

NON-ERGONOMIC POSTURE AND REPETITION WITH LOW BACK PAIN COMPLAINTS IN BAKERS

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Abstrak

Postur tidak ergonomik dan repetisi dalam bekerja meningkatkan resiko mengalami keluhan low back pain. Tujuan penelitian ini ialah menganalisis hubungan postur tidak ergonomik dan repetisi dengan keluhan low back pain pada pembuat kue. Penelitian ini merupakan observational analitik dengan pendekatan cross-sectional. Populasi dalam penelitian ini adalah 69 orang, sementara sampel sebesar 62 orang dipilih dengan purposive sampling dengan mempertimbangkan kriteria inklusi. Keluhan low back pain diukur dengan instrumen Visual Analog Scale serta pemeriksaan fisik sederhana berupa pemeriksaan spasme otot punggung bawah, tungkai atas, tungkai bawah dan dilanjutkan dengan lesegue test. Postur tidak ergonomik dan repetisi diukur menggunakan lembar observasi RULA dan timer. Analisis data yang digunakan adalah uji Pearson. Hasil penelitian menunjukkan bahwa ada hubungan positif yang signifikan antara postur tidak ergonomi dan repetisi dengan keluhan low back pain ($p=0.010$; $p=0.041 < 0,05$). Penelitian ini dapat memberikan informasi sebagai bahan pertimbangan kepada pemilik usaha dalam mengambil kebijakan terkait kesehatan kerja khususnya low back pain serta dapat meningkatkan kesadaran pekerja untuk memperhatikan pola hidup yang sehat serta aktifitas fisik guna meminimalisir risiko nyeri.

Kata kunci: low back pain, postur, repetisi

Abstract

A posture that is not ergonomic and repetitive at work increases the risk of experiencing low back pain complaints. The study aimed to analyze the correlation between non-ergonomic posture and repetition with complaints of low back pain in cake makers. The study was an observational analytic with a cross-sectional approach. The population was 69 people, 62 samples were selected by purposive sampling with the inclusion criteria. Complaints of low back pain were measured using the Visual Analog Scale instrument as well as a simple physical examination in the form of examining the muscle spasms of the lower back, upper limbs, lower legs and followed by a lesegue test. Non-ergonomic postures and repetitions were measured using the RULA observation sheet and a timer. The data analysis used the Pearson test. There was a significant positive correlation between non-ergonomic posture and repetition with complaints of low back pain ($p=0.010$; $p=0.041 < 0.05$). This research can provide information as material for consideration to business owners in making policies related to occupational health, especially low back pain, and can increase worker awareness to pay attention to a healthy lifestyle and physical activity to minimize the risk of pain.

Keywords: low back pain, posture, repetition

1. INTRODUCTION

The rapid development of the industrial sector has a positive impact on the progress of a country which will directly contribute actively to reducing unemployment and increasing the amount of state income. However, this is also in line with the increased risks to occupational safety and health aspects. The opening of various job opportunities and the large number of workers absorbed will increase the risk of work-related accidents and diseases, so this is something that deserves

further attention. Poverty rates and social inequality will increase when individuals are unable to carry out their work activities, especially because of complaints of low back pain (LBP) in low and middle-income countries, where informal work is the most common profession with minimal social support (Hartvigsen et al., 2018).

World Health Organization in 2022 states that musculoskeletal disorders are the leading cause of disability worldwide with LBP as the sole cause of disability in 160

countries. Global Burden of Disease in 2020 states that the number of cases of LBP globally is estimated to reach 619 million cases. In line with this, in 2019 it was shown that around 1.71 billion people in the world live with musculoskeletal disorders, one of which is LBP. In adulthood, LBP is the main reason workers retire early (Cieza et al., 2020).

In the USA, LBP is 1 of the 10 biggest diseases and is ranked fifth on the list of causes for someone to visit a doctor with high medical costs (Minghelli, 2017). In the same year, a study conducted in Asia also stated that in 4 years, 30% of the 42,785 subjects involved experienced LBP (Yiengprugsawan et al., 2017). Meanwhile according to Kementerian Kesehatan RI in 2018, the proportion of back injuries is 6.5%. Research conducted by Torkaman and Attari (2022) on 310 traditional bread-bakers stated that the frequency of musculoskeletal complaints in traditional bakers most often occurred in the lower back. LBP can significantly limit mobility and dexterity, leading to early retirement from work, lower levels of well-being, and reduced ability to participate in society. The defects and costs caused by LBP are projected to increase in the coming decades, particularly in low- and middle-income countries where health systems are still often fragile and ill-equipped to cope with this growing burden (Hartvigsen et al., 2018).

