Percentage (%)
9	High	28	93.3%
11	Very High	2	6.7%
Total	—	30	100%

These results validate the tailors' vulnerability to musculoskeletal disorders and highlight the pressing need for workstation redesign. A user-centered ergonomic approach focusing on posture support, pressure reduction, and adaptability to varying body dimensions should be prioritized to mitigate risk and promote occupational well-being.

3.2. Nordic Body Map (NBM)

No	Jenis Keluhan
0	Sakit/Kaku di leher bagian atas
1	Sakit/kaku di leher bagian bawah
2	Sakit di bahu kiri
3	Sakit di bahu kanan
4	Sakit pada lengan atas kiri
5	Sakit di punggung
6	Sakit lengan atas kanan
7	Sakit pada pinggang
8	Sakit pada bokong atas
9	Sakit pada bokong bawah
10	Sakit pada siku kiri
11	Sakit pada siku kanan
12	Sakit pada lengan bawah kiri
13	Sakit pada lengan bawah kanan
14	Sakit pada pengelangan tangan kiri
15	Sakit pada pergelangan tangan kanan
16	Sakit pada tangan kiri
17	Sakit pada tangan kanan
18	Sakit pada paha kiri
19	Sakit pada paha kanan
20	Sakit pada lutut kiri
21	Sakit pada lutut kanan
22	Sakit pada betis kiri
23	Sakit pada betis kanan
24	Sakit pada pergelangan kaki kiri
25	Sakit pada pergelangan kaki kanan
26	Sakit pada kaki kiri
27	Sakit pada kaki kanan

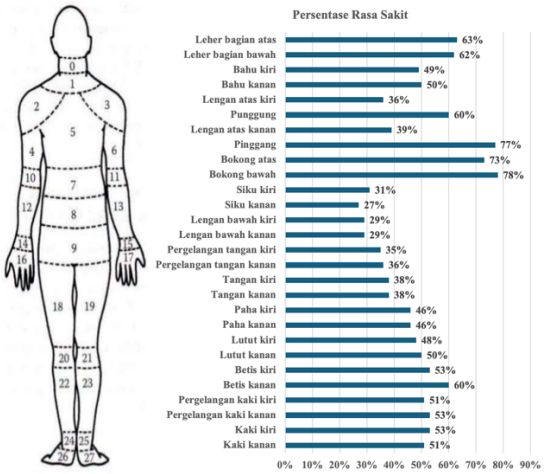


Figure 6 - Nordic Body Map questionnaire results

This study utilized the Nordic Body Map (NBM) questionnaire to identify the distribution and severity of musculoskeletal discomfort experienced by 30 itinerant tailors in Lenteng Agung. The questionnaire covered 28 anatomical regions, allowing respondents to indicate pain levels based on their daily work posture and activities. The mapping results showed that the highest levels of musculoskeletal discomfort were reported in the buttocks (78%), followed by the lower back (77%), and the hips (73%). Other regions with considerable prevalence of discomfort included the upper neck (63%), lower neck (62%), back (60%), and right calf (60%). These patterns indicate that the lower torso and spinal regions are the most consistently affected areas among itinerant tailors.

These pain concentrations are primarily attributed to prolonged static sitting, limited movement variation, and poor seat construction, which collectively contribute to excessive loading on the lower back and pelvic regions. Supporting prior studies, factors such as extended working hours and constrained postures without ergonomic support significantly increase the risk of Work-Related Musculoskeletal Disorders (WMSDs) [2], [3], [11]. Given that all 30 participants reported discomfort in multiple body regions, the findings suggest a systemic ergonomic deficiency in the current workstation design. Therefore, ergonomic interventions are necessary, particularly in the form of seat cushioning, lumbar support, and adaptive features that align with the tailor's body dimensions and seated postures. Addressing these high-risk areas is critical for improving long-term occupational health and comfort among mobile tailors.

Table 4 - Correlation between age and complaint scores

		Age (Years)	Complaint Score
Age (Years)	Pearson Correlation	1	.155
	Sig. (2-tailed)		.413
	N	30	30
Complaint Score	Pearson Correlation	.155	1
	Sig. (2-tailed)	.413	
	N	30	30

The Pearson correlation coefficient between Age and Complaint Scores is 0.155, indicating a weak and positive relationship between the two variables. The significance value (2-tailed Sig.) is 0.413, greater than the common significance level ($\alpha = 0.05$). This means the relationship between Age and Complaint Scores is not statistically significant. Therefore, there is insufficient evidence to conclude that a person's age influences the number of complaints they provide.

