ORIGINAL RESEARCH ARTICLE

Investigation of the Relationship Between Physical and Psychosocial Job Demands and Musculoskeletal Disorders Among Workers in the Textile Industry

Habib Tayebi Khorrami[1], Teimour Allahyari[1]

Published: 30 August 2026

Abstract

Background Musculoskeletal disorders are among the most common occupational health problems in the textile industry. This study investigated the association between physical and psychosocial job demands and musculoskeletal disorders among employees working in textile factories.

Methods In this cross-sectional study, 201 workers were randomly selected through stratified sampling from 628 employees working in four textile factories located in the Goldasht Industrial Zone. Musculoskeletal symptoms were assessed using the Cornell Musculoskeletal Discomfort Questionnaire, and psychosocial job characteristics were measured using the Job Content Questionnaire. Data were analyzed using path analysis, Spearman correlation coefficient, chi-square test, and independent t test in SPSS version 26. Statistical significance was set at $P < 0.05$.

Results The highest prevalence of musculoskeletal disorders was observed in the neck, 69 percent, and knees, 68 percent. The final path analysis model demonstrated that psychological job demands, $\beta = 0.224$, supervisor support, $\beta = -0.270$, coworker support, $\beta = -0.383$, education level, $\beta = 0.214$, and job tenure, $\beta = 0.124$, had direct effects on neck disorders. In contrast, physical workload, $\beta = 0.027$, physical effort, $\beta = 0.070$, and decision-making skill, $\beta = 0.027$, exerted indirect effects.

Conclusion Psychological job demands were identified as risk factors, whereas supervisor and coworker support functioned as protective factors against neck musculoskeletal disorders. Reducing psychosocial stressors and strengthening workplace social support may help prevent neck musculoskeletal disorders among textile industry workers.

Keywords Musculoskeletal Diseases, Psychosocial Factors, Occupational Diseases, Textile Industry, Social Support

✉ Teimour Allahyari
allahyarit@umsu.ac.ir

1. Department of Occupational Health Engineering, Urmia University of Medical Sciences, Urmia, Iran

Received: 29 December 2025/ Revised: 18 January 2026/ Accepted: 25 January 2026

1 Introduction

Work-related musculoskeletal disorders, WMSDs, are among the most significant occupational health challenges worldwide and represent a major focus in ergonomics research. These disorders contribute substantially to lost work time, increased healthcare costs, reduced productivity, and occupational burnout. [1,2] According to the U.S. Bureau of Labor Statistics, approximately 32 percent of all occupational illnesses reported in 2014 were attributed to musculoskeletal disorders. Over the past decade, attention to WMSDs has intensified due to their association with disability, absenteeism, and reduced productive working hours. [3,4] Globally, musculoskeletal disorders rank second only to cardiovascular diseases in terms of disease burden. [5] Furthermore, a 2020 meta-analysis of 45 studies conducted in Iran reported a relatively high prevalence of WMSDs among Iranian workers compared with other countries.[6]

Unlike many occupational diseases caused by specific chemical exposures, most musculoskeletal disorders are multifactorial in origin. They are influenced by physical, psychosocial, and individual factors.[7] Among these, psychosocial work-related factors have received increasing attention. Psychosocial factors refer to the interaction between organizational conditions and individual psychological characteristics that influence health, job satisfaction, performance, and well-being.[8] Hong and colleagues reported that psychosocial factors reflect workers' perceptions of their organizational environment and experiences at work. These factors are often underestimated in occupational settings, yet they play a significant role in the development and progression of musculoskeletal disorders, particularly low back pain. [9]

Evidence from the textile sector indicates a substantial burden of musculoskeletal disorders. A study published in 2018 reported that 67.28 percent of textile workers experienced musculoskeletal symptoms.[10] A review study conducted in 2014 demonstrated that psychosocial job factors are important contributors to low back pain. [11] In addition, previous research has shown that stress and depressive symptoms are common among textile workers, largely due to unfavourable working conditions and socioeconomic pressures.[12]

Most prior investigations have focused on specific occupational groups, such as nurses or firefighters. Consequently, psychosocial risk factors in the textile industry have not been sufficiently examined. Spinning and weaving processes are classified as physically demanding and hazardous occupations, exposing workers to multiple ergonomic and environmental risk factors. According to the National Institute for Occupational Safety and Health, textile factories are among industries with potentially excessive noise exposure levels.[13]

Therefore, the present study aimed to examine the association between psychosocial job stressors and the prevalence of musculoskeletal disorders among textile workers. The findings are expected to provide evidence to inform ergonomic and organizational interventions designed to prevent musculoskeletal disorders in this sector.

