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Relationship Between Age, Work Time, Frame Time with Complaints of Musculoskeletal Disorders in Airport Ground Handling Operator Batam International

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ABSTRACT

Musculoskeletal disorders (MSDs) are a general category of occupational diseases frequently found among workers. Symptoms associated with musculoskeletal discomfort may manifest in several anatomical structures, such as joints, nerves, muscles, and the spine, as a result of performing tasks that deviate from natural ergonomic principles. A correlation has been observed between an individual's level of work intensity and the likelihood of facing musculoskeletal problems. This research aims to determine the relationship between age, length of service, and musculoskeletal problems among ground handling operators at Batam International Airport. This research uses a descriptive-analytical research approach using a cross-sectional research design. This investigation included a group of 24 people, and the REBA measurement methodology was used to assess related factors. The collected data underwent univariate and bivariate analysis, particularly using the chi-square test. The bivariate test produced statistically significant results for age (p=0.002), years of service (p=0.019), and years of service (p=0.038). The findings of this research show an important correlation between age, length of service, length of time, and the occurrence of musculoskeletal problems among ground-handling operators at Batam International Airport. It is expected that ground handling operators can make efforts to prevent musculoskeletal disorders.

INTRODUCTION

Ergonomics is a scientific field that studies the interaction between humans and elements within a system, generating various theories and methods to optimize the performance and overall system efficiency. The primary objective of implementing ergonomics is to uphold the well-being and productivity of individuals in the workplace (Sulianta, 2018). Ergonomics encompasses the design of systems that align the placement of workstations, work procedures, equipment, and machinery, as well as the overall work environment, with the physical limitations and characteristics of the workers. Comfortable work positions enhance job safety and efficiency (Rijanto, 2017).

Incorrect and overly demanding work positions can lead to fatigue, resulting in reduced job efficiency. If prolonged, this situation may potentially cause physiological and psychological disorders,

such as stress. One commonly reported issue arising from inappropriate ergonomic positions is discomfort in the lower back (Tarwaka, 2018). Physically demanding work requires greater muscle strength and poses a risk of complaints in the body. Musculoskeletal Disorders (MSDs) such as Fibromyalgia are conditions marked by a spectrum of symptoms ranging from mild discomfort to severe muscle pain affecting joints, nerves, muscles, and the spine due to unnatural work conditions (Suma'mur, 2018). The highest prevalence of work-related health issues is musculoskeletal disorders, accounting for 16% (Diana Mayasari, Fitria Saftarina, 2016). Broadly, muscle complaints can be categorized into two types:

1. Temporary complaints (reversible): Occur when muscles are under static load, but these complaints disappear when the load is removed.
2. Persistent complaints: Occur when muscle complaints persist even after the work load has ceased. These complaints endure beyond the work demands and can lead to various health issues (Tarawaka, 2004).

Studies on MSDs in various industries show that the most frequently complained-about muscle groups are the skeletal muscles, including those in the neck, shoulders, arms, hands, fingers, back, waist, and lower limb muscles. Skeletal muscle complaints generally result from excessive muscle contraction due to heavy workloads and prolonged duration of exertion, aggravated by the demand for fast-paced work (Suma'mur, 1982; Grandjean, 1993). Peter Vi (2000) explains several factors that contribute to skeletal muscle complaints:

1. Excessive Muscle Stretching
   Often reported by workers whose activities demand significant exertion, such as lifting, pushing, pulling, and supporting heavy loads. Excessive muscle stretching occurs when the required exertion surpasses the optimum strength of the muscles, heightening the risk of muscle complaints and potential skeletal muscle injuries.
2. Repetitive Activities
   Tasks performed continuously, like digging, splitting large wood, lifting, and transporting, lead to muscle complaints as the muscles endure continuous pressure without sufficient relaxation.
3. Unnatural Working Postures
   Working postures that cause body parts to move away from natural positions, such as raised arms, excessive bending of the back, lifted head, etc. The further from the natural position, the greater the strain.

Ground handling services represent a crucial activity in aviation companies involving passenger, baggage, aircraft, crew, and cargo and mail services. The provision of aviation and ground handling services forms an inseparable unity, utilizing Ground Support Equipment (GSE). GSE plays a crucial role in servicing aircraft during on-ground operations, including both take-off and landing preparations (KP635 YEAR 2015). Ground handling, in the assessment of service quality, significantly influences the perception of airport terminal staff and airline personnel in the eyes of passengers (Yulianti et al., 2019).

