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Occupational Sitting Posture and Lower Back Pain Among Employees: A Cross-Sectional Study

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ABSTRACT

Low back pain refers to discomfort in the lower back that can interfere with daily tasks. Health centers are work environments that involve ergonomic activities such as lifting, pushing, pulling, reaching, carrying objects, and handling patients, all of which present potential hazards that may lead to musculoskeletal disorders. This study investigates whether low back pain among employees at the Merdeka Health Center in 2024 is associated with their sitting posture while working. The research applied an analytical survey with a cross-sectional design, using a questionnaire to collect primary data from 35 respondents who met the inclusion criteria. The majority of respondents were female (82.9 percent), aged between 26 and 35 years (40 percent), and worked in functional positions (51.4 percent). Most reported using chairs with backrests while working (82.9 percent), not sitting with a hunched posture (60 percent), and working less than six hours per day (62.9 percent). Statistical analysis produced a p-value of 0.564, indicating no significant association between sitting posture and the occurrence of low back pain. Based on the findings from both the past week and past year, there is no meaningful relationship between sitting position at work and low back pain among employees of the Merdeka Health Center in Bogor City.

Introduction

Occupational Safety and Health (OSH) is an effort to ensure safety and health in order to improve workers' well-being by preventing workplace accidents and occupational diseases, supported by health promotion, treatment, and rehabilitation. Lower back pain (LBP) is an ergonomic issue commonly encountered in OSH implementation, which leads to economic losses due to reduced work capacity and productivity. LBP is defined as local and/or radicular pain felt between the lower costal arch and the lumbosacral area [1]. According to data from the World Health Organization (WHO) in 2022, low back pain is the third most common health problem globally, after osteoarthritis and rheumatism, affecting 17.3 million people. Based on data from the Directorate General of Health Services, Ministry of Health of the Republic of Indonesia (Kemenkes RI) in 2018, the prevalence of low back pain in Indonesia was 18 percent [2].

Community Health Centers are health service facilities that provide both public health and individual health services at the primary level. In Indonesia, their main focus is on organizing promotive and preventive efforts to achieve a high level of public health within their service area, while prioritizing the safety and security of patients, staff, and visitors (Ministry of Health, 2014) [1]. As public health service facilities, health centers pose potential hazards that may affect staff, patients, visitors, and the surrounding community. These hazards include physical, chemical, biological, ergonomic, and psychosocial risks. Health centers are environments where ergonomic activities such as lifting, pushing, pulling, reaching, carrying objects, and handling patients are common. These activities carry higher ergonomic risks that can lead to musculoskeletal disorders [1].

The prevalence of LBP continues to rise and is influenced by several risk factors such as aging, a sedentary lifestyle, and occupations that involve heavy lifting or non-ergonomic sitting positions. Poor sitting posture, including the use of chairs that do not support proper alignment or inappropriate work desks, is often a primary cause of discomfort and pain in the lower back. Additional factors such as prolonged sitting, infrequent breaks, and workplace stress also contribute to the increased risk of LBP [3]. Working positions are generally categorized into two types: static and dynamic. Static positions involve holding a posture for an extended period without joint movement [4]. These positions can interfere with the distribution of nutrients, disrupt metabolic processes, and negatively affect the spine [5]. In contrast, dynamic positions, as defined by Rina et al., involve frequent joint movement [6]. A systematic review by Murti Latifah in 2022 concluded that both sitting posture and sitting duration play a role in the development of LBP among workers [7]. This is supported by a study conducted by Saputra in 2020, which found that LBP symptoms are often associated with non-

ergonomic sitting positions that compromise body posture stability during work. The study also identified a significant relationship between sitting posture and the incidence of LBP among batik craftsmen, with a p-value of 0.042 [8].

Considering the high prevalence of LBP and its documented association with occupational sitting posture, this study seeks to investigate the potential correlation between sitting positions during work and the incidence of LBP. The objective of this study is to examine whether a statistically significant relationship exists between workplace sitting posture and the occurrence of LBP among employees of the Merdeka Health Center in Bogor City during the year 2024.

Literature Review

Low back pain is a symptom, not a disease, and it can be caused by a variety of known or unknown factors. It is defined by its location, specifically the area between the twelfth rib (lower rib margin) and the gluteal fold. The pain may be local, radicular, or both, and is often accompanied by discomfort in one or both legs, sometimes along with neurological symptoms in the lower extremities [3]. According to the International Classification of Diseases, low back pain refers to acute or chronic pain in the lumbar and/or sacral regions of the spine, which may result from sprains, strains, intervertebral disc displacement, or other anatomical abnormalities of the spine [9].