2 Methods

Study Design and Setting

This descriptive, analytical cross-sectional study was conducted in four textile factories in Iran. The study population consisted of 628 workers employed in these factories. Using stratified random sampling proportional to factory size, 215 workers were initially recruited. Fourteen participants were excluded due to incomplete questionnaires or withdrawal, resulting in a final sample of 201 workers. The final sample size was considered adequate for cross-sectional analysis and path modeling, as it exceeded commonly recommended participant-to-parameter ratios for multivariate analysis. Data was collected using anonymous questionnaires administered through structured interviews at the workplace after the end of work shifts.

Participants

Inclusion criteria were age 18 to 65 years, single-job employment, at least one year of work experience, no prior diagnosed musculoskeletal disorders, willingness to participate, and normal body mass index. Exclusion criteria were diagnosed psychological disorders and exposure to severe recent stressful life events, such as divorce or bereavement of a first-degree relative.

Data Collection Instruments

Data were collected using three instruments: a demographic questionnaire, the Job Content Questionnaire, and the Cornell Musculoskeletal Discomfort Questionnaire.

Job Content Questionnaire (JCQ)

The Persian version of the Job Content Questionnaire was validated by Choobineh et al. in 2011 to assess psychosocial job stressors.[14] The instrument is based on the Demand-Control-Support Model developed by Robert Karasek in 1979.[15] The decision latitude, job control, dimension consists of two subscales: skill discretion, 6 items, and decision authority, 3 items. Psychological job demands are assessed using 5 items. Social support includes supervisor support, 4 items, and coworker support, 4 items. Physical job demands include physical effort, 3 items, and isometric physical load, 2

items. Job insecurity is measured with 3 items. Reported Cronbach's alpha coefficients for the Persian version ranged from 0.54 to 0.85, indicating acceptable to good internal consistency across subscales.

Cornell Musculoskeletal Discomfort Questionnaire (CMDQ)

The Cornell Musculoskeletal Discomfort Questionnaire is a standardized self-report instrument used to assess musculoskeletal discomfort across 12 body regions. For each region, scores range from 0 to 90 based on frequency, severity, and interference with work activities. The Persian version was validated by Afifehzadeh Kashani et al. in 2010.[16]

Statistical Analysis

Data were analyzed using SPSS version 26. The chi-square test and independent t test were used to compare categorical and continuous variables, respectively. Spearman correlation coefficient was applied to assess associations between psychosocial factors and musculoskeletal disorders.

Multiple linear regression analysis was performed to identify predictors of musculoskeletal disorders. Path analysis was conducted to examine direct and indirect relationships among variables. Indirect effects were estimated using a regression-based mediation approach. Standardized regression coefficients along theoretically specified pathways were multiplied to calculate indirect effects, enabling identification of variables influencing neck musculoskeletal disorders through psychological job demands. Statistical significance was set at $P < 0.05$.

3 Results

Of the 215 workers initially recruited, 201 completed the study, yielding a response rate of 93.5 percent. All participants were male, and 88.6 percent were married. The mean age was 33.6 ± 7.0 years, the mean job tenure was 10.3 ± 5.61 years, and the mean body mass index, BMI, was 25.3 ± 3.25 kg/m².

The highest prevalence of musculoskeletal disorders was observed in the neck, 69 percent, followed by knees, 68 percent, wrists, 64 percent, lower legs, 61 percent.

Chi-square and independent t tests showed significant associations between job tenure and musculoskeletal disorders in several body regions. Significant relationships were identified for the neck, $P = 0.036$, right shoulder, $P = 0.014$, left shoulder, $P = 0.019$, right arm, $P = 0.043$, right knee, $P = 0.042$, left knee, $P = 0.040$, lower legs, $P = 0.009$, and feet, $P = 0.001$.

