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Ergonomic Risk Factors and Their Impacts on the Productivity Level of Fashion and Textile Designers in the Kumasi Metropolis, Ghana

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Abstract
The working environment setup in small-scale fashion and textile establishments in Ghana face numerous ergonomic risk factors such as low environmental temperatures, noise levels, seating, and ventilation. Due to the continuous precision activities as well as the highly repetitive actions, fashion and textile designers are often exposed to muscle diseases and non-neutral joint postures. This study investigated the impacts of ergonomic risk factors on the productivity of the fashion and textile designers. We used descriptive, cross-sectional and correlational designs under the quantitative research approach to investigate the phenomenon of ergonomic risk factors faced by fashion and textile designers in the Kumasi Metropolis, Ghana. Three hundred and eleven respondents were selected using a random sampling procedure to respond to a closed-ended questionnaire. Additionally, an observation checklist was used to record workers activities at the various workshops. The data were analyzed using descriptive statistics, an independent sample t-test, and correlation. The findings provided strong evidence of the detrimental effects of ergonomic risk factors on the productivity levels of fashion and textile designers in Kumasi Metropolis. The study underscores the need for capacity building in ergonomic risk management to enhance the levels of productivity of fashion and textile designers.

Keywords: *ergonomic risk factors; ergonomic risk mitigation strategies; clothing industry; Ghana*

Faktor Risiko Ergonomis dan Dampaknya terhadap Tingkat Produktivitas Desainer Mode dan Tekstil di Wilayah Metropolitan Kumasi, Ghana

Abstrak
Lingkungan kerja yang diatur dalam perusahaan mode dan tekstil skala kecil di Ghana menghadapi banyak faktor risiko ergonomis seperti suhu lingkungan yang rendah, tingkat kebisingan, tempat duduk, dan ventilasi. Karena aktivitas presisi yang berkelanjutan serta tindakan yang sangat berulang, perancang mode dan tekstil sering kali terpapar penyakit otot dan postur sendi yang tidak netral. Penelitian ini menyelidiki dampak faktor risiko ergonomis terhadap produktivitas perancang mode dan tekstil. Kami menggunakan desain deskriptif, cross-sectional, dan korelasional dengan pendekatan penelitian kuantitatif untuk menyelidiki fenomena faktor risiko ergonomis yang dihadapi oleh perancang mode dan tekstil di Kumasi Metropolis, Ghana. Tiga ratus sebelas responden dipilih menggunakan prosedur pengambilan sampel acak untuk menanggapi kuesioner tertutup. Selain itu, daftar periksa observasi digunakan untuk mencatat aktivitas pekerja di berbagai bengkel. Data dianalisis menggunakan statistik deskriptif, uji-t sampel independen, dan korelasi. Temuan tersebut memberikan bukti kuat tentang efek merugikan dari faktor risiko ergonomis terhadap tingkat

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produktivitas perancang mode dan tekstil di Kumasi Metropolis. Studi ini menggarisbawahi perlunya pengembangan kapasitas dalam manajemen risiko ergonomis untuk meningkatkan tingkat produktivitas perancang busana dan tekstil.

Kata kunci: *faktor risiko ergonomis, strategi mitigasi risiko ergonomis, industri pakaian, Ghana*

INTRODUCTION

Ghana's clothing industry, primarily self-employed micro-enterprises, accounts for over a third of the country's labor market, comprising 40% of the total 24,133 establishments in the manufacturing sector (Gazzola et al., 2020; GSS, 2016; Şen, 2008). The working environment setup in small-scale garment production faces numerous issues, including low environmental temperatures, noise levels, seating, and ventilation (Vandyck and Fianu, 2012). According to the International Labor Organization (2005), millions of workers, including fashion designers, suffer from occupational diseases or accidents every year. The statistics of the Global Burden of Diseases, which have been developed by the World Health Organization (WHO), report that muscular skeletal diseases (MSDs) contribute 37% of the disease burden, which is attributable to occupational risk factors (Johnson et al., 2011). Over 70% of the producers used seats with poor ergonomic design, lacking backrests, inadequate height, narrow depth, no adjustability, inadequate knee room, and improperly contoured and unpadded seat pans (Arora et al., 2021; Akinyemi, 2020; Hoque, 2022; Sarder, 2006; Vandyck & Fianu, 2012). These issues highlight the need for better workplace conditions for both genders in this occupation. According to Jacobs et al. (2017), these poor features in a seat can cause musculoskeletal issues. An ergonomically designed seat offers support, comfort, and minimizes stress, preventing fatigue and promoting optimal posture. It includes features like spinal alignment and adjustability to accommodate workers' varying sizes and shapes, contributing to productivity (Pinto et al., 2021; Sudo et al., 2006). Hignett et al. (2021) describes ergonomic risk factors as aspects of a profession or task that put the worker under biomechanical stress. There are numerous ergonomic risk factors in the garment-making industry, but the most common ones include prolonged sitting or standing, repetitive motions, excessive force or load handling, and awkward postures (Waters et al. 2007). Accordingly, Hagberg et al. (1995) establish that the rise in injuries brought on by these factors (i.e., repetitive motion, uncomfortable postures, and the use of excessive force) in the garment industry has made them a significant concern for worker safety. Chan et al. (2020) further contended that in executing high-continuous and continuous precision activities as well as highly repetitive actions that result in muscle complaints, workers in garment industries have non-neutral joint posture.

