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Evaluation of Work Posture Using the REBA Method and Ergonomic Intervention at the Gelora Bakery MSME in Jakarta

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ABSTRACT

Micro, small, and medium enterprises (MSMEs) play a crucial role in community economic development, yet many neglect occupational safety and health (OSH) and ergonomic considerations for their workforce. An initial assessment at Gelora Bakery, a small-to-medium bakery enterprise in Jakarta, revealed significant ergonomic and safety deficiencies. Workers frequently engaged in unsafe manual handling tasks—bending awkwardly while lifting heavy loads such as flour sacks, baking material buckets, and butter containers without mechanical support. These unsafe working conditions pose a substantial risk of work-related musculoskeletal disorders (WMSDs) among workers. To address these concerns, this research employs the Rapid Entire Body Assessment (REBA), a standard ergonomic evaluation method, to systematically assess worker postures and quantify the risk of musculoskeletal injury. Based on the results of the REBA assessment, the highest score obtained was 10. This rating indicates a high-risk category and requires implementation of changes. This study formulates evidence-based recommendations for improving workplace safety and worker posture at Gelora Bakery. The implementation of ingredient storage shelves represents the primary intervention recommended to create a safer, healthier, and more efficient work environment.

INTRODUCTION

Micro, small, and medium enterprises (MSMEs) are a category of small businesses that significantly contribute to the enhancement and growth of the community's economy, since their presence enables resilience in various circumstances to attain communal welfare (Al Farisi et al., 2022). MSMEs serve as a source of revenue for business owners while offering the community accessible and reasonably priced goods. Due to the increased demand for food and drinks, which are both necessities and components of lifestyle trends, the culinary industry is one of the fastest growing subsectors (Fajrul & Saptyana, 2025). Although this growth trend, several MSMEs continue to neglect sufficient focus on occupational safety and health (OSH) as well as ergonomic issues for their workers (Cahyani et al., 2023). A significant issue often faced by MSME workers is poor working posture. Poor working position induces persistent static strain on specific soft tissues, potentially resulting in diseases and degradation of muscles, bones, and joints, hence adversely affecting job performance and productivity (Dewi, 2016).

The initial study at Gelora Bakery, a small to medium-sized bakery and cookie enterprise in Jakarta, identified multiple problems in ergonomics and worker safety. Workers were often

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observed in awkward positions, such as sustained bending while lifting heavy items including sacks of flour, buckets of baking materials, and containers of butter without mechanical assistance. This condition may lead to occupational disorders among Gelora Bakery workers. Prevalent industrial illnesses, such as occupational cancer, pneumoconiosis, and scoliosis, still continue to be widespread (Mayasari et al., 2022). The Canadian Centre for Occupational Health and Safety (CCOHS) states that Work-Related Musculoskeletal Disorders (WMSD) result from repetitive tasks or improper postures. Work-related musculoskeletal disorders (WMSD) can result in significant health consequences for employees, including discomfort, rigidity, and potential long-term impairment (Wulansari et al., 2024). However, several distinct occupational diseases have appeared as a consequence of the proliferation of sedentary employment and inadequate ergonomics, resulting in a rise in musculoskeletal disorders (MSDs). Musculoskeletal disorders are predominantly found in large-scale workplaces, however they can also manifest in micro, small, and medium-sized enterprises (MSMEs) (Destha & Suhardi, 2017).