Education level was significantly associated only with neck disorders, $P = 0.045$. No significant associations were observed between BMI and musculoskeletal disorders in any body region, $P = 0.468$.

Based on the Job Content Questionnaire scores, the mean ± standard deviation values were as follows: decision latitude, 59.68 ± 13.49; social support, 20.65 ± 5.66; physical job demands, 13.26 ± 3.64; psychological job demands, 31.39 ± 8.04; and job insecurity, 8.66 ± 3.39.

The Kolmogorov, Smirnov test indicated that musculoskeletal disorder scores and psychosocial factor scores were not normally distributed, $P < 0.05$. Therefore, nonparametric analyses were applied.

Correlation Analysis

Spearman correlation analysis demonstrated weak to moderate associations between most psychosocial dimensions and musculoskeletal disorder scores in both upper and lower body regions, $P < 0.05$. No significant correlations were found between decision latitude or its subscales and musculoskeletal disorders, $P > 0.05$.

Notably, neck disorders showed stronger correlations with all psychosocial dimensions compared with other body regions, $P < 0.05$. Significant correlations were also observed between mean severity scores of musculoskeletal disorders and psychosocial dimensions, except for decision latitude and decision-making skill.

Although decision authority was not significant in the bivariate analysis, it was retained in the path model based on the theoretical framework of the Demand-Control-Support model and prior literature.(Table 1)

Given the high prevalence of neck disorders, path analysis was performed to evaluate the direct and indirect effects of psychosocial factors, physical demands, and demographic variables on neck musculoskeletal disorders.

The conceptual model, Figure 1, was developed based on theoretical assumptions and prior research, including psychosocial dimensions, job tenure, education level, and BMI as potential determinants. After empirical testing, the final model was presented as Figure 2.

Multiple linear regression analysis showed a correlation coefficient of $R = 0.668$, indicating a relatively strong association between the independent variables and neck disorders. The adjusted coefficient of determination, $R^2adj = 0.414$, indicated that 41.4 percent of the variance in neck musculoskeletal disorders was explained by the model. The overall model was statistically significant, $F = 13.851$, $P < 0.01$.

According to Figure 2, coworker support, supervisor support, psychological job demands, and education level had direct effects on neck musculoskeletal disorders. In contrast, isometric physical load, physical effort, and decision-making skill exerted indirect effects through psychological job demands (Table 2).

Table 1 Spearman Correlation Coefficients Between Psychosocial Factors and Mean Musculoskeletal Disorder Scores

Body Region	Job Insecurity	Isometric Load	Physical Effort	Physical Job Demands	Supervisor Support	Co-worker Support	Social Support	Psychological Job Demands	Decision Authority	Skill Discretion	Decision Latitude
Neck	0.239***	0.312***	0.360***	0.421***	0.456***	0.328***	0.459***	0.497***	0.266***	0.101	0.138
Right Shoulder	0.063	0.245***	0.297***	0.337***	0.276***	0.192**	0.285***	0.402***	0.158*	0.100	0.052
Left Shoulder	0.057	0.224**	0.297***	0.327***	0.316***	0.181*	0.294***	0.383***	0.186**	0.079	0.082
Upper Back	0.076	0.083	0.164	0.166	0.065	0.191**	0.135	0.175	0.050	0.115	0.027
Upper Right Arm	0.144*	0.173*	0.200**	0.230**	0.311***	0.089	0.236**	0.369***	0.207**	0.236**	0.118
Upper Left Arm	0.075	0.118	0.166*	0.170*	0.266**	0.047	0.130	0.326***	0.131	0.085	0.043
Lower Back	0.103	0.138	0.063	0.102	0.077	0.156*	0.140*	0.141*	0.112	0.029	0.071
Right Forearm	0.088	0.161*	0.130	0.158*	0.255**	0.215**	0.253***	0.280***	0.176*	0.004	0.143*
Left Forearm	0.025	0.101	0.153*	0.150*	0.147*	0.164*	0.172*	0.192***	0.165*	0.062	0.093
Right Wrist	0.095	0.100	0.228**	0.201*	0.195	0.281***	0.286***	0.305***	0.198	0.062	0.110
Left Wrist	0.096	0.083	0.243**	0.204**	0.211**	0.303***	0.306***	0.250***	0.214**	0.034	0.142*
Hip	0.044	0.045	0.121	0.120	0.270	0.146	0.108	0.097	0.084	0.029	0.051
Right Thigh	0.054	0.195**	0.005	0.078	0.039	0.114	0.085	0.150*	0.051	0.001	0.044
Left Thigh	0.028	0.154*	0.043	0.087	0.018	0.058	0.036	0.113	0.043	0.001	0.037
Right Knee	0.146*	0.203**	0.180*	0.228**	0.178*	0.132	0.178*	0.291***	0.160*	0.092	0.054
Left Knee	0.130	0.215**	0.204**	0.250***	0.170*	0.107	0.159*	0.246***	0.140*	0.108	0.028
Lower Right Leg	0.160*	0.156*	0.153*	0.188**	0.266***	0.120	0.221**	0.293***	0.131	0.094	0.022
Lower Left Leg	0.162	0.155	0.147	0.185**	0.280***	0.117	0.230***	0.291***	0.124	0.086	0.019
Right Foot	0.154*	0.158*	0.134	0.174*	0.255***	0.203**	0.286***	0.251***	0.196**	0.030	0.142*
Left Foot	0.140*	0.156*	0.155*	0.182**	0.263***	0.205**	0.291***	0.255***	0.198**	0.033	0.146*