Ground handling services consist of eight units: passenger unit, baggage handling unit, CRO unit, ramp unit, cargo handling unit, operation unit, catering unit, and security unit. Occupational diseases are prevalent across various job types, with certain work groups carrying higher health risks. Ground handling personnel at airports, for instance, face the risk of work-related diseases. Rizkiana (2017) identified potential hazards for ground handling workers in the ramp handling and GSE divisions, including crushed by trolleys, collision with aircraft bodies, falling from aircraft baggage compartments, exposure to noise, heat, dust, lack of ear protection, and absence of safety signs in work areas.

On-Time Performance (OTP) or frame time comprises a specialized and extensively employed set of metrics for schedule reliability. It is typically defined as the segment of a flight that arrives within 15 minutes of the scheduled time, commonly known in the industry as A15. The U.S. Department of Transportation employs A14 as the benchmark for on-time performance. Commonly used OTP thresholds include A0 and A45 (with metrics also existing for on-time departures, such as D0). OTP metrics serve multiple purposes, including furnishing air passengers with information during travel reservations, aiding airline managers in identifying operational issues, supporting comparisons of air service quality, and analyzing regional and temporal trends.(Wang et al., 2019)

Ground handling personnel, particularly those working in cargo units, are at high risk of experiencing MSDs. The task of lifting and arranging passenger baggage into the aircraft cargo holds requires strong muscles and physical endurance. Fatigued workers can lead to losses for airlines, causing flight delays. Additionally, personnel in passenger units are also at high risk of MSDs, typically experiencing lower back and waist pain due to prolonged sitting while assisting passengers during check-in and addressing passenger departure issues (Rijanto, 2017). A study by Zakkya Febrilian et al. (2023) assessed the ergonomic hazards in the production process activities of manual material handling by operators in the plastic injection department of a manufacturing industry. The results indicated ergonomic hazards, particularly muscle disorders, during manual material handling tasks performed by production operators, with specific complaints in the lower back to hips area.

Another investigation by Djuarsah et al. (2018) focused on employees of PT. Penyelesaian in the context of Wika Gedung Depok. It revealed that 14 ground handling personnel (25.5%) had a high-risk body posture during duty, while 41 ground handling personnel (74.4%) had a moderate-risk body posture. There was a significant relationship between body posture during work activities and the occurrence of musculoskeletal problems among ground handling personnel operating at a moderate risk level, as evidenced by reported complaints. In conclusion, the prevalence of musculoskeletal disorders among ground handling personnel is evident, particularly when exposed to moderate-risk work conditions. It is crucial to address ergonomic factors and implement measures to mitigate the risks associated with improper body postures and manual material handling activities. This will not only enhance the well-being of ground handling personnel but also contribute to the overall efficiency and safety of aviation ground handling operations. The prevalence of musculoskeletal disorders among ground handling personnel operating at moderate risk can be observed from the reported complaints of 32 individuals (78.0%), mainly related to body positioning during work activities. In this study, it was found that 78.6% of the sampled 11 ground handling personnel had complaints related to musculoskeletal disorders, particularly associated with high-risk body posture during work activities. The calculated p-value of 0.000, below the significance level of 0.05, indicates a statistically significant relationship between body positioning during work and the occurrence of musculoskeletal problems. Commonly reported musculoskeletal disorders include neck pain, back pain, shoulder pain, elbow pain, wrist pain, repetitive strain injuries, nerve injuries, and chronic pain disorders. According to Baek W, Kang M (2023), the three most affected anatomical locations are the lower back at 53.9% (95% CI: 43.3–64.6), shoulder at 41.4% (95% CI: 27.1–55.8), and wrist/hand at 40.1% (95% CI: 24.5–55.7). This can lead to decreased performance, poor quality of life, and significant disabilities. Ergonomics is the science of adjusting work, equipment, and humans to each other for optimal safety and productivity.

The study conducted by Khofiyya (2019) revealed a noteworthy relationship between workload, work environment, work posture, and musculoskeletal complaints among baggage handling service personnel at Ahmad Yani Semarang International Airport.

Given the contextual framework of this problem, the researchers conducted an initial survey involving a sample of seven males working in the airport cargo division, aged between 19 and 30 years. From these workers, it was found that almost all of them experienced lower back pain and upper arm pain. Additionally, four female workers aged 20-35 years in the ticketing unit reported complaints of lower back pain, buttock pain, and hip pain.