Therefore, it is important to make these risk factors known through this study in order to make the fashion designers in Kumasi Metropolis more comfortable and increase productivity. These ergonomic challenges extend beyond seating arrangements to include other facets of the work environment such as temperature control, noise levels, and ventilation. These factors collectively contribute to the work-related musculoskeletal disorders reported among workers in the fashion and textile sector (Arora et al., 2021; Akinyemi, 2020; Hoque, 2022; Sarder, 2006; Vandyck & Fianu, 2012). This study sought to address the lack of consideration for ergonomic factors in the textile and clothing industry in the Kumasi metropolis and its potential effects on productivity.

Ergonomic Risk Factors and Workers' Awareness

Aspects of a profession or task that put the worker under biomechanical stress are known as ergonomic risk factors (Hignett et al., 2021). Physical risk factors are often the most commonly identified and include repetitive motions, awkward postures, excessive force, prolonged sitting or standing, mechanical pressure, vibration, and poor environmental conditions such as inappropriate lighting or temperature (Oakman et al., 2021). These physical factors, when excessive or prolonged, can contribute to the development of work-related musculoskeletal disorders (WMSDs) (Bernard, 2021). Organizational risk factors pertain to work characteristics and management practices, such as long work hours, inadequate rest breaks, job dissatisfaction, lack of control over the job, and job insecurity (Oakman et al., 2021). High employment demands, poor job control, a lack of social support, and job stress are all psychosocial risk factors (Kiss et al., 2022). Work-related musculoskeletal disorders (WMSDs), lower job satisfaction, and mental health issues can all be influenced by organizational and psychosocial factors. In the context of the fashion design industry, ergonomic risk factors can be particularly prevalent due to the nature of the work. For instance, fashion designers often engage in repetitive tasks, such as sketching, cutting, and sewing, which can lead to strain and overuse injuries (Liu & Chen, 2021). Awkward postures, often related to hunching over a workspace or a sewing machine, can also contribute to musculoskeletal discomfort and disorders (Liu & Chen, 2021).

The awareness of garment industry workers regarding ergonomic risk factors has been a topic of interest for many researchers. This is due to the fact that garment industry workers are often exposed to hazardous working conditions that may lead to severe health issues, like musculoskeletal disorders (MSDs). The literature review presents various findings on this issue from 2010 to September 2021 that are pertinent to the study. Starting from earlier studies, Islam et al. (2010) found that the majority of garment industry workers in Bangladesh lacked awareness about ergonomic risk factors in their workplace. The lack of training

programs and effective management strategies led to high rates of MSDs among the workers. Similarly, a study by Rahman and Abdul-Rashid (2011) in Malaysia's garment industry revealed that there was an insufficient level of ergonomic awareness among the workers, which resulted in high rates of occupational injuries and illnesses.

Contrastingly, research conducted by Potvin et al. (2012) in the Canadian garment industry showed that workers were more aware of ergonomic risk factors, attributing this to the rigorous health and safety training programs offered by companies. However, the study also suggested the need for more comprehensive ergonomic interventions to further decrease the risk of MSDs among workers. In 2014, a study in India by Das and Shikdar (2014) showed a slight improvement in awareness about ergonomic risk factors among garment industry workers. However, the rate of MSDs remained high, indicating the necessity of consistent and more effective ergonomic training in the industry. Later, another study in Bangladesh by Hossain et al. (2017) noted a similar pattern, with increased awareness about ergonomic risk factors. However, the researchers also found that despite the increased awareness, the working conditions were not significantly improved, implying a gap between awareness and implementation. Notably, Zhuang et al. (2018) found that despite increasing awareness, workers often lacked the ability to correctly apply ergonomic principles to their work processes, a pattern also observed in the Indonesian garment industry by Widyanti et al. (2019).

Recent studies such as Amin et al. (2020) and Ranabhat et al. (2021) emphasized the crucial role of management in implementing ergonomic measures in the garment industry. Their findings suggested that while worker awareness is important, it is not enough to prevent MSDs. The companies need to prioritize ergonomics in the workplace by providing appropriate facilities and equipment and implementing effective health and safety management systems. Further studies from 2020 onward highlight the growing emphasis on implementing ergonomic interventions and improving working conditions. Li et al. (2020) conducted a study in China's garment industry, pointing out that although workers were aware of ergonomic risk factors, many lacked the knowledge of effective measures to mitigate these risks. This suggests a necessity for practical, hands-on training on ergonomic measures alongside the standard information-based training. Lopez-Arquillos and Rubio-Romero (2021) conducted a study in Spain's garment industry, which concluded that while worker awareness has improved, the implementation of ergonomic interventions often lagged. They emphasized the crucial role of employers in creating ergonomic-friendly workspaces, including providing adjustable workstations and tools that reduce strain to decrease the risk of musculoskeletal disorders.