LBP is a public health problem in the world that indirectly impacts socio-economic conditions and has an impact on increasing spending on the health sector with the potential to impact quite large losses and become an economic burden in a country (Allegri et al., 2016). LBP is a pain that arises in the lower back. These complaints can trigger a decrease in work productivity and loss of working hours, so it is an important thing to pay attention to (Awaluddin et al., 2019). LBP complaints can attack anyone regardless of race, economic status, and age group. This disorder can occur in all people in various countries with high, medium, and low incomes (Hartvigsen et al., 2018).

According to Vlaeyen et al. (2018) state that LBP is pain that arises as a result of the interaction process of several risk factors, such as both psychological and physical (e.g.: lifting heavy weights and standing for too long) and an unhealthy lifestyle (e.g: obesity, low levels of physical activity and smoking). There is a strong relationship between exposure

to each ergonomic risk factor in the form of fatigue, standing posture, activities of lifting or moving people, activities of pushing, dragging and moving objects with heavy loads, and significant repetition of movements with LBP work-related (Jia et al., 2022; Kim et al., 2018).

Working in a sitting position for a long time in an improper position can result in a person getting tired easily and having less efficiency at work because a bent lordosis position with too much spinal burden triggers muscle disorders, especially the abdominal muscles and back muscles which are the cause of LBP (Rachmat et al., 2019). Another reason is that doing work with bad posture for a long time can easily cause blood circulation disorders. Insufficient blood supply in the spinal area can cause stiffness in the muscle tissue due to the inability of the bones to absorb the nutrients needed to trigger complaints of LBP (Jia et al., 2022). The lack of workers' attention to the ergonomics of sitting positions including sitting posture, table and chair heights, and rest periods during working hours, also contributes to the high incidence of LBP which is closely related to work factors (Yong et al., 2017).

Repetition is a movement or stretching of the same joint or body part continuously without relaxation. Repetitive movements have the potential to cause LBP (Wang et al., 2021). There is a strong relationship between sitting work positions and repetitive movements with LBP complaints in spring roll skin workers (Nurhalimah et al., 2017). Furthermore, the frequency of workers bending and twisting is also a factor causing LBP complaints (Jia et al., 2022; Wami et al., 2019).

In addition, several personal factors can contribute indirectly to the development of LBP, including age, body mass index, smoking, hobbies, history of illness, history of injury, and physical activity. According to research by Jumiaty and Dewi (2022), it states age, exercise habits, and length of work influence the occurrence of LBP. Therefore, this study aims to analyze the factors that have the potential to cause complaints of low back pain in bakers at CV. Fawas Jaya City of Medan.

2. RESEARCH METHOD

The study was an observational analytic with a cross-sectional approach. The population in this study was 69 people. 62 people involved in this study were selected by purposive

sampling, inclusion criteria: 1) bakers who are female; 2) aged 18–60 years, and 3) bakers who are directly involved in making while exclusion criteria: 1) bakers who have a history of trauma to the lower back such as bone fractures and joint disorders, 2) bakers who have a history of diseases related to nerves, and suffer from spinal disorders and 3) bakers who are pregnant. LBP complaints were measured using a questionnaire and visual analog scale. Posture and repetition were measured using the RULA (Rapid Upper Limb Assessment) observation sheet. Fatigue was measured using a reaction timer and physical activity was measured using an interview and filling

out the IPAQ (International Physical Activity Questionnaire). Data were analyzed using the Pearson test. This research passed the ethical test at the Health Research Ethics Commission, the University of Prima Indonesia with number 059/KEPK/UNPRI/III/2023.

3. RESULT AND DISCUSSION

The following presents the characteristics of the respondents based on Age, BMI, Physical activity, Work fatigue, RULA Score, Repetition and VAS score.

Table 1. Respondents' Distribution

Variable	Mean	SD	Min–Max	95% CI
Age	30.97	7.4	18–52	29.09–32.85
BMI	24.96	1.59	21.3–27.00	24.58–25.33
Physical activity	438.06	87.8	267–650	415.74–460.37
Work fatigue	450.40	91.5	285–596	427.16–473.66
RULA Score	4.58	1.19	3–7	4.28–4.88
Repetition	6.31	1	5–8	6.05–6.56
VAS score	3.29	0.91	2–5	3.06–3.52

According to Table 1. the average physical activity of the bakers was 438.06 MET-minutes (95% CI: 415.74–460.37), with a standard deviation of 87.8 MET-minutes. The lowest physical activity value was 267 MET-minutes and the highest physical activity value was 650 MET-minutes. From the interval estimation results, it can be concluded that 95% believed that the average value of the bakers' work fatigue was between 415.74–460.37.