Note: ***p < 0.001, **p < 0.01, *p < 0.05

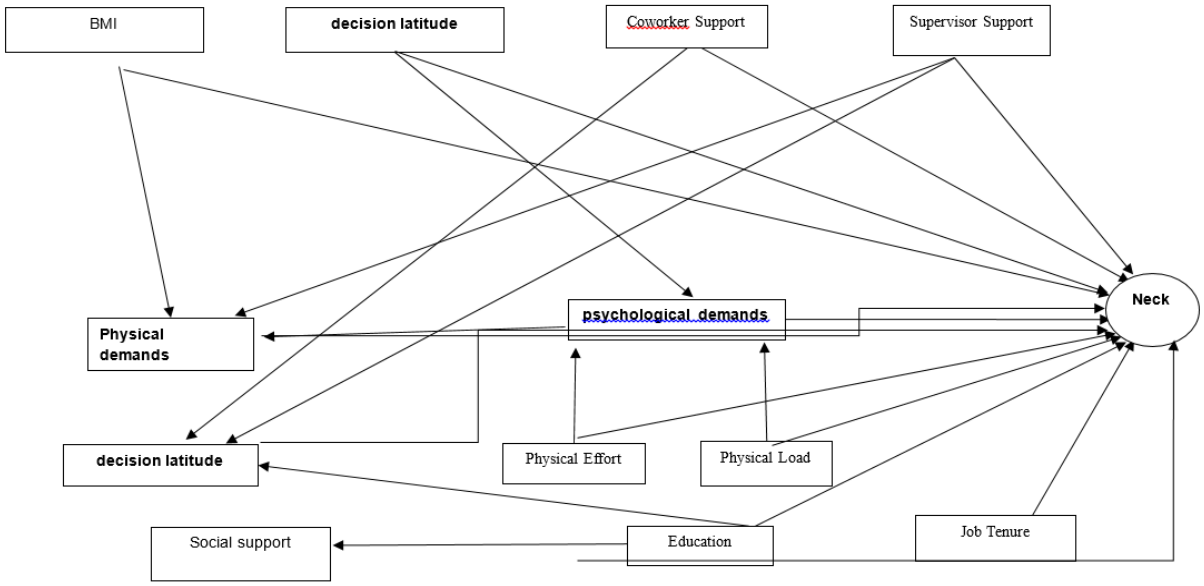

Figure 1 Theoretical Path Model of Psychosocial Factors, Demographic Variables, and Neck Musculoskeletal Disorders