Possible Mitigation Strategies for Ergonomic Risks

Mitigation strategies in the textile and clothing industries aim to reduce ergonomic risk factors, promote safer work practices, and create a conducive work environment. Workstation redesign is a common intervention aimed at reducing physical strain and musculoskeletal disorders by considering worker anthropometric measurements, task nature, and equipment to ensure optimal work conditions (Chen et al., 2022). Paudyal et al. (2018) and Jorgensen et al. (2019) found that ergonomic interventions in the textile industry significantly reduced MSDs and self-reported pain among workers.

Another mitigation strategy is the provision of ergonomic training programs to educate workers about safe work practices and the importance of rest breaks. According to a study by Kuorinka et al. (2021), ergonomic training had a significant positive effect on workers' awareness and behaviour towards ergonomics, reducing instances of unsafe work practices and reducing musculoskeletal complaints. A study by Asfaw et al. (2021) found that a participatory ergonomic approach in a textile factory significantly reduced the prevalence of musculoskeletal disorders (MSDs) among workers.

In terms of cognitive demands, strategies may include job rotation, which can help reduce mental fatigue and monotony, and the implementation of stress management programs (Paschoarelli et al., 2020). Moreover, introducing flexible work schedules can contribute to a better work-life balance, reducing stress levels (Dawson et al., 2019). Taken together, the literature suggests that ergonomic interventions can effectively mitigate ergonomic risks in the textile and clothing industry, but their success depends on the specific context, organizational support, and employee involvement.

METHOD

Research Design

We used descriptive, cross-sectional and correlational designs under the quantitative research approach to investigate the iphenomenon of ergonomic risk factors faced by fashion and textile designers in the Kumasi Metropolis, Ghana. This approach and research designs were appropriate for this study because participants were observed in a natural and unchanged environment (Grime et al., 2002). The cross-sectional design, on the other hand, was used by the researcher to make inferences about the population of interest. It was used by the researchers to examine the ergonomic risk factors in the fashion industry as well as evaluate its awareness. The correlational design was used to examine the impacts of ergonomic factors on productivity in the fashion design industry. As this study aimed to examine the effect of ergonomic factors on productivity, the correlational design was instrumental in providing quantifiable evidence on the extent to which

ergonomic risk factors in the fashion design industry impacted productivity. The chosen research design facilitated the acquisition of empirical data that could be subjected to rigorous statistical analyses, enabling the derivation of valid and reliable conclusions.

Study Area

This study, which was carried out between January 2022 and May 2023, was in selected fashion industries in Kumasi Metropolis. The Kumasi Metropolitan Assembly (KMA) (Figure 1) is a rapidly expanding metropolis in Ghana, with a projected population of over two million and an annual growth rate of 5.4%. The metropolis is characterized by a fast rate of urbanization, with 48%, 46%, and 60% being rural, peri-urban, and urban, respectively. For effective administration, Kumasi Metropolises continuously worked in its divided 10 Sub-Metropolitan District Councils, namely Manhyia, Tafo, Suame, Asokwa, Oforikrom, Asawase, Bantama, Kwadaso, Nhyiaeso, and Subin. According to the Metropolitan Assembly, there were approximately 2,000 registered fashion design businesses operating in the metropolis at the time of this study. The work tasks performed within the industry include forming patterns, sewing, and ironing.

Participants

A simple random sampling technique was employed to select 311 respondents out of 2000, giving each fashion designer an equal and fair chance of being selected for the study. This method ensured the sample's representativeness and helped to eliminate selection bias. The random sampling technique was used to select samples from the ten (10) sub-metropolitan district councils in the Kumasi Metropolis (see Table 1). The number was appropriate because it met Yamane's (1973) formula for estimating sample size.

