CoMPHI Journal: Community Medicine and Public Health of Indonesia Journal
Vol. 6, No. 3, February 2026, hlm. 195-200

e-ISSN 2722-8169
p-ISSN 2723-097X

The Relationship between Ergonomic Position and Disability Level Due to Low Back Pain (LBP) among Ceramic Craftsmen in Dinoyo Ceramic Village, Malang

Deka Bagus Binarsa[1*], Tutik Purwanti[1], Ma'ruf Ilham Hanafi[2], Annisa Nurul Arofah[2]

[1]Department of Forensic and Medicolegal, University of Muhammadiyah Malang, Malang, Indonesia
[2]University of Muhammadiyah Malang, Malang, Indonesia

Article History:
Received: 2025-12-07
Revised: 2026-01-02
Accepted: 2026-01-25
Publish: 2026-02-28

Key words:
Ceramic Craftsmen, Disability, Ergonomics, Low Back Pain (LBP), REBA

Author correspondence:
***Correspondence of the author:**
Name : Deka Bagus Binarsa
Email : deka@umm.ac.id
Affiliation : Department of Forensic and Medicolegal, University of Muhammadiyah Malang, Malang, Indonesia

ABSTRACT

Low Back Pain (LBP) is one of the main Musculoskeletal Disorders (MSDs) caused by work, especially in professions that involve non-ergonomic postures such as ceramic craftsmen. This study aims to examine the relationship between ergonomic position and the level of disability due to LBP in this population. This study used an analytical observational method with a cross-sectional design conducted on 19 ceramic craftsmen in Kampung Keramik Dinoyo, Malang. The sample was selected using purposive sampling with the criterion of more than 5 years of work experience. The independent variable (Ergonomic Position) was measured using the Rapid Entire Body Assessment (REBA) worksheet, and the dependent variable (LBP Disability) was measured using the Modified Oswestry Low Back Pain Disability Questionnaire (MODQ). The data were analyzed using Spearman's correlation test. It was found that 100% of respondents had ergonomic risks, with 15 people (78.9%) in the moderate risk category and 4 people (21.1%) in the high risk category. Most respondents (89.5%) experienced LBP disability, with 11 people (57.9%) experiencing moderate disability and 6 people (31.6%) experiencing severe disability. The results of the Spearman correlation test showed a positive and statistically significant correlation between the level of ergonomic risk and the level of LBP disability (correlation coefficient r = 0.468; p-value = 0.043). There is a significant relationship between poor ergonomic positioning and increased disability due to LBP among ceramic craftsmen. These findings indicate the urgent need for ergonomic interventions to improve work posture and reduce the risk of functional disability among workers.

INTRODUCTION

Musculoskeletal disorders (MSDs) have been identified as a dominant occupational health problem globally. MSDs contribute significantly to reduced work productivity, increased compensation and healthcare costs, and reduced quality of life for workers. Among the various MSD complaints, low back pain (LBP) is the most common complaint (Nicol et al., 2023). Data from the World Health Organization (WHO) in 2021 shows that the global prevalence of LBP reaches 568 million people (WHO, 2021). LBP is often categorized as an Occupational Disease (OD), which is a disease that arises from work activities or environmental conditions (Lestari et al., 2023). Occupational risk factors that contribute to LBP include activities involving repetitive heavy lifting, awkward (unnatural) postures, and long working hours (Wardoyo et al., 2021). Excessive and continuous muscle contraction due to poor posture can inhibit muscle metabolism, cause lactic acid accumulation, and stimulate pain receptors (nociceptors) (Ardi et al., 2021).

The informal sector workforce, such as artisans, is a group that is vulnerable to MSDs but often not covered by formal occupational health and safety regulations. One high-risk occupation is

e-ISSN 2722-8169
p-ISSN 2723-097X

ceramic artisans. The ceramic manufacturing process requires workers to maintain certain postures for long periods of time, often with inadequate work equipment (Usman et al., 2022). Specific problems identified among ceramic artisans are work positions dominated by a bent posture (lumbar flexion) and the use of non-ergonomic chairs (Usman et al., 2022). This non-ergonomic static posture, when maintained repetitively for hours every day, can cause cumulative injuries to the musculoskeletal system, manifesting as chronic LBP and functional disability (Usman et al., 2022). Given the prevalence and clear risk factors, this study aims to determine whether there is a relationship between ergonomic posture and disability due to LBP among ceramic artisans in the Dinoyo Ceramic Village Industry Sector in Malang.