METHOD

This research utilized a cross-sectional research approach, surveying the entire population of ground handling personnel currently on duty at Batam International Airport. The sample size for this study comprised 24 individuals.

RESULTS AND DISCUSSION

Table 1. Frequency Distribution and Percentage of Characteristics among Ground Handling Personnel

Characteristics	Frequency	%
Age		
<35 years	14	58,3
>35 years	10	41,7
Gender		
Girl	24	100
Boy	0	0
education		
SMP	1	4,16
SMA	13	54,16
SMK	10	41,68
years of service		
<1 years	5	20,8
1-5 years	8	33,3
>5 years	11	45,8
working hours		
<10 hours	10	41,67
>10 hours	14	58,33
Total	24	100

Based on Table 1, it is evident that 14 individuals (58.3%) fall into the age group of <35 years among ground handling personnel. Regarding gender, all 24 ground handling personnel are male (100%). Regarding education level, 13 individuals (54.16%) completed high school. In terms of work experience, 11 individuals (45.8%) have worked for more than 5 years, and 14 individuals (58.33%) work more than 10 hours per day.

Table 2. Frequency Distribution of Age among Ground Handling Personnel

Age	Frequency	%
<35 years	14	58,3
>35 years	10	41,7
Total	24	100

Analysing the data presented in Table 2, the majority of ground handling personnel, specifically 14 individuals (58.3%), belong to the age group of less than 35 years.

Table 3. Frequency Distribution of Tenure among Ground Handling Personnel at Batam International Airport

years of service	Frequency	%
<1 years	5	20,8
1-5 years	8	33,3
>5 years	11	45,8
Total	24	100

Table 3 analysis shows that the majority of ground handling personnel have less than 5 years of experience, particularly 11 individuals, which represents 45.8% of the overall sample.

Table 4. Frequency Distribution of Frame Time among Ground Handling Personnel

Frame Time	Frequency	%
on time	14	58,3
not on time	10	41,7
Total	24	100

Based on the data presented in Table 4, the majority of ground handling personnel, particularly 14 individuals (58.3%), adhere to punctuality in their work.

Table 5. Frequency Distribution of Musculoskeletal Disorders Complaints among Ground Handling Personnel

working hours	Frequency	%
Normal	0	0
Medium	8	33,3
High	8	33,3
Very high	8	33,3
Total	24	100

According to Table 5, there are 8 ground handling personnel (33.3%) with a medium level, 8 personnel (33.3%) with a high level, and 8 personnel (33.3%) with a very high level.

Table 6. The Relationship between the Age of Ground Handling Personnel and Musculoskeletal Disorders (MSDs) Complaints

Age	Complaint of MSDS								Total		Value *p*
	Normal		*Medium*		*High*		*Very High*				
	f	%	f	%	f	%	f	%	f	%	
<35 years	0	0	1	4,17	8	33,3	5	20,83	14	58,33	0,002
>35 years	0	0	7	29,17	0	0	3	12,5	10	41,67	

From Table 6, among the 14 ground handling personnel under 35 years old, 8 individuals (33.3%) reported high-level MSDS complaints, and 5 individuals (20.83%) reported high-level MSDS complaints. In the group of 10 ground handling personnel over 35 years old, 7 individuals (29.16%) reported moderate-level MSDS complaints, while 3 individuals (12.5%) reported very high-level MSDS complaints.

Table 7. The Relationship between the Tenure of Ground Handling Personnel and Musculoskeletal Disorders (MSDs) Complaints

Usia	Complaint of MSDS								Total		Nilai *p*
	Normal		*Medium*		*High*		*Very High*				
	f	%	f	%	f	%	f	%	f	%	
<1 year	0	0	4	16,67	0	0	1	4,17	5	20,83	
1-5 years	0	0	4	16,67	2	8,33	2	8,33	8	33,33	0,019
>5 years	0	0	0	0	6	25	5	20,83	11	45,83	

According to the data in Table 7, among the 11 ground handling personnel with over 5 years of service, 6 individuals (25%) reported high-level MSDS complaints, while 5 individuals (20.83%) reported very high-level MSDS complaints. Greetings. I hope this message reaches you well. Of the 8 ground handling personnel with a tenure ranging from 1 to 5 years, it was observed that 4 individuals (16.67%) reported medium-level complaints related to Material Safety Data Sheets (MSDS). Additionally, 2

individuals (8.33%) reported high-level MSDS complaints, while 2 others (8.33%) reported very high-level MSDS complaints. In the context of the study, among the group of five ground handling personnel with less than one year of tenure, a total of four individuals (16.67%) reported experiencing MSDS complaints classified as moderate. Additionally, one person (4.17%) reported experiencing MSDS complaints classified as very high.

