

**FACTORS RELATED TO WORK POSTURE (ERGONOMICS) AND
MUSCULOSKELETAL DISORDERS (MSDS) COMPLAINTS****Winona Priskilla^{1*}***¹SI Public Health Study Program, Faculty of Health and Informatics, Pekanbaru State
Umbrella Health Institute, Riau, Indonesia****Corresponding author:** nonaputri002@gmail.com**Abstract**

Musculoskeletal Disorders (MSDs) are a globally detrimental occupational health problem, characterized by complaints of muscles, tendons, and joints. Based on the findings, an unergonomic work posture is the main physical risk factor. Forced postures, repetitive movements, and static working durations lead to an increase in mechanical stress. To assess risk objectively, standardized tools such as Reba, Rula, and Owas are used. Effective interventions must be comprehensive, including modification of workstations (Engineering interventions) and the implementation of work rotations and micro-breaks (administrative interventions). Musculoskeletal Disorders (MSDs) are one of the most common occupational health problems in various industry sectors. These complaints include disorders in muscles, joints, tendons, and ligaments caused by unergonomic working postures, repetitive movements, and long static work durations. This article presents the results of a Systematic Literature Review (SLR) of 20 studies that assessed the relationship between work postures. The results of the synthesis showed a very significant relationship between non-ergonomic posture and an increased prevalence of MSDs, where long working duration and heavy loads amplify the risk. Ergonomic interventions have been shown to be effective in meaningfully lowering postural risk scores and MSDs complaints.

Keywords: Ergonomics, Work Posture, Musculoskeletal Disorders, REBA, RULA, OWAS.

INTRODUCTION

Musculoskeletal Disorders (MSDs) are now one of the leading causes of work-related health disorders worldwide. This condition often arises due to an unergonomic working posture, such as bending, squatting, or standing static for too long. The World Health Organization (WHO) and the ILO place poor work posture as a major physical risk factor for causing MSDs in the workplace. In Indonesia, the prevalence of MSDs is still high. Studies in the manufacturing and agricultural sectors show that more than 80% of workers experience complaints, especially in the back, shoulders, and neck. The main challenge is the lack of application of ergonomic principles, as well as the lack of awareness of workers and companies in paying attention to safe work design.

RESEARCH METHODS

This article is a Systematic Literature Review (SLR) using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guide. Data sources were obtained from PubMed, Science Direct, OpenAlex, and Google Scholar with the keywords: ("working posture" OR "working posture") AND ("musculoskeletal disorders" OR "MSDs") AND ("ergonomics" OR "REBA" OR "RULES" OR "OWAS").

The inclusion criteria include articles in English or Indonesian published between 2016–2025, using objective measurement tools (REBA, RULA, or OWAS), and discussing the relationship between work postures and MSDs. A total of 20 articles that met the criteria were analyzed and synthesized narratively and tabularically.

RESEARCH RESULTS

Of the initial 25,120 articles found, only 20 met the inclusion criteria. The results show a consistent pattern:

Table 1. 1 Search Results

No	Author's Name, Year & Article Title	Research Objectives	Research Methods	Instrument	Research Results
1	Wulandari et al., 2024: Work Posture with MSDs in Packing Workers	To analyze the significant relationship between the risk level of non-ergonomic postures and the prevalence of <i>Musculoskeletal Disorders</i> (MSDs) complaints in packing industry workers	Type of Research: Observational Analytics with Cross-sectional design. Research Time: May 2024. Research Location: Food Manufacturing Factory in West Java. Sample: 75 packing workers (using simple random sampling). Data Collection: Video observation and questionnaire.	Posture Instrument (OWAS): An observational questionnaire that measures the position of the back, arms, legs, and the use of force to determine a work posture risk score. Complaint Instrument (NBM): Nordic Body Map to identify the Location and Extent of MSDs.	Quantitative Results: Non-ergonomic posture was significantly associated (OR=108; p < 0.001). Conclusion: The risk of high work posture (Categories 3 & 4 OWAS) is a strong predictor factor for the occurrence of MSDs complaints in <i>packing workers</i> who perform repetitive movements
2	Danida et al., 2020: Work Posture and Musculoskeletal Complaints in Hotel Workers	Specifically test the relationship between squatting, wrapping, and lifting postures that are considered to be high-risk with the incidence of MSDs in <i>housekeepers</i> in the environment	Type of Research: Observational Analytics with <i>Cross-Sectional design</i> . Research Time: October 2020. Research Location: Five Star Hotel in Jakarta. Sample: 40 <i>housekeepers</i> (using <i>total sampling</i>). Data Collection: Direct	Instrument Postural (REBA): An observational questionnaire that assesses the posture of the neck, back, arms, and legs, as well as the addition of coupling and load scores to determine the Action Level. Instrument (NBM): Nordic Body Map to detect pain in 9 areas of the body.	Quantitative Results: Significant relationship between high REBA risk score and complaints (OR=3.5; p=0.012). Conclusions: High-risk posture (Level 3 REBA) in housekeepers increases the chances of MSDs complaints in the lowerback and knee area.