Table 1: The number of Participants sampled from the Sub-Metropolitan District

Sub-Metropolitan District	Sample Size
Manhyia	11
Tafo	11
Suame	10
Asokwa	11
Oforikrom	12
Asawase	10
Bantama	11
Kwadaso	12
Nhyiaeso	12
Subin	11
Total	**311**

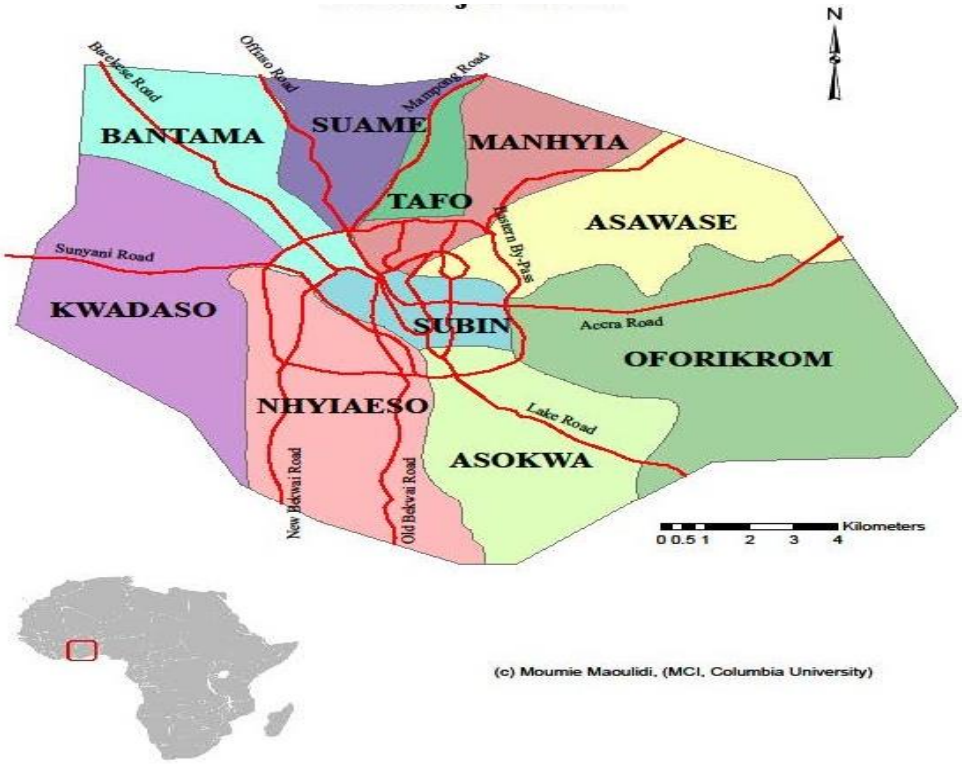

Figure 1: Map of the Kumasi Metropolis.
Source: MCI, Columbia University, 2020.

Data Collection Instruments

The primary method of data collection for this study was through self-administered questionnaires, which have been found to be an effective tool for collecting data in ergonomic research (Smith et al., 2019). Both closed-ended and open-ended questions were employed. The questionnaire was tailored to capture information pertaining to different aspects of the study. These sections included demographic details of respondents, questions assessing ergonomic risk factors in the fashion design industry in the Kumasi Metropolis, questions relating to the impact of these risk factors, and questions pertaining to mitigation strategies employed. A five-point Likert scale designated as “strongly agree (5)”, “agree (4)”, “undecided (3)”, “disagree (2)”, and “strongly disagree (1)” were used by respondents to answer the questionnaire items. Before the main data collection, a pilot study was conducted with 20 fashion designers who were not part of the main study to pre-test the questionnaire. This was done to ensure that the questions were understood as intended and to make any necessary revisions to improve the quality and reliability of the questionnaire.

Also, direct observations were made with the aid of a well-designed observation checklist, with the researchers acting as non-participant observers. The researchers used this type of observation because it gave them the chance to collect information from real-life situations.

Data Collection Procedure

Data collection was carried out between January 2022 and May 2023. Ethical considerations, such as obtaining consent from the participants, ensuring confidentiality, and respecting the participants' rights to withdraw from the study at any point, were strictly adhered to during the data collection process. The researchers made personal contacts in the first place with the respondents to seek their consent by giving them consent forms to fill out, to give advance information to those who consented to participate in the study, and to make the necessary arrangements for the administration of the instruments. The second was the administration of the instrument and the collection of the data. To ascertain the reliability of the instruments, the study used Cronbach's alpha, a measure of internal consistency. After the questionnaire was administered, the responses were analyzed, and a Cronbach's alpha coefficient was computed. A coefficient above 0.7 is generally considered acceptable and indicates a high level of reliability (Tavakol & Dennick, 2011). For this study, the computed Cronbach's alpha for the entire scale was found to be above 0.7, indicating that the questionnaire was reliable and the items were consistently measuring the intended constructs.

For the observational checklist, inter-rater reliability was established. This was done by having two independent raters assess a subset of the sampled fashion design workplaces. The agreement between the raters was then calculated (Creswell & Creswell, 2017). A high degree of agreement demonstrated that the observational checklist was reliable, suggesting that the observations were consistent, regardless of the observer. Through these measures, the study ensured the validity and reliability of the findings, which provides confidence in the accuracy of the identified ergonomic issues faced by fashion designers in the Kumasi Metropolis.