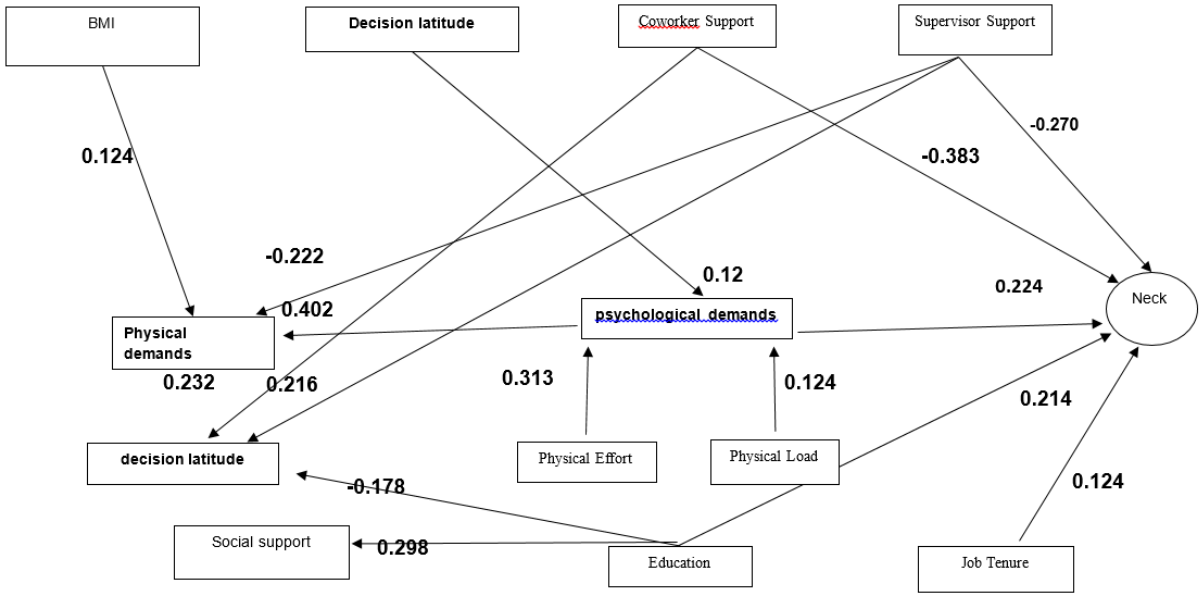

Figure 2 Empirical Path Model of Psychosocial Factors, Demographic Variables, and Neck Musculoskeletal Disorders

Table 2 Direct, Indirect, and Total Effects of Independent Variables on Neck Musculoskeletal Disorders

Independent Variable	Direct Effect	Indirect Effect	Total Effect
Supervisor Support	-0.27	–	0.27
Coworker Support	-0.383	–	0.383
Psychological Job Demands	0.224	–	0.224
Education	0.214	–	0.214
Job Tenure	0.124	–	0.124
Physical Load	–	0.124 × 0.224	0.027
Physical Effort	–	0.313 × 0.224	0.070
Decision-Making Skill	–	0.124 × 0.224	0.027

Indirect effects were calculated through mediating variables in the path mode

4 Discussion

The primary objective of this study was to examine the association between physical and psychosocial job demands and the prevalence of musculoskeletal disorders among textile industry workers. The final sample included 201 production-line workers employed in four textile factories located in the Goldasht industrial area of Najafabad.

Prevalence of Musculoskeletal Disorders

The findings demonstrated a high prevalence of musculoskeletal disorders across multiple body regions. In the upper extremities, prevalence rates were highest in the neck, 69 percent, followed by the shoulders, 64 percent, wrists, 64 percent, upper arms, 58 percent, forearms, 51 percent, and upper back, 41 percent. In the lower extremities, the highest prevalence was observed in the knees, 68 percent, followed by the feet, 61 percent, lower back, 60 percent, thighs, 31 percent, and hips, 16 percent.

These findings are broadly consistent with previous research. Tania et al. reported a prevalence of 68.9 percent for neck disorders among women and 63.16 percent among men, with substantial involvement of the upper back and shoulders.[17] Similarly, Moussavi Najarkola and Mirzaeiet reported high prevalence rates in textile workers, including 67.7 percent in the neck and 87 percent in the upper arms.[18] A national meta-analysis conducted in Iran between 2001 and 2016 also identified the neck as one of the most frequently affected regions. [6] Although absolute prevalence rates vary across studies, likely due to differences in methodology and occupational context, the overall pattern is comparable.