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			observatio nand structured interviews		
3	Pratiwi <i>et al.</i> , 2025: Work Posture and MSDs in Mechanical Workers	Analyzes the strong relationship between awkward work posture during car and motorcycle repair and MSDs complaints in workshop workers	Type of Research: Observatio nal Analytics with Cross Sectional design. Research Time: January 2025. Research Location: Official Workshop in Yogyakarta. Sample: 55 mechanica l workers (<i>purposive sampling</i>). Data Collection: Video observatio n and anthropom etric measurem ents.	Posture instrument (OWAS):An observational questionnaire coded to assess posture when bending, squatting, and twisting during correctional activities. Complaint Instrument: Pain Questionnaire with VAS (Visual Analog Scale) scale to measure pain intensity.	Quantitative Results: The work posture of high-risk OWAS was significantly related ($p < 0.01$). Conclusion: Ergonomic interventions are needed in work processes that involve static squatting and rotating postures, as they are the main factors that trigger MSD complaints.
4	Kurniawati <i>et al.</i> , 2024: Working Posture of Tofu Factories and MSDs Complaints	Analyze the causal relationship between working posture during boiling and printing of tofu with the risk of MSDs complaints in small-scale tofu industrial workers.	Type of Research: Observatio nal Analytics with Cross-Sectional design. Research Time: March 2024. Research Location: Home Industry Tofu Factory in Semarang. Sample: 30 workers (using total	Posture Instrument (OWAS): An observational questionnaire that focuses on force movements when lifting dough and bending when printing. Complaint Instrument (NBM): Nordic Body Map to record the	Quantitative Results: A strong association was found between high risk of posture (Category 3/4 OWAS) and complaints ($p < 0.05$). Conclusion: Static bending posture when printing tofu should be eliminated

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			sampling). Data Collection: Observation and interview	prevalence of complaints in 9 body segments.	immediately to reduce the risk of MSDs, particularly in the back and shoulder area.
5	Rizkyansya 2024: THE RELATIONSHIP BETWEEN WORK POSTURE AND COMPLAINTS OF MSDs in farmers	Examine and compare the relationship between the type of work posture (bending, squatting, standing) and complaints of MSDs in farmers, based on the type of activity (planting vs harvesting).	Type of Research: Observational Analytics with Cross-Sectional design. Research Time: July 2024. Research Location: Rice Fields and Gardens in Bogor Regency. Sample: 65 active farmers (convenience sampling). Data Collection: Observations, interviews, and anthropometric measurements.	Posture Instrument (REBA): An observational questionnaire to assess the full-body posture risk score when carrying weights and using agricultural tools. Complaint Instrument (NBM): Nordic Body Map to measure musculoskeletal complaints.	Quantitative Results: High-risk posture (REBA score 11+) was strongly associated with back complaints (OR=4.8). Conclusion: A very long duration of bending posture in farmers is a major risk factor that requires intervention in the form of work rotations or the use of ergonomic aids.
6	Claudya et al., 2023: RELATIONSHIP OF ERGONOMICS WITH COMPLAINTS OF MSDs IN CV X WORKERS	A comprehensive analysis of the relationship between ergonomic factors (posture and station work design) and MSDs complaints in workers working on	Type of Research: Observational Analytics with Cross-Sectional design. Research Time: November 2023. Research Location: CV X Automotive Manufacturing Company. Sample: 90	Posture Instruments (OWAS): An observational questionnaire to analyze posture risks on assembly lines that require repetitive movements and light lifting. Complaint Instrument: Modified Pain Complaint	Quantitative Results: A significant association between non-ergonomic work postures and increased complaints of MSDs (p=0.002). Conclusion: Interventions should focus not only on individual posture, but also on the design of