Data Analysis Procedure

The study analyzed data from the administered questionnaire in the Kumasi Metropolis fashion design industries using quantitative data analytical procedures. Descriptive statistics were used to describe ergonomic risk factors, while inferential statistics, such as correlation analysis and independent sample t-tests, were used to determine the relationship between ergonomic risk factors and productivity among designers. The results were presented in tables and charts, and conclusions were drawn based on the study's objectives.

Ethical Considerations

We obtained ethical clearance from our institutional ethics boards before starting the research. Additionally, we ensured that each participant signed an informed consent to indicate that their participation would be voluntary. To protect

their identities, pseudonyms were used to represent the views of participants whose views were presented in the data.

RESULT

Demographic Characteristics of Study Participants

The gender distribution of the respondents who took part in the study, used a valid sample size of 311 participants from the fashion industries in the Kumasi Metropolis. It was revealed that the majority of the participants were females (n=218, 70%), while males constituted 93 respondents, representing 30% of the study population. These results highlight that the fashion design industry in the Kumasi Metropolis is predominantly female dominated. The age distribution of the respondents shows that the majority of the participants fall within the 21-30 years age bracket (n=98, 31.5%). This is closely followed by those in the 31-40 years range (n=93, 29.9%), then those aged between 41-50 years (n=78, 25.1%). The smallest age group is represented by those aged 50 years and above (n=42, 13.5%).

Handling of Ergonomic Tools and Equipment

Table 2: Handling of Ergonomic Tools and Equipment

Statement	N	Min	Max	Mean	±SD
I regularly use ergonomic sewing machines in my work.	311	1	5	1.17	1.252
Ergonomic chairs and tables are available for use at my workplace.	311	1	5	2.04	1.201
There are tools available to help lift or move heavy items safely.	311	1	5	1.23	.685
Cutting tools and materials used in my work are ergonomically designed.	311	1	5	3.82	.965
There are measures in place to reduce repetitive motion in my tasks.	311	1	5	1.23	.587
Ergonomic lighting systems are utilized in my workplace.	311	1	5	3.63	.752
My organization provides protective clothing that fits well and protects against job-specific risks.	311	1	5	1.45	.864
Adequate ventilation and temperature controls are in place at my workplace.	311	1	5	3.00	1.124

Table 2 presents the availability of various ergonomic tools and equipment among the participants in the fashion industry in the Kumasi metropolis. Notably, the most available ergonomic tool was ergonomic scissors (ETE2) with 57.9% of respondents having access to this, followed by safety gloves (ETE12) available with 56.3% of respondents. Task lighting (ETE5) was also quite available, with 45% of the respondents reporting having them. However, it is of great concern to realize from the data that majority of respondents lacked access to key ergonomic tools. Specifically, the least available tool was hand trucks or trolleys (ETE7) with only

14.5% of respondents having access, and anti-fatigue mats (ETE6) with only 16.1% availability. Other critical tools such as ergonomic sewing machines (ETE1) and adjustable chairs with back support (ETE4) were available with only 25.0% and 24.1% of respondents respectively. Even more, the availability of ergonomic foot pedals (ETE13), which can significantly impact comfort and efficiency for those sewing, were present for only 20.9% of respondents, which underlines the profound lack of ergonomic considerations within the industry.

Awareness of Ergonomic Risk Factors

Table 3: Awareness of Ergonomic Risk Factors

Statement	N	Min	Max	Mean	±SD
I am aware of the ergonomic risk factors in my sewing job.	311	1	5	3.69	.977
There is sufficient training provided on ergonomic risks.	311	1	5	2.19	1.286
I am aware of the ways to mitigate the ergonomic risks.	311	1	5	1.27	.768
My organization prioritizes awareness on ergonomic risks.	311	1	5	1.04	1.143
I regularly update my knowledge on ergonomic risks.	311	1	5	2.74	1.345
The ergonomic risks are communicated to us regularly by our supervisors.	311	1	5	1.53	1.104
There are clear guidelines in our workplace to minimize ergonomic risks.	311	1	5	3.42	.685
I feel confident in my ability to reduce ergonomic risks during my work.	311	1	5	4.67	.895

The data in Table 3 sheds light on the respondents' awareness of ergonomic risk factors in their sewing jobs within the textile and clothing industry in Kumasi. On a five-point scale, respondents showed a moderately high level of personal awareness of these risks, as indicated by a mean score of 3.69. However, the respondents did not feel that there was sufficient training provided on these risks, with a mean score of 2.19. This indicates a significant gap in formal training and knowledge enhancement concerning ergonomics in their workplaces.This mirrors previous studies, such as Islam et al. (2010) and Rahman and Abdul-Rashid (2011), where a lack of training programs and effective management strategies were associated with a high prevalence of musculoskeletal disorders among garment industry workers. There is a discrepancy between individual awareness and the organization's action towards ergonomic risk management. This reflects the findings of Zhuang et al. (2018) and Widyanti et al. (2019), who found that workers, despite being aware, often lacked the capacity to correctly apply ergonomic principles to their work processes, suggesting a gap between awareness and application.