METHODOLOGY

This study adopted an analytical observational method with a cross-sectional approach to identify the relationship between ergonomic work positions and the level of disability due to low back pain (LBP), where both variables were measured simultaneously in the same period of time. The study took place in the Dinoyo Ceramic Village Industrial Sector, Malang City, in November 2024.

Of all ceramic workers at the research site, 19 people were selected as respondents using purposive sampling with a minimum employment period of 5 years as the criterion, while workers who refused to participate or had a history of spinal trauma were not included. The level of disability due to LBP was measured using the Modified Oswestry Low Back Pain Disability Questionnaire (MODQ), a validated instrument that assesses the impact of back pain on daily activities such as lifting, walking, sitting, sleeping, and social life, with results categorized as minimal disability (0-20%), moderate (21-40%), and severe (41-60%) (Fritz & Irrgang, 2001).. Work ergonomics were assessed through direct observation using the Rapid Entire Body Assessment (REBA) worksheet, which analyzes overall body posture from the neck, back, legs, to the wrists, taking into account load and grip factors, resulting in a risk level score ranging from negligible to very high (Pratiwi et al., 2021). After obtaining the respondents' consent, the researchers documented work activities through photos and videos for accurate posture analysis, then the respondents independently filled out the MODQ questionnaire. Data processing was performed using SPSS with univariate analysis to describe the distribution of respondent characteristics and Spearman's correlation test to examine the strength of the relationship between ergonomic position and LBP disability with a significance level of $p<0.05$. This study has obtained ethical approval from the Health Research Ethics Committee (KEPK) of Muhammadiyah University Malang with number E.5.a/288/KEPKUMM/XI/2024.

RESULTS AND DISCUSSION

RESULT

A total of 19 ceramic artisans participated in this study. The characteristics of the respondents are presented in Table 1. The majority of respondents were male (63.2%), with the largest age group being 46-55 years old (36.8%). In accordance with the inclusion criteria, 100% of respondents had worked for more than 5 years. The dominant daily working hours were 8 hours per day (47.4%) and 7 hours per day (36.8%).

Univariate analysis of the research variables (Table 1) shows a clear picture of occupational health conditions at the research site. In the Ergonomic Position (REBA) variable, none (0%) of the respondents were in the “Negligible” or “Low” risk categories. Most respondents, namely 15 people (78.9%), worked in positions that fell into the Moderate Risk category (REBA score 4-7). The remaining 4 people (21.1%) were in the High Risk category (REBA score 8-10).

Regarding the LBP Disability (MODQ) variable, only 2 people (10.5%) experienced Minimal Disability. The majority of respondents (89.5%) reported experiencing functional disability due to LBP. The distribution was 11 people (57.9%) experiencing Moderate Disability (MODQ score

e-ISSN 2722-8169
p-ISSN 2723-097X

21-40%) and 6 people (31.6%) experiencing Severe Disability (MODQ score 41-60%).

Table 1. Distribution of Respondent Characteristics Based on Gender, Age, Length of Employment, Duration of Employment, Severity of LBP, Ergonomic Position

Variable	Category	Frequenci (n)	Percentage (%)
Gender	Male	12	63.2%
	Female	7	36.8%
Age	<25 years old	4	21.1%
	26-35 years old	1	5.3%
	36-45 years old	2	10.5%
	46-55 years old	7	36.8%
	56-65 years old	4	21.1%
	>65 years old	1	5.3%
Working Hours	5-7 hour/day	8	42.1%
	8-10 hour/day	11	57.9%
Ergonomic Position (REBA)	Low Risk (Score 1-3)	0	0.0%
	Medium Risk (Score 4-7)	15	78.9%
	High Risk (Score 8-10)	4	21.1%
LBP disability (MODQ)	Minimal Disability (0-20%)	2	10.5%
	Moderate Disability (21-40%)	11	57.9%
	Severe Disability (41-60%)	6	31.6%