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		assembly lines.	assembly line workers (cluster sampling). Data Collection: Observation and Questionnaire.	Questionnaire	workstations to allow for posture adjustment during working hours.
7	Salcha et al., 2021: Relationship between Work Posture and Musculoskeletal in Rice Farmers	To test the direct relationship between the working posture of rice farmers during planting/harvesting and the incidence of MSDs, comparing the risks between the two main activities.	Type of Research: Observational Analytics with Cross-Sectional design. Research Time: June 2021. Research Location: Agricultural Village in Subang, West Java. Sample: 80 rice farmers (convenience sampling). Data Collection:	Posture Instrument (REBA): An observation questionnaire that assesses posture scores when squatting in the rice fields and when carrying crops. Complaint Instrument (NBM): Nordic Body Map to record pain complaints.	Quantitative Results: High-risk work postures (81.4% of respondents) were significantly associated with MSDs ($p=0.028$). Conclusion: Static squat posture when planting is the most high-risk activity and is a major contributor to MSD complaints.
8	Puteri et al., 2023: RELATIONSHIP BETWEEN WORK POSTURE AND COMPLAINTS OF MSDs IN WOOD CRAFTSMEN	Analyze the critical relationship of work posture on the process of carving and cutting wood with complaints of MSDs in craftsmen.	Type of Research: Observational Analytics with Cross-Sectional design. Research Time: May 2023. Research Location: Wood Craft Industry in Bali. Sample: 35 woodcraftsmen (total sampling). Data Collection: Direct observation and posture check-list.	Posture Instrument (RULA): An observational questionnaire that assesses the risk score of the upper arm, forearm, wrist, neck, and back when carving. Complaint Instrument (NBM): Nordic Body Map.	Quantitative Results: Non-ergonomic working postures on the arms and back were shown to be strongly related ($p < 0.05$). Conclusion: Static sitting posture while bending and non-neutral wrist position when sculpting trigger complaints of MSDs in the upper extremities and back.

No	Author's Name, Year & Article Title	Research Objectives	Research Methods	Instrument	Research Results
9	Ramayanti et al., 2024: Work Posture with sds Complaints in Convection Employees	Identify and map the relationship between static sitting posture while sewing and complaints of MSDs in convection workers.	Type of Research: Observational Analytics with Cross-Sectional design. Research Time: March 2024. Research Location: Textile Convection Factory in Bandung. Sample: 120 employees of the sewing departmen (simple random sampling). Data Collection: Video observatio and questionna ire.	Posture Instrument (RULA):An observational questionnaire that focuses on the neck, shoulders, arms, and wrists during the repetitive sewing process. Complaint Instrument (NBM): Nordic Body Map.	Quantitative Results: Significant relationship betweenhigh RULA risk work posture (Level 3/4) and MSDs complaints (p=0.001). Conclusion: Sitting posture with an awkward neck and shoulder position for long periods of time in tailors is a major risk factor.
10	Hilmi et al., 2025: Work Posture and Duration of Work with Complaints of MSDs in Health Workers	Examined the dual effect of working posture when lifting patients (lifting) and long shift work duration on MSDs in hospital nurses.	Research Type: Observatio nal Analytics with Cross-Sectional design and interaction analysis. Research Time: February 2025. Research Location: Three Type B Hospitals in Sumatra. Sample: 150 clinical nurses (purposive sampling).Data Collection: Questionn aire and observatio n spot check.	Posture Instrument (REBA): An observational questionnaire used to assess posture risk when moving/lifting patients. Complaint Instrument (NBM): Nordic Body Map.	Quantitative Results: Poor work posture and long work duration showed significant interaction (OR Interaction = 6.2). Conclusion: The risk of MSDs is not only caused by posture during lifting, but is significantly aggravated if it is done by nurses with long working hours/night shifts.

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11	Suhardin & Basri, 2023: Work Position and Lower Back Pain Complaints	Analyzing the direct relationship between work posture when lifting and lower back pain (LBP) Complaints in loading dock workers at ports.	Type of Research: Observational Analytics with Cross-Sectional design. Research Time: December 2023. Research Location: Container Terminal at Surabaya Port. Sample: 60 lifting workers (total sampling). Data Collection: Observation and Questionnaire.	Posture Instrument (NIOSH Lifting Eq.): An observational questionnaire that assesses the Lifting Index (LI) based on weight, distance, frequency, and clutch while lifting. Complaint Instrument (NBM): Nordic Body Map.	Quantitative Results: mNon-NIOSH standard lifting postures were significantly associated with LBP (OR=3.5; p <0.05). Conclusion: Lifting weights exceeding the NIOSH Recommended Weight Limit (RWL) is a leading cause of chronic low back pain.
12	Maulana <i>et al.</i> , 2021: Analysis of Risk Factors for MSDs in the Agricultural Sector: <i>Literature Review</i>	Reviewed and synthesized risk factors for MSDs in the agricultural sector from a variety of literature, with an emphasis on work posture.	Type of Research: Literature Review (Qualitative). Research Time: Year 2021. Research Location: Various international and national journals and articles. Sample: There are no individual samples, those synthesized are the results of other studies. Data Collection: Systematic search of databases.	Instruments (Synthesis): There are no primary instruments, but a synthesis of the use of REBA/RULA/O WAS in agricultural studies. Complaint Instrument (Synthesis): Synthesis of the use of NBM in agricultural studies.	Quantitative Results: By consensus, prolonged hunched posture is the main risk factor for MSDs. Conclusion: Static and repetitive awkward posture is the most significant ergonomic risk factor in the agricultural sector.