Entrepreneurs sometimes prioritise production results, neglecting the long-term expenses associated with hazardous conditions, including as absenteeism, medical bills, and diminished efficiency. Moreover, there is a general deficiency in structured instruction regarding safe lifting techniques, ergonomic equipment layout, and hygiene control. The inadequate integration of occupational safety and health (OSH) with ergonomics constitutes a significant challenge that must be resolved to promote sustainable and competitive development of small and medium-sized enterprises (SMEs) (Rahmawati et al., 2025). All workplaces, regardless of its formalities, possess numerous potential dangers that may impact worker health or lead to occupational disorders. Interactions transpire among personnel, equipment, materials, and the organisation within a work environment during the work process. This relationship generates the possibility for dangers in each component, which may result in injury. A hazard is the potential for a job component to inflict harm or disease (loss) (Hermawan et al., 2024). At Gelora Bakery, workers frequently must manually lift heavy products and equipment. Manual material handling activities, such as pushing, lowering, lifting, tugging, and carrying, are the primary source of worker problems in the industrial sector. Rising injury or accident rates might result in health issues or concerns among workers, so diminishing production and adversely affecting the organisation. They also exert personal effects on workers about illnesses of the human musculoskeletal system. Alongside physical losses, they also incur material losses due to substantial medical expenses, worker absenteeism, and a decline in job quality. The majority of workers exhibit non-ergonomic postures when performing their tasks, characterised by an overly flexed spine, reaching beyond their arm's length, and utilising equipment that is incompatible with their anthropometric dimensions (Sanjaya et al., 2018).

Ergonomics and Safety are two distinct domains focused on enhancing working conditions. However, by engaging with the same object work they ultimately establish a shared domain of activity, both practically and theoretically. In this intersecting domain, Ergonomics, with its specialised knowledge and methodologies, enhances safety in multiple ways, contingent upon the presence of human activity as a fundamental component of a sociotechnical system (Paula & Lima, 2024). Workplace interventions have developed into a collection of holistic health promotion and occupational health techniques executed at the worksite to enhance work-related outcomes, including productivity, characterised as effective working hours and performance. Work-related outcomes are represented by many variables indicative of worker employability, with the primary focus on worker productivity, presenteeism, and absenteeism. In certain research, productivity denotes the optimal individual performance potential of people in the company. Absenteeism is characterised as the duration an worker is absent from work owing to illness or disability (Tarro et al., 2020). Considering the conditions experienced by workers at Gelora Bakery, additional research is required to assess and analyse ergonomics and occupational safety at the establishment, as well as to formulate recommendations for enhancements aimed at creating a healthier, safer, and more efficient work environment.

Most prior research on work posture assessment using the REBA method for manual material handling activities in food industry MSMEs predominantly focuses on the identification of musculoskeletal risk levels, yet frequently neglects the subsequent design and execution of

ergonomic interventions customized to address specific field issues. Furthermore, the majority of research focuses on large-scale manufacturing sectors or formal employment settings, leaving the context of baking MSMEs, which perform with constraints such as limited space, equipment, and dynamic work characteristics, little explored. This mismatch generates a gap between this study and others utilizing the REBA approach. Prior research typically concludes at the general suggestion phase, failing to assess the direct influence of assistive device design implementation on alterations in REBA scores and the prospective decrease in the risk of musculoskeletal disorders (MSDs). This study fills the current gap by integrating work posture analysis via the REBA method for manual material handling in bakery MSMEs, implementing ergonomic shelf design as an intervention, and assessing the effectiveness of this intervention through alterations in REBA scores and the risk of musculoskeletal disorders among workers at Gelora Bakery MSME Jakarta.

RESEARCH METHODS

This study will concentrate on assessing worker posture via a traditional ergonomic evaluation method, namely the Rapid Entire Body Assessment (REBA). The primary objective of this working posture assessment is to correlate the risk of musculoskeletal damage with the employed working position. REBA can be utilized to detect, assess, and evaluate all body segments for Work-related Musculoskeletal Disorders (WMSDs), involving the following body parts: neck, shoulder, upper back, lower back, elbow, hand, thigh, knee, legs, trunk, arms, and wrist (Deros et al., 2017). REBA enables concurrent assessment of the posture of the upper extremities (arms, forearms, wrists), trunk, neck, and lower extremities. It also distinguishes between grip styles and muscle activity (Purnawinadi et al., 2022). Research proposes observational and instrument-based methods to quantitatively assess the extent of discomfort and postural strain induced by various body positions. The angular deviation of a body segment from the neutral posture in observational approaches is obtained by visual perception, while continuous recordings of body postures in instrument-based procedures are captured using a device affixed to the individual (Madani & Dababneh, 2016). This method measures the risk associated with several body parts, including the back, neck, arms, wrists, and legs, considering the worker's workload and frequency of tasks. This technique employs a camera to obtain visuals tailored to the worker's position. The REBA approach offers an efficient assessment system for muscles and bones, indicating stable, dynamic, and unstable body postures, and can facilitate emergency response (Nurdiyanti & Kristanto, 2025).