(Primary Data, 2024)

To test the research hypothesis, a Spearman correlation analysis was conducted between the ergonomic risk score (REBA) and the LBP disability score (MODQ). The results of the analysis showed a correlation coefficient (r) of 0.468 with a significance value (p) of 0.043.1

Since the p = 0.043 value is smaller than the predetermined significance level (p < 0.05$), H0 is rejected. This indicates that "There is a statistically significant relationship between ergonomic position and disability due to LBP."1 The positive correlation (r = 0.468$) indicates that the higher the ergonomic risk score (the worse the position), the higher the LBP disability score experienced by the craftsmen.

Cross-correlation analysis (Table 2) clarifies these findings. In the Moderate Risk group (n=15), the majority (10 people) experienced Moderate Disability, and 3 people experienced Severe Disability. In the High Risk group (n=4), no one experienced minimal disability, and most (3 people) experienced Severe Disability.

Table 2. Cross-Correlation between Ergonomic Risk Categories (REBA) and LBP Disability Levels (MODQ)

Degree of Severity of LBP										
Ergonomic Position	Minimal Disability		Moderate Disability		Severe Disability		Total		R	P-value
	N	%	N	%	N	%	N	%		
Medium Risk	2	10.5 %	10	52.6 %	3	15.8 %	15	78.9 %		
High Risk	0	0.0%	1	5.3%	3	15.8 %	4	21.1 %	0.468	0.043
Total	2	10.5 %	11	57.9 %	6	31.6 %	19	100 %		

(Primary Data, 2024)

DISCUSSION

A study of 19 workers in the Dinoyo Malang Ceramic Village Industrial Sector showed that the majority of respondents were men, numbering 12 (63.2%), while female workers numbered 7 (36.8%). Women have a higher risk of experiencing LBP complaints due to fluctuating estrogen hormone levels caused by pregnancy, contraception, and menopause. Increased estrogen causes an increase in the hormone relaxin, resulting in weakness in the joints and ligaments of the waist, while a decrease in estrogen during menopause reduces bone density (Ayuni & Inayah, 2023; Rahmawati, 2021). A study (To et al., 2020) on gas station operators in Kupang City supports these findings, stating that women's muscle strength is only 60% of men's, especially in the arms, back, and legs, with a ratio of muscle complaints between women and men of 3:1.

Most respondents were over 25 years old (15 people, 78.9%) and all had worked for over 5 years. This age and length of employment increase the risk of LBP due to tissue degeneration, changes in body posture, and reduced fluid in the intervertebral discs (Wardoyo et al., 2021). The degeneration process causes disc space thinning and reduces the lumbar spine's ability to bear body weight by 40-50% (Steven & Andriani, 2023). Longer work experience prolongs exposure to risk factors and accelerates spinal degeneration (Wardoyo et al., 2020).

e-ISSN 2722-8169
p-ISSN 2723-097X

Daily working hours varied: 9 respondents worked 8 hours, 7 respondents worked 7 hours, 2 respondents worked >8 hours, and 1 respondent worked 5 hours. The optimal working hours are 6-8 hours per day so that workers have sufficient time for rest and other activities (Handayani & Demiyati, 2022).

The main findings of this study confirm a statistically significant positive relationship ($p = 0.043$) between ergonomic position and the level of disability due to LBP in ceramic craftsmen. The positive correlation ($r = 0.468$) indicates that poorer work posture is directly related to a higher level of functional impairment. These findings are consistent with previous studies, such as those conducted by Sanjaya & Lumbantobing (2021), who also found a significant relationship between prolonged static sitting work positions and LBP complaints.

The underlying injury mechanism for this relationship can be explained pathophysiologically. The work postures identified in the study, namely "bent body" and "non-ergonomic chair," forced workers to maintain a static lumbar flexion posture for long working hours (mostly 7-8 hours per day). This static posture required continuous contraction of the lower back muscles to stabilize the spine. This prolonged isometric contraction inhibits blood flow to muscle tissue, causing local ischemia, decreased oxygen supply, and accumulation of metabolic waste products such as lactic acid. This condition in turn activates nociceptors (pain receptors), which when chronic will cause LBP and decreased functional capacity.