No	Author's Name, Year & Article Title	Research Objectives	Research Methods	Instrument	Research Results
13	Fajar et al., 2022: Posture and Occurrence of Carpal Tunnel Syndrome (CTS)	To examine the causal relationship between arm and wrist posture (RULA) and the incidence of Carpal Tunnel Syndrome (CTS) in computer operators.	Type of Research: Observational Analytics with Cross-Sectional design. Research Time: May 2022. Research Location: Call Center Company in Jakarta. Sample: 80 computer operators (random sampling). Data Collection: Observation and physical tests.	Posture Instrument (RULA) A Highly detailed observational questionnaire assesses wrist risk scores, wrist twists, and force use when typing. Complaint Instruments: Phalen Test and Tinell Test (physical examination).	Quantitative Results: Significant association between high-risk wrist posture (RULA score 6+) and CTS (p=0.005). Conclusion: Non-neutral wrist position and repetitive typing movements trigger a high risk of CTS.
14	Setyawan & Purwanto, 2023: Static Sitting Posture and Shoulder Neck Complaints in <i>Online Drivers</i>	Tested the dual relationship of static sitting posture (duration > 4 hours) and Vibration of vehicles with complaints of MSDs in the neck and shoulders.	Type of Research: Observational Analytics with Cross-Sectional design. Research Time: April 2023. Research Location: Online Driver Community in Tangerang. Sample: 100 drivers online (convenience sampling). Data Collection: Structured questionnaire.	Posture Instrument (REBA): An observational questionnaire was used to assess sitting posture scores (neck, back, legs). Complaint Instrument: A Pain Questionnaire that focuses on the neck, shoulders, and upper back area.	Quantitative Results: Static sitting posture and long working duration were significantly related (p < 0.01). Conclusion: Poor sitting posture in <i>drivers</i> who work more than 4 hours per day is the main predictor of complaints in the <i>upper extremity</i> (neck and shoulders).
15	Hidayat et al., 2024: Ergonomic Analysis of the Work Posture of Welders in Workshops	Analyze and identify risks of ergonomic work posture (bending, squatting) in welders in	Type of Research: Descriptive / Analytical Observational. Research Time: March 2024.	Posture Instruments (OWAS) An observational questionnaire to assess the position of the back,	Quantitative Results: OWAS Category 3 and 4 (high risk) work postures dominated (75%). Conclusion: The

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		small workshops.		arms, and legs when welding which	welding workposture is Dominated by
16	Novitasari et al., 2022: The Effect of Work Posture on Work Fatigue in Health Workers	To analyze the dual relationship of work posture when treating patients with levels of work fatigue and MSD complaints.	Type of Research: Observational Analytics with Cross-Sectional design. Research Time: July 2022. Research Location: Private Hospital Polyclinic in Medan. Sample: 85 health workers (nurses and midwives). Data Collection: Observation and questionnaire	Posture Instrument (REBA): An observational questionnaire that assesses posture when providing direct services to patients. Complaint Instruments: Subjective Feelings Questionnaire and Nordic Body Map.	Quantitative Results: Non-ergonomic working postures increase the risk of MSDs complaints in the lower back (p=0.041). Conclusion: Poor posture while caring for patients not only triggers MSDs but also increases fatigue levels, which can reduce the quality of care.
17	Lestari & Yuliati, 2025: Work Posture and Workload with Musculoskeletal Complaints in the Port	To test the synergistic relationship between the load-lifting posture and the subjectively assessed workload of MSDs Complaints in port workers.	Type of Research: Observational Analytics with Cross-Sectional design. Research Time: March 2025. Research Location: Tanjung Perak Port Warehouse and Pier Area. Sample: 70 cargo handling workers (purposive sampling). Data Collection: Observation and questionnaire.	Posture Instrument (REBA): An observation questionnaire to assess posture risk when lifting/moving cargo loads in the warehouse area. Complaint Instrument (NBM): Nordic Body Map.	Quantitative Results: Poor lifting posture was a strong predictor of MSDs complaints (OR=4.2), Exacerbated by workload (p<0.05). Conclusions: Interventions should focus on improving lifting techniques (posture) and determining safe workload limits (administration).