Demographic Factors

A significant association was observed between job tenure and musculoskeletal disorders in the knees and feet. This finding aligns with reports from steel, aluminum, and metal-structure manufacturing industries. [19,20] The absence of significant associations in other body regions may reflect the occupational structure of the textile sector, where physically demanding tasks allow retirement after 20 years of service. Consequently, many workers are relatively young with moderate job tenure. In addition, the nature of textile production, which often requires prolonged standing and repetitive lower-limb activity, may explain the stronger association with knee and foot disorders.

Education level was associated with neck disorders, suggesting that lower educational attainment may be linked to assignment to more physically demanding or repetitive tasks. No significant relationship was observed between BMI and musculoskeletal disorders, which may reflect the relatively homogeneous BMI distribution in this occupational group.

Psychosocial Factors

Workers reported relatively high decision latitude and low job insecurity, suggesting that these dimensions were unlikely to be major stressors in this setting. In contrast, psychological job demands and physical job demands were reported at higher levels, indicating substantial workload pressure and time constraints.

Findings from other occupational groups show similar patterns. Gholami et al. reported comparable mean scores for psychosocial dimensions among nurses.[21] Gomez-Ortiz also documented similar distributions of decision latitude, psychological job demands, and social support among Colombian nurses.[22] Although occupational contexts differ, these studies support the relevance of psychosocial constructions measured by the Job Content Questionnaire.

A significant association was observed between physical job demands and musculoskeletal disorders in nearly all body regions, except the thighs. Tun Win demonstrated that physical job demands were significant predictors of work-related musculoskeletal disorders among sewing-machine operators.[23] Likewise, Stijn et al. reported positive associations between physical job demands and musculoskeletal disorders among nursing assistants.[24] These findings reinforce the central role of biomechanical load in the development of musculoskeletal symptoms.

In contrast, no significant association was identified between decision latitude and musculoskeletal disorders. Similar results were reported by Lorusso et al. among radiology technicians[25] and by Choobineh et al. in an ergonomic intervention study among office workers. [26] However, other studies have identified low decision latitude as a risk factor for shoulder pain or general musculoskeletal disorders.[23] These discrepancies may be attributable to differences in task characteristics, organizational structure, and workforce demographics.

Social Support and Path Analysis Findings

Social support, including supervisor and coworker support, showed significant associations with musculoskeletal disorders across body regions. Datience and Erick reported that higher levels of social support were associated with lower musculoskeletal disorder prevalence among schoolteachers.[27]

Path analysis demonstrated that coworker support, supervisor support, and psychological job demand exerted direct effects on neck disorders. Isometric physical load and physical effort showed indirect effects. Education level also demonstrated a direct association with neck disorders. Tun Win Oo identified job stress and physical job demands as important predictors of musculoskeletal

disorders,[23] findings that are consistent with the present study.

Similarly, Silva et al. reported that psychosocial factors, including occupational stress, psychological job demands, and low supervisor support, increased the likelihood of musculoskeletal disorders among production-line workers.[28] These findings collectively support the Demand-Control-Support theoretical framework.

The prominent role of supervisor and coworker support observed in this study suggests that social support functions as a protective factor. In textile production environments characterized by repetitive tasks and sustained postures, limited social support may intensify muscle tension and prolong static loading, thereby increasing the risk of neck disorders. Social support therefore represents a modifiable target for organizational and ergonomic interventions.

Several limitations should be considered. First, environmental factors such as noise, temperature, and lighting were not included in the analytical model, although they may influence occupational stress and musculoskeletal outcomes. Second, the study population was limited to male workers within a single geographic region, which may restrict generalizability. Third, the relatively modest sample size may limit statistical power for detecting smaller effects. Finally, the cross-sectional design precludes causal inference between psychosocial factors and musculoskeletal disorders.

Future longitudinal studies incorporating environmental exposures and diverse worker populations are recommended to clarify causal pathways and strengthen external validity.