One of the most important findings of this study is implied by the data in Table 2. Although 78.9% of workers were classified as having "Moderate Risk" based on their REBA scores, MODQ data showed that 13 out of 15 people (86.7%) in this group already suffered from moderate to severe disability. This suggests that the "Moderate Risk" category on the REBA measurement tool may not fully capture the dangers of maintaining static postures for long periods of time. Duration appears to be the dominant pathological component, causing significant functional disability (89.5% of the total sample) despite an absolute posture score of "moderate." Furthermore, in the "High Risk" group, 3 out of 4 workers (75%) had suffered "Severe Disability," indicating that at this risk level, severe disability is almost inevitable.

These findings have urgent clinical and occupational health implications. The fact that 100% of workers are in the moderate or high risk category indicates a systemic failure in the design of workstations in the Dinoyo ceramics industry. The recommendations proposed in the original thesis are highly relevant: ergonomic interventions are urgently needed. This includes redesigning workstations, particularly work chairs to provide lumbar support (maintaining lordosis) and adjusting the height of turntables to reduce the need for excessive back flexion. In addition, regular health surveillance is essential to detect LBP at an early stage before it develops into severe disability.

This study has several limitations that must be acknowledged. First, the cross-sectional design does not allow for the determination of cause-and-effect relationships (causality); it cannot be ascertained whether poor posture causes LBP or whether pre-existing LBP forces workers to adopt certain postures. Second, the small sample size (N=19) limits the ability to generalize these findings to the broader population of ceramic artisans. However, it should be noted that finding statistical significance ($p = 0.043$) with such a small sample highlights the strength of the relationship between posture and disability in this population. Third, the inclusion criterion of "length of service > 5 years" likely created a healthy worker survivor effect, whereby workers who experienced severe LBP in the early years may have already left the job. This implies that the 89.5% prevalence of LBP disability found in this study is likely an underestimation of the actual problem.

CONCLUSION

Based on the results of the study and discussion, several conclusions can be drawn as follows:

e-ISSN 2722-8169
p-ISSN 2723-097X

1. There is a statistically significant relationship (p = 0.043) with a positive correlation (r = 0.468) between ergonomic position and the level of disability due to low back pain (LBP) among ceramic craftsmen in the Dinoyo Ceramic Village Industry Sector in Malang.
2. Most artisans (89.5%) experienced functional LBP disability, with 57.9% experiencing moderate disability and 31.6% experiencing severe disability, indicating the high prevalence of this problem.
3. All artisans (100%) worked in positions with ergonomic risks (78.9% moderate risk and 21.1% high risk).
4. These findings highlight the urgent need for ergonomic interventions, such as improving workstation design and regular health monitoring, to prevent worsening disability in this worker population.

ACKNOWLEDGEMENTS

The highest appreciation and gratitude are also expressed to all ceramic artisans in the Dinoyo Malang Ceramic Village Industrial Sector who have been willing to take the time to become respondents and participate in this research.

REFERENCES

Alammari, N. A., & Ibrahim Alabdali, M. Y. (2025). Psychosocial and Occupational Factors Associated With Low Back Pain Among Healthcare Professionals: A Systematic Review. Cureus, 17(1), e77426. https://doi.org/10.7759/cureus.77426

Ardi, S. Z., Indriastika, L., Hidayah, Q., & Dahlan, U. A. (2021). Hubungan Antara Masa Kerja Dan Sikap Kerja Dengan Keluhan Low Back Pain Pada Buruh Gendong Pasar Beringharjo Kota Yogyakarta. Jurnal Dunia Kesmas, 10(2), 213–220.

Ayuni, R. F., & Inayah, Z. (2023). Hubungan Posisi Kerja dengan Keluhan Low Back Pain pada Pekerja Sarang Burung Walet Kembangbahu Relationship Work Position and Complaints of Low Back Pain in Kembangbahu Swiftlet Nest Workers. Kesehatan Masyarakat, 8(1), 395–403.