Table 8. The Relationship between Frame Time of Ground Handling Personnel and Musculoskeletal Disorders (MSDs) Complaints

Frame Time	Complaint of MSDS								Total		Nilai *p*
	Normal		*Medium*		*High*		*Very High*				
	f	%	f	%	f	%	f	%	f	%	
On time	0	0	2	8,33	5	20,83	7	29,17	14	58,33	0,038
Not on time	0	0	6	25	3	12,5	1	4,17	10	41,67	

Based on the data presented in Table 8, it is observed that among the 14 ground handling personnel who adhere to the predetermined time frame, 7 individuals (29.17%) reported very high-level MSDS complaints, 5 individuals (20.83%) reported high-level complaints, and 2 individuals (8.33%) reported moderate-level complaints. In the group of 10 ground handling personnel with untimely work schedules, 6 individuals (25%) reported moderate-level MSDS complaints, 3 individuals (12.5%) reported high-level MSDS complaints, and 1 individual (4.17%) reported very high-level MSDS complaints.

A. Relationship Between Age of Ground Handling Personnel and MSD Complaints

Typically, individuals tend to show symptoms of musculoskeletal problems upon entering the workforce, a stage that usually occurs between the ages of 25 and 60. Musculoskeletal problems usually emerge as early complaints around the age of 35. The phenomenon tends to increase with age due to a decline in muscle strength and endurance, particularly after middle age, resulting in increased vulnerability to muscle complaints. The aging process is often associated with a decrease in various physiological and cognitive functions, including maximum oxygen uptake (volume O2 max), optical acuity, hearing acuity, perceptual processing speed, decision-making ability, and memory capacity. Therefore, age is consistently considered a crucial component in the occupational process (Tarwaka, 2019).

Based on the research findings, 14 operators under the age of 35 reported experiencing musculoskeletal disorders and subsequently filed complaints. Out of the total 14 operators, the majority, 8 individuals (33.3%), reported musculoskeletal disorders classified as high. Additionally, 5 individuals (20.83%) experienced musculoskeletal complaints classified as very high, while only 1 person (4.17%) reported complaints in the moderate category. Among the group of 10 operators aged 35 and over reporting musculoskeletal disorders, 7 individuals (29.17%) reported complaints in the moderate category, while 3 individuals (12.5%) reported musculoskeletal disorders in the high category. The level of high complaints increased significantly. The research conducted by I Putu (2020) states a similar assertion, highlighting that individuals over the age of 35 have a high risk of MSDs (Kisi & Kayastha, 2024).

Statistical analysis shows a p-value of 0.002 ($p < 0.05$), indicating a statistically significant relationship between the age of ground handling personnel and the occurrence of MSD complaints. Therefore, there is a positive relationship between age and MSD complaints among ground handling personnel at Batam International Airport.

The observations align with the theoretical framework asserting that advancing age plays a pivotal role in the development of bone deterioration, a phenomenon frequently observed in individuals aged 35 years and older. The aforementioned processes lead to the formation of scar tissue within the spinal disc, a reduction in the fluid content between joints, and permanent thinning of the disc space. Consequently, the stability of spinal segments becomes compromised. The phenomenon of disc space narrowing has been observed to have detrimental effects on the spine's load-bearing capacity, particularly in the lumbar region.

Diminished capacity to bear loads and perform bodily movements results in expressions of discomfort associated with back pain (Jatmikawati, 2019). The frequency of musculoskeletal symptoms in any body region increases with age, lower educational attainment, female gender, higher BMI, prolonged occupational tenure, and lifestyle. Risk factor analysis indicates that age is the most critical parameter for the occurrence of musculoskeletal disorders.(Krishnan KS, Raju G, Shawkataly O., 2021) (Mohith Bekal Kar, Mangalpady Aruna, Bijay Mihir Kunar, 2023) (Thamrin et al., 2021). In contrast to Study (Thamrin et al., 2021), where respondents of advanced age are able to continue working without encountering the expected musculoskeletal issues for their age, a similar pattern is observed among avid and motivated anglers who smoke. Meanwhile, the duration of employment exerts a more substantial influence on musculoskeletal disorders among fishermen.