The findings implies that there is a pressing need for strategies at the organizational level to augment awareness, furnish training, and prioritize the alleviation of ergonomic risks in the Kumasi fashion design industry. Furthermore,

the low mean scores of 1.27 and 1.04 regarding the awareness of risk mitigation strategies and the organization's prioritization of ergonomic risk awareness, respectively, are cause for concern. It indicates a lack of communication, guidance, and prioritization of ergonomic considerations in their workplaces.Interestingly, the study showed a high mean score of 4.67, indicating the workers' confidence in their ability to reduce ergonomic risks. However, the low scores related to organizational prioritization of ergonomic risk awareness and awareness of risk mitigation strategies reveal a glaring deficiency in management's commitment to implementing ergonomic measures. This is in line with the findings of Amin et al. (2020) and Ranabhat et al. (2021) that highlighted the pivotal role of management in enforcing ergonomic measures in the workplace. It is evident from the results that the organizations within the fashion industry in Kumasi are lagging in terms of providing effective training and necessary information related to ergonomic risk factors and their mitigation strategies. This not only aligns with the findings of previous research such as Li et al. (2020), which pointed out that workers, despite being aware of ergonomic risks, often lacked the knowledge of effective measures to mitigate these risks, but it also resonates with the findings of Lopez-Arquillos and Rubio-Romero (2021), who found that while worker awareness has improved, the implementation of ergonomic interventions often lagged behind.

Predominant Ergonomic Risk Factors

Table 4: Predominant Ergonomic Risk Factors

Statement	N	Min	Max	Mean	±SD
My work involves repetitive tasks such as cutting and sewing fabrics.	311	1	5	4.70	.629
I often need to maintain awkward postures while sewing.	311	1	5	4.46	.592
My work requires me to lift or handle heavy materials or equipment.	311	1	5	1.12	.623
I frequently experience physical discomfort or pain due to my work of sewing.	311	1	5	4.52	.628
Deadlines and client demand often lead to work-related stress.	311	1	5	4.50	.725
I use sewing or cutting tools for prolonged periods without breaks.	311	1	5	4.40	.747
My work requires constant attention to fine details.	311	1	5	3.59	.765
I have to stand or sit in the same position for extended periods.	311	1	5	4.68	.852

Table 4 presents the descriptive statistics of the statements related to predominant ergonomic risk factors. On a scale of 1 to 5, where 1 is Strongly Disagree and 5 is Strongly Agree, it can be observed that the mean scores for all the statements are relatively high (above the scale midpoint of 3), indicating that respondents generally agreed with these statements. The statement "My work involves repetitive tasks such as cutting and sewing fabrics" had the highest mean

value of 4.70, suggesting that repetitive tasks were a predominant ergonomic risk factor in the work of the respondents. Close to this, with a mean value of 4.68, was the statement "I have to stand or sit in the same position for extended periods". This shows that a significant number of respondents are exposed to static postures for prolonged periods while working. Such high scores for these physical ergonomic factors suggest that these aspects form a significant part of the work routine for participants, which, as established and consistent with literature (Waters et al., 2022; Oakman et al., 2021; Bernard, 2021).

On the other hand, the statement "My work requires me to lift or handle heavy materials or equipment" had the lowest mean score (1.12), indicating that lifting or handling heavy materials or equipment may not be a common ergonomic risk for most respondents. Moreover, work-related stress, a psychosocial risk factor, also emerged as significant in our study, with a mean score of 4.50. This underscores a potentially high-stress work environment that could lead to burnout, decreased job satisfaction, and potential mental health problems, consistent with previous findings (Kiss et al., 2022).

Proposed Solutions to Mitigate Ergonomic Risk Factors

Table 5: Descriptive statistics on mitigating strategies against ergonomic risks

Statement	N	Min	Max	Mean	±SD
Ergonomically designed workstations would reduce the physical strain in garment production.	311	1	5	4.06	1.173
Adjustable worktables or chairs would enhance my comfort while sewing.	311	1	5	3.40	1.181
Ergonomic training programs would help me understand safe sewing practices better.	311	1	5	3.94	1.157
I believe that regular rest breaks are crucial to prevent work-related discomfort or pain.	311	1	5	4.02	1.124
I think being involved in identifying and solving ergonomic issues at work (participatory ergonomics) would improve our work conditions.	311	1	5	3.56	.563
Use of assistive devices or equipment designed with ergonomic principles would make my work easier and safer.	311	1	5	3.99	.876
Job rotation would help to reduce mental fatigue and monotony in my work.	311	1	5	4.11	1.130
A positive work culture that emphasizes health and safety would make it easier to implement ergonomic interventions.	311	1	5	3.75	.741

The data presented in Table 3 represent the descriptive statistics for each statement on mitigating strategies against ergonomic risks. The statistics are based on responses from 311 participants, with a response scale ranging from 1 to 5. The statement "Job rotation would help to reduce mental fatigue and monotony in my work" yielded the highest mean score (M=4.11, SD=1.130), suggesting that participants generally agreed or strongly agreed with the assertion. This finding

indicates that respondents perceive job rotation as a critical ergonomic strategy for reducing mental fatigue and monotony in their work. The second-highest mean score (M=4.06, SD=1.173) was observed for the statement "Ergonomically designed workstations would reduce the physical strain in garment production." This finding suggests that the participants generally agreed that ergonomically designed workstations could potentially reduce the physical strain associated with garment production.