The average work fatigue of bakers was 450.40 milliseconds (95% CI: 427.16–473.66), with a standard deviation of 91.58 milliseconds. The lowest fatigue value was 285 milliseconds and the highest fatigue value was 596 milliseconds. From the interval estimation results, it can be concluded that 95% believed that the average value of the bakers' work fatigue was between 427.16 – 473.66.

Table 2. Distribution of Physical Examination Results

LBP	n	%
Palpation		
Positive		
Lower back muscle spasm	36	58.1
Upper limb muscle spasm	27	43.5
Lower limb muscle spasm	29	30.6
Negative		
Lower back muscle spasm	26	41.9
Upper limb muscle spasm	35	56.5
Lower limb muscle spasm	43	69.4
Lasegue		
Positive	7	11.3
Negative	55	88.7
Pain duration (hours)		
<12	60	96.8
12-24	2	3.2

Based on table 2, shows that out of 62 respondents, 36 people (58.1%) had spasms in the lower back muscles for positive palpation while 43 people (69.4%) had a muscle spasm in the lower limb muscle for negative palpation. At the lasegue examination, the results obtained were 55 people (88.7%) who negatively experienced radiating pain with the duration of pain being felt by most respondents <12 hours, namely 60 people (96.8%).

Table 3. Correlation Test Between Non-ergonomic Posture and Repetition with LBP Complaints

Variable	R	p-value
Non-ergonomic posture	0.324	0.010
Repetition	0.260	0.041

Table 3 showed that there was a relationship between unergonomic posture and LBP complaints with p-value =0.010 (p<0.05). Meanwhile, non-ergonomic posture and LBP complaints have a weak correlation (0.324). The correlation coefficient on the results is positive, meaning that if the non-ergonomic posture is getting worse, LBP complaints will also increase. There was a relationship between repetition and LBP complaints with p-value = 0.041 (p<0.05). Meanwhile, repetition and LBP complaints have a weak correlation (0.260). The correlation coefficient on the results is positive, meaning that if repetition occurs more frequently in bakers, complaints of low back pain will also increase.

Non-ergonomic posture is a significant contributor to musculoskeletal disorders due to stretching of the body's physical limits and can compress nerves and irritate tendons (Stack et al., 2016). Cieza et al. (2020) also reveal that exposure to risks from work such as lifting, bending, awkward postures, vibrations, and tasks that are considered physically demanding are associated with an increased risk of low back pain. LBP can arise due to a static position while working and is continuous so it can disrupt working hours which results in a decrease in work productivity.

This theory is in line with the research of Rachmawati et al. (2022) which states that there is an effect of work posture on LBP complaints with a p-value=0.000<0.05,

which means that there is a significant effect between work posture and LBP complaints. Ergonomic body posture is an ideal posture that shows the proper alignment of the body segments in such a way that the amount of energy required to maintain the desired position can be minimized. In this position, a person can optimally achieve balance with the proportion of body mass and frame by their physical limitations. Good posture optimizes breathing and influences the circulation of blood and body fluids, thereby reducing the risk of muscle fatigue and minimizing pain.

The results showed that the average worker did 6 repetitions of the entire cake-making process. The repetition activity in question is where the worker rotates his body to place or reach a cake tin from the right side to the left side of his body. While bending is done when you want to work or reach with a body position that is leaning forward. The same thing was also stated by the Health and Safety Executive (2021) where almost 82.6% of bakers out of a total sample of 120 people experienced pain in their lower back area which was caused by lifting heavy weights and equipment repeatedly, bending and twisting. Working with a bent body position for a long time has the potential to cause work risks. When muscles receive static loads repeatedly and for a long time, they can cause complaints of musculoskeletal disorders, and damage to joints, ligaments, and tendons (Fahmi et al., 2023). If the muscles contract excessively, blood circulation to the muscles will be reduced. As a result, the supply of oxygen to the muscles will be reduced, metabolic processes will be hampered and finally, lactic acid accumulation will occur which will cause muscle pain.

Research by Wami et al. (2019) stated that the results of multivariate analysis showed that the prevalence of low back pain in housekeeping workers who were involved in work activities that required repeated bending (AOR=1.97, 95% CI: 1.03, 3.75) had a statistically significant relationship with pain lower back where the p-value ≤0.05. Respondents whose jobs require repeated bending have a 97% higher likelihood of experiencing lower back pain than those whose tasks do not require repeated bending.