Table 5 - Correlation between length of work and complaint scores

		Length of Work (Years)	Complaint Score
Length of Work (Years)	Pearson Correlation	1	.241
	Sig. (2-tailed)		.199
	N	30	30
Complaint Score	Pearson Correlation	.241	1
	Sig. (2-tailed)	.199	
	N	30	30

The Pearson correlation coefficient between Length of Work and Complaint Scores is 0.241, indicating a weak and positive relationship between the two variables. The significance value (2-tailed Sig.) is 0.199, also greater than the significance level ($\alpha = 0.05$). This means the relationship between the Length of Work and Complaint Scores is not statistically significant. Therefore, the length of time a person has been working does not significantly influence the number of complaints submitted.

The results of the correlation analysis reveal that neither age nor length of employment demonstrates a statistically significant relationship with the complaint score. This suggests that variations in these two factors do not meaningfully influence the level of complaints reported by the respondents. Consequently, age and length of employment cannot be regarded as primary predictors for assessing the severity or frequency of complaints within the studied population. These findings suggest that other variables, such as ergonomic work conditions, physical workload, psychological stressors, or individual health factors, may play a more significant role in explaining the variability observed in complaint scores. Further research is warranted to identify and evaluate additional factors that could serve as more reliable predictors of reported complaints and to develop targeted interventions aimed at addressing the root causes of these issues.

3.3. Semi-Structured Interview Findings

The semi-structured interviews were conducted in Bahasa Sunda, the native language of most participants, to ensure better clarity, comfort, and authenticity in responses. Using the local language allowed participants to express their experiences and perceptions more naturally, particularly when describing physical sensations, work habits, and personal reflections related to their occupation. All quotations presented in this paper have been translated into English for clarity while maintaining the original meaning and context. Semi-structured interviews with 30 itinerant tailors revealed recurring themes related to physical discomfort, usability of existing workstations, and expectations for improvement. While participants expressed adaptation to pain over time, they also highlighted specific ergonomic concerns, particularly related to lower back and buttock discomfort. The table below summarizes the findings:

Table 6 - Summary of Interview Themes and Representative Quotes

Interview Focus	Emerging Theme	Summary Description	Verbatim Quote (Translated)
1. Pain points and triggers	Lower back and buttock soreness	Discomfort caused by long hours of sitting without sufficient support	"I feel soreness and heat from prolonged sitting, but I've gotten used to it."
2. Perception of current workstation	Functional but lacking comfort	Seat is easy to use and maintain, but lacks cushioning and stability	"I added foam to the seat to make it more comfortable."
	Self-modification strategies	Tailors improvise by adding padding to reduce discomfort	"I patched it with foam to make it bearable."
3. Expectations for ergonomic improvements	Desire for better back support and padding	Participants hoped for redesigns that reduce pain without losing the practicality of the mobile cart	"I hope someone helps so I don't feel back pain anymore."
	Maintain simplicity and portability	Redesigns should retain foldability and ease of use	"It's easy, just unlock the seat and start sewing."

These responses confirm that physical discomfort is a daily reality and that there is clear interest in workstation improvements. However, such interventions must be designed without compromising the mobile and self-contained nature of the tailor's workspace.

4. CONCLUSION

This study reveals a critical prevalence of musculoskeletal complaints and postural risks among itinerant tailors in Lenteng Agung, South Jakarta. Through the use of the Nordic Body Map (NBM) and Rapid Entire Body Assessment (REBA), all 30 participants were found to be at high to very high risk of developing musculoskeletal disorders, particularly in the buttocks, lower back, and hips. These findings reflect the strain caused by prolonged static sitting, repetitive motion, and lack of ergonomic support. Correlation analysis indicated no significant relationship between age or work experience and the severity of complaints, reinforcing that poor ergonomic conditions are the primary contributors to physical discomfort.

Qualitative insights from semi-structured interviews further support these findings, revealing how tailors cope with discomfort through makeshift modifications while expressing a strong desire for better back support and cushioning. As such, this study highlights the urgent need for ergonomic interventions that are not only anthropometrically appropriate but also compatible with the mobile and informal nature of their work. Future design strategies should emphasize adjustability, simplicity, and education on healthy posture practices to ensure long-term occupational well-being. By integrating empirical data with lived experiences, the study contributes to the growing discourse on inclusive and context-sensitive ergonomic design for the informal sector. Future research may involve prototype development of ergonomic seating tailored to the anthropometry of itinerant tailors, validated through participatory design methods.

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