Furthermore, respondents also acknowledged the importance of regular rest breaks (M=4.02, SD=1.124) and the use of assistive devices or equipment designed with ergonomic principles (M=3.99, SD=.876) in reducing work-related discomfort or pain and enhancing work safety, respectively. The statement "Ergonomic training programs would help me understand safe sewing practices better" had a mean score of 3.94 (SD=1.157), indicating a general agreement among the respondents. "A positive work culture that emphasizes health and safety would make it easier to implement ergonomic interventions" had a mean score of 3.75 (SD=.741), showing that participants generally agreed with the importance of a positive work culture in facilitating the implementation of ergonomic interventions. The statement "I think being involved in identifying and solving ergonomic issues at work (participatory ergonomics) would improve our work conditions" had a mean score of 3.56 (SD=.563), suggesting that respondents moderately agreed with the benefits of a participatory approach to ergonomics. "Adjustable worktables or chairs would enhance my comfort while sewing" had a mean score of 3.40 (SD=1.181), indicating that respondents were somewhat neutral to agreeing with the assertion.

Ergonomic Risk Factors and Productivity

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.757[a]	.573	.573	.670

a. Predictors: (Constant), Erg_RF

The results from Table 4 show that the regression model is significant in predicting the dependent variable with an R value of 0.757. The R value represents the correlation between the predicted and actual values of the dependent variable, indicating a strong positive relationship.

The R-Square value is 0.573, which means that approximately 57.3% of the variance in the dependent variable can be explained by the Ergonomic Risk Factors (Erg_RF). This leaves about 42.7% of the variance explained by factors not included in the model.

The adjusted R-Square is also 0.573, confirming the model's robustness by adjusting for the number of predictors relative to the number of observations. The

Standard Error of the Estimate (SEE) of 0.670 is a measure of the differences between the observed and predicted values of the dependent variable. It quantifies the spread that would be seen around the line of best fit if the model were depicting the relationship perfectly.

Overall, the model exhibits good predictive power, indicating that Erg_RF is a significant determinant in the context of this study. However, it also suggests that other factors not included in the model may have significant influences and should be explored in future research.

Table 7: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2268.163	1	2268.163	5055.635	.000[b]
	Residual	1689.132	3765	.449		
	Total	3957.294	3766			

a. Dependent Variable: Prod b. Predictors: (Constant), Erg_RF

The data presented in Table 5 pertains to an Analysis of Variance (ANOVA) test which was carried out to determine whether there is a statistically significant difference in the means of Productivity (Prod) based on Ergonomic Risk Factors (Erg_RF). The table shows a significant F-value of 5055.635 with a p-value of less than 0.001 (Sig. = .000b). This suggests that the regression model is statistically significant in predicting the dependent variable, Productivity (Prod).

The Regression sum of squares (2268.163) is substantially larger than the Residual sum of squares (1689.132). This demonstrates that a large proportion of the total variation in Productivity (Prod) can be explained by the model (i.e., by Ergonomic Risk Factors). The Mean Square for Regression (2268.163) greatly exceeds the Mean Square for Residual (0.449), indicating a strong effect of the Ergonomic Risk Factors on Productivity.

Table 8: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	.915	.042		21.680	.000
	Erg_RF	.769	.011	.757	71.103	.000

a. Dependent Variable: Prod

The data in Table 6 presents the coefficients of the regression model in which Productivity (Prod) is the dependent variable, and Ergonomic Risk Factors (Erg_RF) is the independent variable. The Unstandardized Coefficients column shows the value of B and the corresponding Standard Error. The B value for Erg_RF is .769, which suggests that for every unit increase in Erg_RF, there is an expected increase of .769 units in Prod, all other factors being held constant. The Standard

Error associated with this coefficient (.011) is relatively small, indicating a high level of precision in the estimate of the coefficient.

The Standardized Coefficients column presents the Beta value (.757), which is the coefficient of Erg_RF when the model is standardised. This Beta value indicates that a standard deviation increases in Erg_RF corresponds to a .757 standard deviation increase in Prod. The t-statistic (71.103) associated with Erg_RF and the corresponding p-value (Sig. = .000) suggest that Erg_RF is a statistically significant predictor of Prod. The model's constant (.915) is also statistically significant (t = 21.680, Sig. = .000).