5 Conclusion

The findings indicate that psychological job demands act as risk factors, whereas supervisors and coworker support function as protective factors against neck musculoskeletal disorders among textile workers. Physical job demands also contribute directly and indirectly to musculoskeletal outcomes.

These results highlight the need for macro-ergonomic interventions aimed at task redesign, workload management, and strengthening workplace social support systems. Reducing psychological job demands and minimizing physical risk factors, including repetitive tasks, static postures, and high-force exertion, may reduce the burden of musculoskeletal disorders and improve productivity in the textile industry.

Declarations

Acknowledgments
Not applicable

Artificial Intelligence Disclosure
The author declared utilized ChatGPT-4 (OpenAI) solely for the purpose of enhancing the clarity, coherence, and grammar of the English language. The authors have reviewed and approved all modifications to ensure accuracy and alignment with the research objectives.

Authors' Contributions
Habib Tayebi Khorrami and Teimour Allahyari contributed to study design and conceptualization. Data collection and analysis was conducted by Habib Tayebi Khorrami. Habib Tayebi Khorrami drafted the initial manuscript. Teimour Allahyari. critically revised the manuscript, and approved the final version.

Availability of Data and Materials
The essential data of this study are available and can be provided upon request.

Conflict of Interest
The authors declare that they have no competing interests.

Consent for Publication
Not applicable.

Ethical Considerations
Ethical approval for this study was obtained from the Ethics Committee of Urmia University of Medical Sciences (Ethics Code: IR.UMSU.REC.1400.406). The study was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants prior to data collection.

Funding
The author has no funding to report.

References

1. Khandan M, Koohpaei A, Kohansal Aghchay M, Ebrahimi MH, Khammar A, Arsang Jang S, et al. Assessing the factors predicting work-related musculoskeletal disorders among Iranian port personnel using regression models. Iranian Rehabilitation Journal. 2017;15(4):309–316. doi:10.29252/nrip.irj.15.4.309.
2. Khandan M, Vosoughi S, Poursadeghiyan M, Azizi F, Ahounbar E, Koohpaei A. Ergonomic assessment of posture risk factors among Iranian workers: an alternative to conventional methods. Iranian Rehabilitation Journal. 2018;16(1):11–16. doi:10.29252/nrip.irj.16.1.11.