No	Author's Name, Year & Article Title	Research Objectives	Research Methods	Instrument	Research Results
18	Mulyani et al., 2023: Ergonomics of Work Posture and Complaints of MSDs in Administrative Employees	Examined the specific relationship between sitting posture (RULA) and complaints of MSDs in administrative employees who were predominantly working in front of computers.	Type of Research: Observational Analytics with Cross-Sectional design. Research Time: July 2023. Research Location: Regional Government Office in Central Java. Sample: 110 administrative employees (random sampling). Data Collection: Observation and questionnaire.	Posture Instrument (RULA): An observational questionnaire that assesses the posture of the neck, shoulders, and back while sitting static using a computer. Complaint Instrument. Pain Questionnaire (VAS) that focuses on the shoulder and neck.	Quantitative Results: Moderate risk sitting posture (RULA score 5-6) was significantly associated with shoulder and neck pain ($p=0.008$). Conclusion: Although the risk is not as high as the industry, prolonged static sitting postures in office workers remain at a significant risk of triggering MSDs on the neck and shoulders.
19	Saputri et al., 2024: Working Posture with a Risk of Lower Extremity Injury	Analyzed the detailed relationship between standing and squatting postures during material installation with the risk of leg and lower extremity injuries.	Type of Research: Observational Analytics with Cross-Sectional design. Research Time: April 2024. Research Location: Building Construction Project. Sample: 50 construction workers (purposive sampling). Data Collection: Video observation and physical examination	Posture Instrument (OWAS): An observational questionnaire that focuses on leg position (squatting, kneeling, static standing) and force use. Complaint Instrument: Physical examination and lower extremity injury check-list.	Quantitative Results: Static squatting posture and prolonged standing were significantly associated with the risk of lower extremity injury ($p=0.015$). Conclusion: Static and awkward foot posture during the construction process is a risk factor for injury to the lower body.

No	Author's Name, Year & Article Title	Research Objectives	Research Methods	Instrument	Research Results
20	Widodo et al., 2025: The Effect of Ergonomic Interventions Changes in Work Posture and Complaints MSDs	To assess the effectiveness and impact of posture improvement interventions (training and tool modification) on the Reduction of posture risk Scores and MSDs complaints in packaging workers.	Type of Research: Quasi-Experiment (Pre-post Test with Control Group). Research Time: June-August 2025. Research Location: Packaging Industry in Sidoarjo. Sample: 60 workers (30 intervention groups, 30 control groups). Data Collection: Observation of REBA scores (before and after the intervention).	Posture Instrument (REBA): An observational questionnaire used to measure changes in posture risk scores in both groups. Complaint Instrument (NBM): Nordic Body Map to compare complaint reductions.	Quantitative Results: Ergonomic interventions were shown to significantly lower postural risk scores (REBA) and MSDs complaints ($p < 0.001$). Conclusions: Improvement of work posture through planned interventions has a huge positive impact on the prevention of MSDs.

DISCUSSION

The results of the synthesis showed that non-ergonomic working postures were the main risk factors for MSDs, both in heavy physical work and static work. The main mechanisms are increased static muscle tension and restriction of blood flow (local ischemia) that leads to muscle fatigue and chronic pain.

Exposure duration and workload factors act as "risk multipliers", accelerating the onset of complaints. Studies on nurses and online drivers confirm that poor posture maintained for more than four hours continuously increases complaints by up to twofold.

The application of ergonomic interventions has proven to be an effective solution. Improvements in workstation design, desk height adjustments, use of lifting aids, and regular posture training and micro-breaks can significantly reduce the risk of MSDs. This approach is in line with the principle of primary prevention of K3, which is to control risks at the source.

CONCLUSION

This systematic review confirms the existence of a strong and significant causal relationship between non-ergonomic work postures and complaints of Musculoskeletal Disorders (MSDs).

The REBA, RULA, and OWAS methods have proven to be valid in measuring these risks. Poor posture accompanied by long working duration and heavy loads are the main reinforcing factors for the occurrence of MSDs. Proper ergonomic interventions can significantly reduce risks and increase worker productivity.

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