This study will provide recommendations to enhance the working posture of Gelora Bakery workers based on the measurement results from the REBA evaluation. Two male workers were assessed for their work postures, and six different postures were evaluated. Observations of work posture were performed on-site in August 2025. The addition of shelves to hold cake ingredients is the suggested upgrade. These shelves are helpful for keeping cake ingredients organized and for enhancing the posture of workers who are carrying cake ingredients. A well-designed product will have an appealing appearance, perform better, be easy and inexpensive to use, and be simple and cost-effective to produce and distribute (Wahyuni et al., 2024). Anthropometric data from a Gelora Bakery workers will be used to create the shelves' size and design. Anthropometric data was sourced from secondary data, namely the Indonesian Anthropometry Data website, which has particular limitations: male gender, data from 2023, and age range between 27 to 35 years. Anthropometry is the specialized science that studies body dimensions, shape, strength, and work capacity with the aim of designing products tailored to human body composition. In a company where work desks are lacking in comfort, anthropometric measurements are frequently required as a design consideration, ensuring user comfort and minimizing physiological disturbances (Suarjana et al., 2022).

RESULTS AND DISCUSSION

The findings of this research include observations of work postures evaluated by the REBA method, alongside with the collecting of anthropometric data from Gelora Bakery workers. Based on the REBA assessment outcomes and the anthropometric data of Gelora Bakery workers, the

research team recommended a goods rack to enhance the working posture of Gelora Bakery workers during manual material handling.

Work Posture Analysis Using REBA

Observations showed that material handling operations in this SME are still handled manually. This observations consists of several activities, including: lifting the flour sack, lifting the bucket of cake ingredients, lifting the butter container, push the dough container, take the oven tray, put cookies in a resting place. In addition to there lifting and carrying tasks, high-risk body postures were also identified during lifting the bucket of cake ingredients and lifting the butter container. Table 1 presens the results of the work posture analysis using the REBA methods.

Tabel 1. REBA Assessment Results

Work Posture	REBA score	
Lifting the flour sack	Neck score	1
	Trunk score	4
	Leg score	1
	Posture score A	3
	Force/Load score	2
	Score A	**5**
	Upper arm score	3
	Lower arm score	1
	Wrist score	2
	Posture score B	4
	Coupling score	2
	Score B	**6**
	Table score C	7
	Activity score	1
	REBA score	**8**
Lifting the bucket of cake ingredients	Neck score	1
	Trunk score	4
	Leg score	2
	Posture score A	5
	Force/Load score	2
	Score A	**7**
	Upper arm score	4
	Lower arm score	2
	Wrist score	1
	Posture score B	5
	Coupling score	0
	Score B	**5**
	Table score C	9
	Activity score	1
	REBA score	**10**
Lifting the butter container	Neck score	1
	Trunk score	4

	Leg score	2
	Posture score A	5
	Force/Load score	2
	Score A	**7**
	Upper arm score	4
	Lower arm score	2
	Wrist score	1
	Posture score B	5
	Coupling score	0
	Score B	**5**
	Table score C	9
	Activity score	1
	REBA score	**10**
Push the dough container	Neck score	2
	Trunk score	3
	Leg score	2
	Posture score A	5
	Force/Load score	2
	Score A	**7**
	Upper arm score	3
	Lower arm score	2
	Wrist score	1
	Posture score B	4
	Coupling score	0
	Score B	**4**
	Table score C	8
	Activity score	1
	REBA score	**9**
Take the oven tray	Neck score	2
	Trunk score	3
	Leg score	3
	Posture score A	6
	Force/Load score	0
	Score A	**6**
	Upper arm score	3
	Lower arm score	1
	Wrist score	2
	Posture score B	4
	Coupling score	0
	Score B	**4**
	Table score C	7
	Activity score	1
	REBA score	**8**
Put cookies in a resting place	Neck score	2