DISCUSSION

The analysis of data in relation to the first objective of this study underscores the importance of managing ergonomic risk factors in the fashion industry in the Kumasi Metropolis, highlighting their impact on productivity. This finding aligns with the empirical literature presented by Amponsah-Tawiah & Dartey-Baah (2021) and Niederman et al. (2022) that ergonomic risk factors significantly influence both the physical and cognitive health of workers, ultimately affecting productivity levels. The results of the regression model, where a significant positive coefficient for ergonomic risk factors (.769) was identified, indicate that these risk factors are indeed associated with higher levels of productivity. This high ergonomic risk may cause workers to exert more effort or work longer hours, temporarily increasing productivity. However, this can lead to health issues such as musculoskeletal disorders or psychological illnesses, potentially affecting long-term productivity. Such a situation, as indicated by the work of Morgeson et al. (2023), is detrimental to the long-term sustainability of the industry. Errors and product quality may rise due to mental fatigue and decreased concentration in high-demand jobs, potentially affecting short-term productivity but potentially harming workers' health and industry reputation in the long run.

Furthermore, it is critical to note that high ergonomic risks, although initially linked to increased productivity, can ultimately lead to increased absenteeism and high employee turnover rates, as suggested by Niederman et al. (2022). This may be due to the development of work-related musculoskeletal disorders and other physical or psychological health problems arising from poor ergonomics. Consequently, the industry may be burdened with additional indirect costs, such as hiring and training new workers, as well as decreased efficiency during transition periods.

While this study focused on the fashion industry within the Kumasi Metropolis, the implications of the findings are far-reaching. Poor management of ergonomic risk factors could hamper the growth of the fashion industry on a larger scale, considering that the Kumasi Metropolis is a significant hub for high-quality

textile and clothing production. Additionally, the societal impact cannot be overlooked. The health burden on workers might increase the pressure on healthcare systems, which will need to cater to the resulting health issues. Emphasizing the crucial role of ergonomic interventions in enhancing worker comfort and well-being within the fashion industry, particularly in the Kumasi Metropolis. Literature suggests that a well-implemented ergonomic intervention strategy can mitigate prevalent ergonomic risks (Chen et al., 2022; Paudyal et al., 2018). Indeed, our findings support this assertion. Participants generally agreed that ergonomically designed workstations could potentially reduce the physical strain associated with garment production, which mirrors the conclusions drawn by Jorgensen et al. (2019) and Paudyal et al. (2018) regarding the implementation of adjustable worktables and weaving looms.

Participants also acknowledged the importance of regular rest breaks and the use of assistive devices or equipment designed with ergonomic principles, aligning with the recommendations provided by David et al. (2023). These measures can reduce work-related discomfort or pain, enhance work safety, and are reflective of a comprehensive approach towards ergonomics, as championed by previous literature (Paschoarelli et al., 2020). Moreover, consistent with the insights from Kuorinka et al. (2021), the results underscore the value of ergonomic training programs in educating workers about safe practices. The participants' agreement with the assertion that "ergonomic training programs would help me understand safe sewing practices better" testifies to the effectiveness of such interventions in promoting safe work behaviours.

The study participants' belief in the benefits of a participatory approach to ergonomics also resonates with Asfaw et al.'s (2021) findings that involving workers in identifying and solving ergonomic issues leads to a significant decrease in the prevalence of musculoskeletal disorders. Similarly, the recognition of the role of a positive work culture in implementing ergonomic interventions echoes the sentiments in the literature, emphasizing the necessity of organizational support and employee involvement in successful ergonomic initiatives. However, the results indicated a slightly lower consensus regarding the comfort enhancement provided by adjustable worktables or chairs, which deviates somewhat from the conclusions of Zare et al. (2020). This discrepancy may stem from the specific nature of tasks or equipment used in the Kumasi Metropolis fashion industry, highlighting the need for context-specific ergonomic solutions.

CONCLUSION

The overall aim of this research was to examine ergonomic risk factors and evaluate awareness among workers in the Kumasi metropolis' textile and fashion industries. The study concluded that the Kumasi metropolis' textile and fashion

industries are faced with various ergonomic risk factors such as repetitive tasks, static postures, and work-related stress. The study contends that long working hours negatively impacted the level of productivity and design quality, emphasizing the need for industry-wide intervention to improve worker well-being. Also, ergonomic risk factors were the main cause of musculoskeletal disorder occurrences in textile and fashion workers in the Kumasi Metropolis. Moreover, the correlation established between job demands, job resources, and the prevalence of ergonomic risk factors was significant, implying that strategic management of ergonomic risk factors could be crucial in the quest for their mitigation. There is a positive correlation between ergonomic risk factors and productivity, indicating that reducing ergonomic risks could boost productivity considerably.

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