Chaiklieng, S., & Suggaravetsiri, P. (2020). Low Back Pain (LBP) Incidence, Ergonomics Risk and Workers' Characteristics in Relations to LBP in Electronics Assembly Manufacturing. Indian journal of occupational and environmental medicine, 24(3), 183–187. https://doi.org/10.4103/ijoem.IJOEM_4_20

Fritz, J. M., & Irrgang, J. J. (2001). A comparison of a modified Oswestry low back pain disability questionnaire and the Quebec back pain disability scale. Physical Therapy, 81(2), 776–788. https://doi.org/10.1093/ptj/81.2.776

Handayani, M., & Demiyati, C. (2022). Hubungan Faktor Individu Dan Faktor Pekerjaan Dengan Keluhan. Faktor Individu 11(11), 352–357. http://eprints.ulm.ac.id/8044/1/21. HUBUNGAN FAKTOR INDIVIDU DAN FAKTOR PEKERJAAN DENGAN KELUHAN.pdf

Iwakiri, K., Sasaki, T., Sotoyama, M., DU, T., Miki, K., & Oyama, F. (2024). Effect of occupational pushing and pulling combined with improper working posture on low back pain among workers. Industrial health, 62(1), 62–66. https://doi.org/10.2486/indhealth.2023-0034

Lambek, A. M., Palilingan, R. A., & Suarjana, W. G. (2021). Hubungan antara posisi kerja dengan keluhan musculoskeletal pada nelayan di Desa Gemeh Kecamatan Gemeh Kabupaten Kepulauan Talaud. Jurnal Kesehatan Masyarakat UNIMA, 2(2), 25–31.

Lestari, I., Russeng, S., & Thamrin, Y. (2023). Hubungan beban kerja dan postur kerja dengan keluhan low back pain. Journal of Muslim Community Health, 4(2), 118–125. https://doi.org/10.52103/jmch.v4i2.1209

e-ISSN 2722-8169
p-ISSN 2723-097X

Pratiwi, P. A., Widyaningrum, D., & Jufriyanto, M. (2021). Analisis postur kerja menggunakan metode REBA untuk mengurangi risiko musculoskeletal disorder (MSDs). Profisiensi, 9(2), 205–214.

Rahmawati, A. (2021). Risk factor of low back pain. Jmh, 3(1), 402–406.

Sanjaya, J., & Lumbantobing, L. A. (2021). Hubungan Antara Posisi Dalam Bekerja Dengan Low Back Pain Pada Pekerja Pabrik. Ebers Papyrus, 27(2), 32–41. https://doi.org/10.24912/ep.v27i2.16124

Sugiyono. (2020). Metodologi penelitian kuantitatif, kualitatif dan R & D.

Steven, M., & Andriani, R. (2023). Hubungan Faktor Risiko dengan Kejadian Nyeri Punggung Bawah pada Karyawan PT X Selama Pandemi Covid-19. Jurnal Kesehatan Dan Kedokteran Tarumanagara, 2, 8–15. https://journal.untar.ac.id/index.php/JKKT/article/view/23926

To, K. E., Berek, N. C., & Setyobudi, A. (2020). Hubungan Masa Kerja, Jenis Kelamin dan Sikap Kerja dengan Keluhan Muskuloskeletal pada Operator SPBU di Kota Kupang. Media Kesehatan Masyarakat, 2(2), 42–49. https://doi.org/10.35508/mkm.v2i2.2853

Usman, R. A., Chairani, A. R. N., & Lubis, Z. I. (2022). Analisa posisi kerja terhadap resiko kejadian low back pain pada pengrajin keramik Dinoyo. Physiotherapy Health Science (PhysioHS), 4(1), 22–26. https://doi.org/10.22219/physiohs.v4i1.21855

Wardoyo, F. S., Wadopo, S., & Sakinah, R. K. (2021). Hubungan lama duduk dan masa kerja dengan low back pain di PT Sun Chang Kota Banjar pada tahun 2020. Prosiding Kedokteran, 7(1), 37–41. http://dx.doi.org/10.29313/kedokteran.v7i1.25935