B. Relationship Between Work Experience and MSD Complaints

Musculoskeletal disorder complaints may increase with the duration of one's tenure. Besides giving rise to musculoskeletal complaints, prolonged employment can impact an individual's physical and psychological well-being. Extended tenure represents one risk aspect that can influence an individual's susceptibility to musculoskeletal disorders, particularly in occupations involving significant energy expenditure and physical activity (Tarwaka, 2018).

Based on research findings, among the participant group, 11 operators who have worked for more than 5 years reported musculoskeletal complaints. Additionally, 8 operators with service durations ranging from 1 to 5 years experienced similar issues, while 5 operators with less than 1 year of service reported similar problems. Out of the total 11 operators, 6 individuals (equivalent to 25%) reported musculoskeletal issues categorized as high. Furthermore, 5 individuals (20.83%) reported musculoskeletal disorders classified as very high. Among the eight operators who have served for one to five years, a total of four individuals (16.67%) reported experiencing musculoskeletal disorders classified as moderate. Additionally, two individuals (8.33%) reported musculoskeletal disorders categorized as high, while two others (8.33%) reported disorders classified as very high. Among the five operators who worked for less than one year, four individuals (16.67%) reported complaints of moderate-level musculoskeletal disorders, while one individual (4.17%) reported complaints classified as very high.

Statistical analysis indicates a p-value of 0.019 ($p < 0.05$), demonstrating a statistically significant relationship between labor duration and the prevalence of musculoskeletal problems among operators. This research's findings align with those of Indriyani (2022), who reported a statistically significant relationship ($p = 0.013$) between employees' tenure and the occurrence of musculoskeletal diseases. Similarly, research by Aditya Jaka Laksana and Triana Srisantyorini (2020) supports a relationship between tenure and complaints of MSDs.

According to Rahayu et al. (2020), prolonged exposure to non-ergonomic work postures is known to be associated with an increased risk of musculoskeletal disorders. The observed phenomenon can be linked to repetitive and sustained muscle contractions, leading to the development of muscle complaints. The discussion primarily revolves around ligaments and joints. In the study by Indriani, Putri Rizki Amalia Badri (2022), Musculoskeletal Disorders complaints are most commonly experienced by workers with less than 5 years of tenure, totaling 62 individuals (62.63%), predominantly reporting low-level Musculoskeletal Disorders complaints. This aligns with the research conducted by Irawati (2020), stating that workers with less than 5 years of tenure had more respondents suffering from musculoskeletal complaints compared to those with more than 5 years of tenure. A similar study by Santosa (2018) shows a negative correlation between tenure and the frequency of MSD complaints (r: -0.301; p-value < 0.05), indicating that respondents with less than 5 years of tenure experience more MSD complaints than those working for more than 5 years. Musculoskeletal Disorders are more commonly complained about by new workers (less than 5 years), influenced by limited work experience, unfamiliarity with the activities, and the need for adaptation to conditions, equipment, and the work environment (Santosa, 2018; Irawati et al., 2020). In contrast, a study by Erna Novita Sari, Lina Handayani, Azidanti Saufi (2017) states that there is no relationship between tenure and the occurrence of musculoskeletal complaints in workers.

OSHA Academy (2018) also asserts a similar notion, explaining that there is a positive correlation between workers' tenure and the intensity of experienced complaints. The concept of tenure refers to the

cumulative aggregation of individual work efforts over an extended period. Prolonged engagement in these activities can lead to adverse physiological consequences. Prolonged exposure to physical stress can result in decreased muscle performance. This continuous daily increase in pressure can lead to a decline in an individual's health, potentially causing the onset of chronic musculoskeletal fatigue.

C. Relationship Between Punctuality and MSD Complaints

In this research, it is evident that the majority of respondents achieved frame times within the designated category. This is apparent from the work stages carried out by porters, which can be completed within the specified time frame. However, some cargo handlers were unable to fulfill their duties within the allotted time. The incapacity of ground handling personnel to meet their responsibilities within the specified timeframe may be attributed to some ground handling personnel working solely with their own physical strength, without assistance from the tools provided by the airline. These ground handling personnel entirely rely on their own physical effort to arrange baggage, from loading passenger items into transport vehicles to the aircraft, and transferring items from the transport vehicle to the aircraft cargo hold. Such conditions contribute to the occurrence of untimely frame times (Baek & Kang, 2024).