The same results were shown in the study by Tefera et al. (2021) where from the

logistic regression analysis bending or twisting had a relationship with complaints of low back pain with a p-value of 0.025 (<0.05). The fact is that when people work in time-hunting conditions the tendons, ligaments, joints, and muscles in the back will come out of their neutral posture and put unnecessary stress on the back. This results in more soft tissue strain and tear and ultimately increases the risk of low back pain. In addition, bending the posture at high frequency overstretches the worker's back muscles and other soft tissues; which is one of the biggest contributing factors to the onset of low back pain (Wami et al., 2019).

4. CONCLUSION AND SUGGESTION

There is a significant effect between non-ergonomic posture and LBP complaints in bakers ($p=0.01$), and also there is a significant effect between repetition and the emergence of LBP complaints in bakers ($p=0.04$) at CV. Fawas Jaya Medan City.

Business owners should make efforts to prevent LBP by improving working conditions and work environments that lead to workers' understanding of occupational health issues. Workers can do stretching activities to reduce stiffness in body muscles, fatigue and discomfort which will result in increased productivity. Workers can start with a routine of increasing light or moderate physical activity in 30 or 45 minutes, 3 or 5 times a week.

5. REFERENCE

- Allegrì, M., Montella, S., Salici, F., Valente, A., Marchesini, M., Compagnone, C., Baciarello, M., Manferdini, M. E. & Fanelli, G. (2016). Mechanisms of Low Back Pain: A guide for Diagnosis and Therapy [version 1; referees: 3 approved]. *F1000Research*, 5. <https://doi.org/10.12688/F1000RESEARCH.8105.1>
- Awaluddin, Syafitri, N. M., Rahim, M. R., Thamrin, Y., Rachmat, M., Ansar, J. & Muhammad, L. (2019). Hubungan Beban Kerja dan Sikap Kerja dengan Keluhan Low Back Pain pada Pekerja Rumah Jahit Akhwat Makassar. *Jkmm*, 2(1), 25–32. <https://doi.org/10.30597/jkmm.v2i1.10704>
- Cieza, A., Causey, K., Kamenov, K., Hanson, S. W., Chatterji, S. & Vos, T. (2020). Global Estimates of The Need For Rehabilitation Based on The Global Burden of Disease Study 2019: A Systematic Analysis for the Global Burden of Disease Study 2019. *The Lancet*, 396(10267), 2006–2017. [https://doi.org/10.1016/S0140-6736\(20\)32340-0](https://doi.org/10.1016/S0140-6736(20)32340-0)
- Fahmi, A. A., Dwiyanto, R. & Putri, A. S. (2023). Improvement of working posture in the metal casting industry to prevent musculoskeletal disorders. *Journal of Engineering and Applied Technology*, 4(1), 21–32.
- Bergamin, M. (2019). Physical Exercise is Confirmed to Reduce Low Back Pain Symptoms in Office Workers: A Systematic Review of The Evidence to Improve Best Practices in the Workplace. *Journal of Functional Morphology and Kinesiology*, 4(3), 1–15. <https://doi.org/10.3390/jfmk4030043>
- Hartvigsen, J., Hancock, M. J., Kongsted, A., Louw, Q., Ferreira, M. L., Genevay, S., Hoy, D., Karppinen, J., Pransky, G., Sieper, J., Smeets, R. J., Underwood, M., Buchbinder, R., Cherkin, D., Foster, N. E., Maher, C. G., van Tulder, M., Anema, J. R., Chou, R., Woolf, A. (2018). What low back pain is and why we need to pay attention. *The Lancet*, 391(10137), 2356–2367. [https://doi.org/10.1016/S0140-6736\(18\)30480-X](https://doi.org/10.1016/S0140-6736(18)30480-X)
- Health and Safety Executive. (2021). *Work-Related Musculoskeletal Disorders Statistics in Great Britain, 2021*. <https://www.hse.gov.uk/statistics/causdis/msd.pdf>
- Jia, N., Zhang, M., Zhang, H., Ling, R., Liu, Y., Li, G., Yin, Y., Shao, H., Zhang, H., Qiu, B., Li, D., Wang, D., Zeng, Q., Wang, R., Chen, J., Zhang, D., Mei, L., Fang, X., Liu, Y., Wang, Z. (2022). Prevalence and Risk Factors Analysis for Low Back Pain Among Occupational Groups in Key Industries of China. *BMC Public Health*, 22(1), 1–10. <https://doi.org/10.1186/s12889-022-13730-8>
- Jumiati, J. & Dewi, S. K. (2022). Williams Flexion Exercises Dan Core Stability