3. Anghel M, Argesanu V, Talpo C, Lungeanu D. Musculoskeletal disorders as consequences of prolonged static postures. Journal of Experimental Medical & Surgical Research. 2007;4:167–172.
4. Pelnar P. Vibration-induced arterial shear stress. Arch Environ Health. 1973;27(2):116–119. doi:10.1080/00039896.1973.10666332.
5. Chiasson MÈ, Imbeau D, Aubry K, Delisle A. Comparing the results of eight methods used to evaluate risk factors associated with musculoskeletal disorders. Int J Ind Ergon. 2012;42(5):478–488. doi:10.1016/j.ergon.2012.07.003.
6. Parno A, Sayehmiri K, Amjad RN, Ivanbagha R, Ahagh MMH, Foladi SH, et al. Meta-analysis of work-related musculoskeletal disorders in Iran. Archives of Rehabilitation. 2020;21(2):182–205. doi:10.32598/RJ.21.2.2444.4.
7. Punnett L, Wegman DH. Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. J Electromyogr Kinesiol. 2004;14(1):13–23. doi:10.1016/j.jelekin.2003.09.015.
8. Theorell T. Psychosocial factors in research on work conditions and health in Sweden. Scand J Work Environ Health. 2007;33(Suppl 1):20–26.
9. Huang GD, Feuerstein M, Sauter SL. Occupational stress and work-related upper extremity disorders: concepts and models. Am J Ind Med. 2002;41(5):298–314. doi:10.1002/ajim.10045.
10. Angeline GN, Bobby J. Work-related musculoskeletal disorders among adolescent girls and young women employed in textile industries in Tamil Nadu, India. Int J Adolesc Med Health. 2018;30(6):1–8. doi:10.1515/ijamh-2016-0116.
11. Yilmaz E, Dedeli O. Effect of physical and psychosocial factors on occupational low back pain. J Back Musculoskelet Rehabil. 2014;27(3):345–352.
12. Gnanaselvam NA, Joseph B. Depression and behavioral problems among adolescent girls and young women employees of the textile industry in India. Workplace Health Saf. 2018;66(1):24–33. doi:10.1177/2165079917716187.
13. Babaei Heydarabadi A, Mohammadpuor H, Fallah Madvari, A, Mosa Qarkhani M, Fallah Madvar R, Afshin A. Study the status of job stress and work-related stressors among the employees of a Spinning industry. J Occup Health Psychol. 2017;14(2):45–53.
14. Choobineh A, Ghaem H, Ahmedinejad P. Validity and reliability of the Persian version of the Job Content Questionnaire among hospital nurses. East Mediterr Health J. 2011;17(4):335–341. doi:10.26719/2011.17.4.335.
15. Karasek R, Brisson C, Kawakami N, Houtman I, Bongers P, Amick B. The Job Content Questionnaire (JCQ): an instrument for internationally comparative assessments of psychosocial job characteristics. J Occup Health Psychol. 1998;3(4):322–355. doi:10.1037/1076-8998.3.4.322.
16. Afifehzadeh Kashani H, Choobineh A, Bakand S, Gohari MR, Abbastabar H, Moshtaghi P. Validity and reliability of the Persian version of the Cornell Musculoskeletal Discomfort Questionnaire. Iran Occupational Health. 2011;7(4):1–8.
17. Lima TM, Coelho DA. Ergonomic and psychosocial factors and musculoskeletal complaints in public sector administration. Int J Ind Ergon. 2018;66:85–94. doi:10.1016/j.ergon.2018.02.006.
18. Moussavi Najarkola SA, Mirzaei R. Evaluation of upper limb musculoskeletal loads using RULA in a textile factory. Health Scope. 2012;1(2):25–33.
19. Aghilinejad M, Choobineh A, Sadeghi Z, Nouri M, Ahmadi AB. Prevalence of musculoskeletal disorders among Iranian steel workers. Iran Red Crescent Med J. 2012;14(4):198–203.
20. Choobineh A, Soleimani E, Daneshmandi H, Mohamadbeigi A, Izadi K. Prevalence of musculoskeletal disorders and posture analysis using the RULA method among dentists. The Journal of Islamic Dental Association of Iran. 2012;24(4):244–250.
21. Gholami T, Heidari Pahlavian A, Akbarzadeh M, Motamedzade M, Heidari Moghadam R. Structural equation modeling of job stress and musculoskeletal disorders. Iranian Journal of Ergonomics. 2015;3(3):51–64.
22. Gomez-Ortiz V. Assessment of psychosocial stressors at work: psychometric properties of the JCQ in Colombian workers. Rev Latinoam Psicol. 2011;43(2):329–342.
23. Oo TW, Taneepanichskul N. Work-related musculoskeletal disorders, psychosocial factors, and work ability among garment factory workers in Myanmar. J Occup Health. 2022;64(1):e12314.
24. Keyaerts S, Godderis L, Delvaux E, Daenen L. Association between work-related physical and psychosocial factors and musculoskeletal disorders in healthcare workers. J Occup Health. 2022;64(1):e12314. doi:10.1002/1348-9585.12314.
25. Lorusso A, Bruno S, L'Abbate N. Musculoskeletal complaints among Italian X-ray technologists. Ind Health. 2007;45(5):705–708. doi:10.2486/indhealth.45.705.
26. Choobineh A, Motamedzade M, Kazemi M, Moghimbeigi A, Pahlavian AH. Impact of ergonomic intervention on psychosocial factors and musculoskeletal symptoms among office workers. Int J Ind Ergon. 2011;41(6):671–676. doi:10.1016/j.ergon.2011.08.007.
27. Erick PN, Smith DR. Musculoskeletal disorders among school teachers: prevalence and risk factors. Occup Med Health Aff. 2014;2(4):1–7. doi:10.1186/1471-2474-15-359.
28. ilva JM, Silva LB, Gontijo LA. Relationship between psychosocial factors and musculoskeletal disorders in footwear industry workers. Production. 2017;27:e20162315. doi:10.1590/0103-6513.231516.