Trunk score	2
Leg score	3
Posture score A	5
Force/Load score	0
Score A	**5**
Upper arm score	3
Lower arm score	2
Wrist score	2
Posture score B	5
Coupling score	0
Score B	**5**
Table score C	6
Activity score	1
REBA score	**7**

Based on results on table 1 shows that the tasks of lifting a butter container and lifting a bucket of cake ingredients both had the maximum REBA score of 10. A number of 10 signifies that the work posture, load, and activities performed possess a significant risk of inducing muscle, bone, or joint injuries, particularly when sustained or prolonged (Wibowo & Mawadati, 2021). The jobs that received the highest REBA score of 10 were lifting the bucket of cake ingredients and lifting the butter container. After reviewing the biomechanical factors, researchers came to the findings that the job received a score of 10 because of several of contributing factors, including the moment of force on the spine, which increased intervertebral disc pressure; compression pressure on the first sacral vertebra (S1) and the fifth lumbar vertebra (L5); shear force on the spine, which increased the risk of disc herniation; and a shifted center of gravity, which led to postural instability and increased worker fatigue. According on the REBA assessment results, the research team will recommend enhancements in the form of shelves for storing baking ingredients and allowing freshly baked cakes to rest. The research team utilized anthropometric data from Gelora Bakery workers to establish the proportions of the suggested shelves. This anthropometric data was derived from secondary data sources, specifically about men aged 27 to 35 years. The anthropometric data is presented in Table 2 below.

Tabel 2. Anthropometric Data of Gelora Bakery Workers

Dimensions	Information	5th	50th	95th	SD
D1	Height	6,46	164,82	173,74	0,24
D2	Eye height	6,17	155,66	6,81	0,21
D3	Shoulder height	5,25	5,7	6,14	0,29
D4	Elbow height	97,63	103,62	4,55	0,17
D5	Hip height	3,71	3,89	97,94	0,14
D6	Height of vertebral bone	2,75	3,02	3,27	0,17
D7	Fingertip height	61,87	3,04	3,52	0,31
D8	Height in sitting position	72,89	78,81	84,73	0,13

D9	Eye height in sitting position	2,66	2,92	75,65	0,17
D10	Shoulder height in sitting position	2,43	74,79	3,82	0,42
D11	Elbow height in sitting position	1,23	33,88	1,61	0,14
D12	Table Paha	0,74	0,84	0,92	0,07
D13	Knee length	2,17	2,19	2,21	0,01
D14	Popliteal length	1,26	36,73	1,81	0,19
D15	Knee-high	2,08	2,35	62,88	0,17
D16	Popliteal height	1,73	1,92	50,79	0,14
D17	Shoulder width	41,94	48,83	55,72	0,18
D18	Upper shoulder width	1,38	1,67	2	0,2
D19	Hip width	1,44	38,95	43,62	0,14
D20	Thick chest	0,86	0,92	0,96	0,04
D21	Stomach thickness	0,97	32,66	1,75	0,28
D22	Upper arm length	32,92	34,87	36,82	0,05
D23	Forearm length	1,46	1,69	45,63	0,14
D24	Length of arm span forward	2,63	2,77	2,9	0,05
D25	Shoulder length-hand grip forward	1,93	2,4	2,87	0,3
D26	Head length	0,68	0,75	0,85	0,05
D27	Head width	0,71	0,83	0,98	0,09
D28	arm length	0,79	0,93	1,05	2
D29	Hand width	0,42	0,55	0,71	0,09
D30	Leg length	0,97	1,08	1,2	0,09
D31	Foot width	0,35	0,42	0,47	0,06
D32	Length of arm span to the side	6,87	7,1	175,91	0,16
D33	Elbow span length	3,44	87	91,69	0,14
D34	Height of hand grip upwards in standing position	8,41	207,92	8,94	0,19
D35	High grip up in sitting position	5,09	5,35	5,61	0,18
D36	Length of hand grip forward	56,71	2,86	3,33	0,3