Based on the research findings, among 14 participants with specific timeframes, 7 individuals (29.17%) reported experiencing complaints related to MSDS in the very high category, while 5 individuals (20.83%) reported complaints in the high category. Additionally, 2 individuals (8.33%) reported complaints in the moderate category. In the group of 10 participants with untimely frame times, 6 individuals (25%) reported experiencing MSDS complaints in the moderate category, while 3 individuals (12.5%) reported experiencing complaints in the high category. Moreover, one participant (4.17%) reported experiencing MSDS complaints in the very high category.

Statistical analysis indicates a p-value of 0.038 ($p < 0.05$), demonstrating a statistically significant relationship between the timeframe and the occurrence of musculoskeletal problems among operators. The robustness of this research conclusion is reinforced by additional research conducted by Sari (2018), stating that the timeliness of air transportation activities is related to flight delays at Adisutjipto Yogyakarta International Airport. The faster a porter completes their tasks (transporting and loading passenger baggage into the aircraft cargo hold), the more likely the aircraft will depart on time. In other words, the quicker a porter finishes their tasks, the more likely the aircraft will depart on time (Tahermanesh et al., 2023).

Airports face challenges due to the increasing volume of air traffic and stricter environmental restrictions, leading to the need to actively integrate speed profiles into conventional routing and scheduling procedures (Weiszer et al., 2015). With the rising air traffic, airport surfaces become congested, and air traffic flow is disrupted due to the formation of surface congestion. Therefore, in enhancing efficiency and predictability, airport ground operations are not only the primary focus of the NASA Integrated Arrival/Departure/Surface Operations initiative. Although several tactical initiatives have proven effective in improving airport surface operations from the service provider's perspective, their impact on airline frame time/done time scheduling, which has been shown to directly affect airline punctuality, should be considered(Kang & Hansen, 2018).

Tight frame times, especially in the cargo loading and unloading processes, can trigger repetitive movements that may stress the muscles and joints of ground handling workers. This process not only demands speed but also precision, often accelerated to meet flight departure schedules. With increasing efficiency demands, ground handling workers may face an elevated risk of musculoskeletal complaints. Inappropriate design of tools and equipment without ergonomic principles can exacerbate the risk of musculoskeletal complaints. Improper equipment and non-ergonomic work positions can lead to excessive pressure on the body, particularly on the back, neck, and shoulders. With the increased frequency of unnatural movements, ground handling workers become susceptible to injuries and musculoskeletal complaints. Airline management plays a significant role in mitigating the risk of musculoskeletal complaints by providing appropriate work equipment, maintaining regular work schedules, and prioritizing worker safety. Ergonomic training and awareness of health risks are also essential to equip ground handling workers with the knowledge and skills needed to reduce the negative impact of working hours and frame times.

CONCLUSION

A significant association was observed between age and Musculoskeletal Disorders (MSDs) complaints, particularly in individuals aged 35 and above. A correlation exists between the prolonged work duration and the occurrence of Musculoskeletal Disorders (MSD). Jobs involving uncomfortable and non-ergonomic postures over an extended period elevate the risk of musculoskeletal complaints, particularly due to the repetitive and prolonged exposure of muscles to static loads (Yılmaz et al., 2024). Although the average frame time aligns with schedules, the research indicates a connection between frame time and MSDs. Jobs requiring repetitive and rapid movements can lead to discomfort in muscles and joints. A holistic approach, encompassing fair work regulations, ergonomic training, and attention to the airline's frame time impact, is necessary to maintain the well-being of ground handling workers.

Providing ergonomic aids to workers with the goal of minimizing the lifting distance of loads can enhance the comfort of workers, thereby minimizing the potential ergonomic hazards. Offering education to workers on the importance of ergonomics, stretching, and body care is essential. Provide training on safe and healthy working techniques, paying attention to body posture during work. Sit properly in the chair, ensure that the monitor is at eye level, and avoid body positions that may cause additional stress. If possible, consider the use of assistive tools or ergonomic equipment that can help reduce stress on the body. Additionally, the implementation of a specific occupational safety and health (OSH) training program, particularly focusing on ergonomics knowledge, can prevent workplace accidents resulting from musculoskeletal disorders (MSDs). The company should provide corrective training to workers, addressing the specific body parts that experience discomfort after completing tasks (Tahermanesh, Kobra, 2023). In this study, the sample size was 24. It is anticipated that future research endeavors will consider investigating with a larger sample size.

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