- Exercises Menurunkan Tingkat Disabilitas Punggung Bawah Pembatik Dengan Myogenic Low Back Pain. *Majalah Ilmiah Fisioterapi Indonesia*, 10(2), 126. <https://doi.org/10.24843/mifi.2022.v10.i02.p12>
- Kementerian Kesehatan RI. (2018). *Laporan Nasional RISKESDA 2018*.
- Kim, J. Y., Shin, J. S., Lim, M. S., Choi, H. G., Kim, S. K., Kang, H. T., Koh, S. B. & Oh, S. S. (2018). Relationship between Simultaneous Exposure to Ergonomic Risk Factors and Work-Related Lower Back Pain: A Cross-Sectional Study Based on The Fourth Korean Working Conditions Survey. *Annals of Occupational and Environmental Medicine*, 30(1), 1–9. <https://doi.org/10.1186/s40557-018-0269-1>
- Minghelli, B. (2017). Low Back Pain in Childhood and Adolescence Phase: Consequences, Prevalence And Risk Factors - A Revision. *Journal of Spine*, 06(01), 1–6. <https://doi.org/10.4172/2165-7939.1000351>
- Nurhalimah, Sutangi & Handayan, S. (2017). Hubungan Posisi Kerja Duduk dan Gerakan Repetitif dengan Keluhan Nyeri Punggung Bawah pada Pembuat Kulit Lumpia. *Jurnal Kesehatan Masyarakat*, 2(1), 23–30.
- Rachmat, N., Utomo, P. C., Sambada, E. R. & Andyarini, E. N. (2019). Hubungan Lama Duduk dan Sikap Duduk terhadap Keluhan Nyeri Punggung Bawah pada Penjahit Rumahan Di Kecamatan Tasikmadu. *Journal of Health Science and Prevention*, 3(2), 79–85. <https://doi.org/10.29080/jhsp.v3i2.204>
- Rachmawati, S., Suryadi, I. & Pitanola, R. D. (2022). Low Back Pain: Based on Age, Working Period and Work Posture. *Jurnal Kesehatan Masyarakat*, 17(2), 287–292. <https://doi.org/10.15294/kemas.v17i2.26313>
- Stack, T., Ostrom, L. T. & Wilhelmsen, C. A. (2016). *Occupational Ergonomics: A Practical Approach* (First). John Wiley & Sons, Inc.
- Tefera, B. Z., Zeleke, H., Abate, A., Abebe, H., Mekonnen, Z. & Sewale, Y. (2021). The magnitude and Associated Factors of Low Back Pain Among Nurses Working at Intensive Care Unit of Public Hospitals in Amhara Region, Ethiopia. *PLoS ONE*, 16(12 December), 1–13. <https://doi.org/10.1371/journal.pone.0260361>
- Torkaman, J. & Attari, S. G. (2022). Prevalence of Musculoskeletal Disorders and Ergonomic Risk Factors among Bread-Bakers. *IJMPP*, 7(2), 720–727.
- Vlaeyen, J. W. S., Maher, C. G., Wiech, K., Van Zundert, J., Meloto, C. B., Diatchenko, L., Battié, M. C., Goossens, M., Koes, B. & Linton, S. J. (2018). Low Back Pain. *Nature Reviews Disease Primers*, 4(1), 1–18. <https://doi.org/10.1038/s41572-018-0052-1>
- Wami, S. D., Abere, G., Dessie, A. & Getachew, D. (2019). Work-related risk factors and the prevalence of low back pain among low wage workers: Results from a cross-sectional study. *BMC Public Health*, 19(1), 1–9. <https://doi.org/10.1186/s12889-019-7430-9>
- Wang, H.-Y., Feng, Y.-T., Wang, J.-J., Lim, S.-W. & Ho, C.-H. (2021). Incidence of Low Back Pain and Potential Risk Factors Among Pharmacists. *Medicine*, 100(9), e24830. <https://doi.org/10.1097/md.00000000000024830>
- World Health Organization. (2022). *Musculoskeletal Health*. <https://www.who.int/news-room/fact-sheets/detail/musculoskeletal-conditions>
- Yiengprugsawan, V., Hoy, D., Buchbinder, R., Bain, C., Seubsman, S. A. & Sleight, A. C. (2017). Low back pain and limitations of daily living in Asia: Longitudinal findings in the Thai cohort study. *BMC Musculoskeletal Disorders*, 18(1), 1–7. <https://doi.org/10.1186/s12891-016-1380-5>
- Yong, R. J., Nguyen, M., Nelson, E. & Urman, R. D. (2017). Pain medicine: An essential review. *Pain Medicine: An Essential Review*, 1–606. <https://doi.org/10.1007/978-3-319-43133-8>