A number of anthropometric variables will be chosen from the Gelora Bakery workers' anthropometric data to be utilized throughout the shelf design phase. The following are the chosen anthropometric data variables: height, shoulder height, elbow height, knee-high, shoulder width, shoulder length-hand grip forward, height of hand grip upwards in standing position. This study

utilized the 95th percentile data to develop the shelf design. The 95th percentile was selected to guarantee the safety of larger postures workers (P95) and to obviate the necessity of bending during manual material handling (Azriadi et al., 2022). The design was modified to fit the available site space and the dimensions of Gelora Bakery's product packaging. The shelf design can be seen in figures 1 and 2 below.

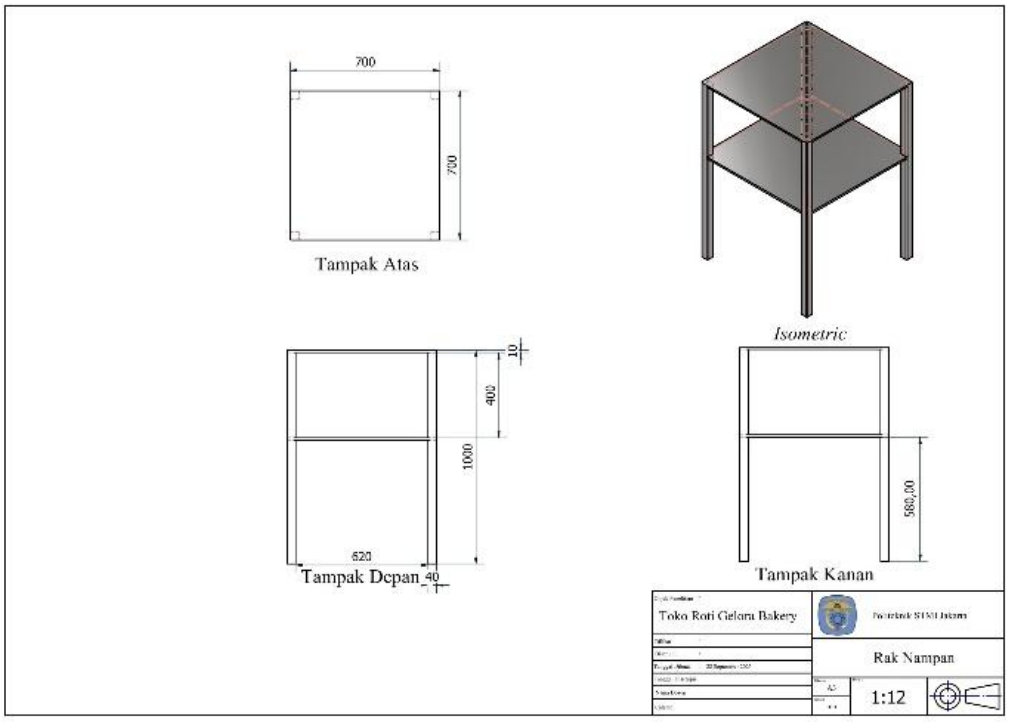

Figure 1. Tray Rack Design

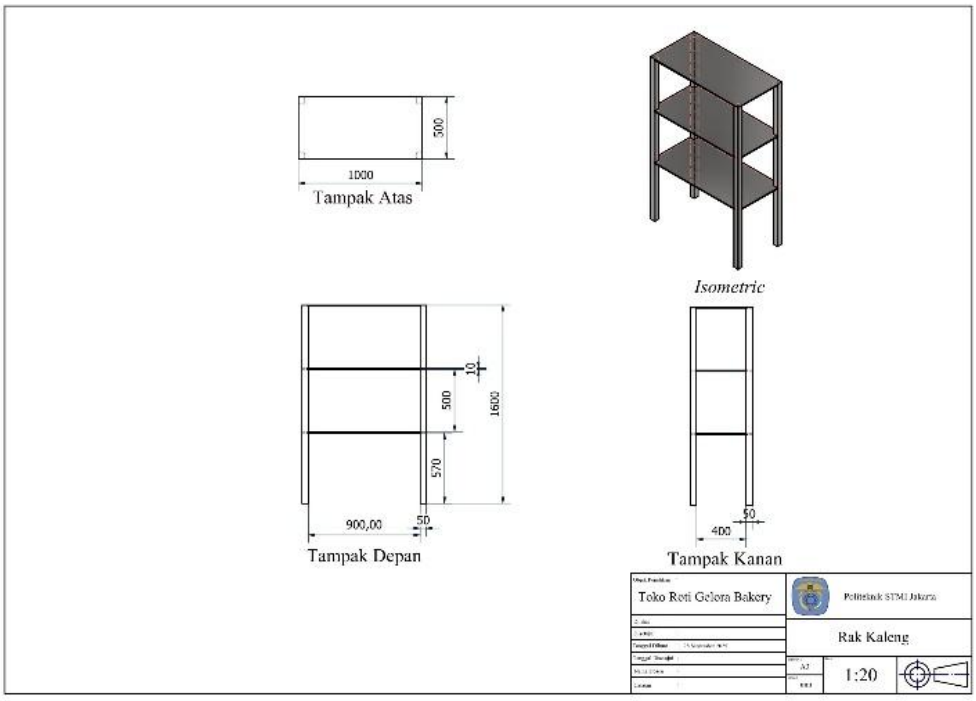

Figure 2. Packaging Rack Design

The tray rack seen in Figure 1 is utilized for the storage of cake trays that have recently been extracted from the oven for resting. The rack is presently during construction and is being produced by the vendor. The second shelf (Figure 2) is designated for the storage of Gelora Bakery cookie packing tins. This rack, constructed from robust and durable material, is suitable for storing substantial, heavy-duty baking supplies such as flour and butter. This rack is expected to support Gelora Bakery workers in mitigating the risk of workplace injuries and occupational-related diseases. The outcomes from the second rack can be seen in Figure 3 below.

Figure 3. Packaging Rack

CONCLUSION

The REBA evaluation results for manufacturing workers at Gelora Bakery reveal that many work postures during manual load handling are classified as high risk, scoring 10, which signifies an immediate requirement for ergonomic intervention. The rack design, formulated using workers' anthropometric data, serves as an effective engineering control measure to alleviate biomechanical strain and reduce the likelihood of musculoskeletal disorders (MSDs), especially in the neck, back, shoulders, and lower limbs. The implementation of the ergonomic storage rack in this study is expected to reach lower workers' REBA scores from 10 (high risk) to 5 (medium risk) by minimizing trunk flexion, excessive reaching distances, and awkward lifting postures during manual material handling tasks. This reduction signifies a significant decline in musculoskeletal risk levels and illustrates the efficacy of low-cost ergonomic interventions for small-scale bakery MSMEs with constrained workspace. The deployment of this lifting apparatus is anticipated to markedly decrease REBA scores and enhance occupational safety within the production plant. This study offers empirical evidence on the efficacy of anthropometry-based interventions in mitigating ergonomic risks within the food industry, leading to improving occupational health and safety requirements. Additional recommendations entail continuous assessment using post-intervention REBA evaluations to confirm risk mitigation and uphold ergonomic adherence in everyday operations at Gelora Bakery.

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