There are five main categories of the etiology of low back pain. The first is mechanical causes, such as injuries to the spine or intervertebral discs. Herniated discs are a common example, and pregnancy can also be a mechanical cause of back pain. The second is degenerative processes, including conditions like spinal osteoarthritis and degenerative disc disease. The third is inflammatory causes, primarily due to seronegative spondyloarthropathies such as ankylosing spondylitis. The fourth is oncological or malignant causes, which may involve lytic lesions in the spine, bone marrow cancers, or nerve compression from space-occupying lesions. These often present as pathological fractures. The fifth is infectious causes, which may result from infections of the spine, intervertebral discs, epidural abscesses, or abscesses in the muscles or soft tissues [10].

Based on its onset, low back pain can be classified into two types. First, acute pain, which is sudden, intense, and often described as deep and severe. Individuals may experience disturbed sleep, and the pain worsens with movement. This type of discomfort typically lasts less than eight weeks. Second, chronic pain, which is persistent and usually does not resolve completely. Although it may last for a week or several weeks, it often

reappears after a short break. In some cases, recurrent pain can be triggered by simple physical activity [11].

Clinically, sciatica is typically characterized by a history of dermatomal leg pain, leg pain that is more intense than back pain, and pain that worsens with coughing, straining, or sneezing. In contrast, radiculopathy involves motor weakness, reduced sensory sensitivity, or other neurological disturbances associated with nerve root involvement. It often occurs alongside radicular pain [12].

There are several symptoms and signs to watch for in individuals with low back pain, commonly referred to as red flags. If any of these symptoms or signs are present, immediate referral for further evaluation and therapy is recommended. Red flags are divided into symptoms and signs. Symptom red flags include being under 18 years of age, over 50 years of age, or being immunocompromised. Sign red flags include lower extremity muscle weakness, saddle anesthesia, decreased anal sphincter tone, hyperreflexia, hyporeflexia, and areflexia [13].

Several anatomical structures and components of the lumbar spine such as bones, ligaments, tendons, discs, and muscles contribute to the development of low back pain. Most of these lumbar spine components contain sensory nerves that can produce nociceptive signals, which respond to tissue-damaging stimuli. Neuropathic causes like sciatica also play a role, and most cases of chronic low back pain involve a mixed cause of both nociceptive and neuropathic pain [14].

To provide a robust academic foundation, this study adopts an integrated theoretical approach combining several models. The first is the biomechanical model of musculoskeletal disorders, which states that mechanical loading on the spine, including compression, shear, and torque forces, can cause micro-injuries to spinal structures when posture is poor or ergonomics are inadequate. For example, sustained forward flexion, such as hunched sitting, can increase disc pressure and alter lumbar curvature, increasing the risk of low back pain. The second model is the work-related musculoskeletal disorder framework developed by the National Institute for Occupational Safety and Health (NIOSH). This framework identifies key occupational risk factors such as awkward posture, force, and repetition, with sitting position being a critical aspect of awkward posture. The third is the biopsychosocial model of pain, which recognizes that pain perception and chronicity are influenced not only by physical factors but also by psychosocial elements like stress, job satisfaction, and individual health beliefs. This model enables a holistic understanding of low back pain in the work environment.

Material And Methods

This study used an analytical survey with a cross-sectional design and collected primary data through a questionnaire. The results were analyzed using the Fisher Exact test followed by an in-depth analysis. The research was conducted at the Merdeka Health Center, Bogor City, in October 2024. The population included all employees of the health center, with a sample of 35 respondents selected using total sampling, based on specific inclusion and exclusion criteria. The inclusion criteria were: 1) employees of the Merdeka Health Center, Bogor City, and 2) willingness to participate as respondents. The exclusion criteria were: 1) unwillingness to participate, 2) presence of spinal abnormalities such as scoliosis, 3) diagnosed spinal diseases such as spondylosis or herniated nucleus pulposus (HNP), and 4) a history of spinal trauma.

The data in this study are primary data because they were collected directly by the researchers from the respondents. Information was gathered through a questionnaire distributed to the participants. Before completing the questionnaire, respondents were asked to provide their identity and answer several questions related to the exclusion criteria. The research instrument consisted of a questionnaire divided into two parts. The first part collected participant data, the variables under study, and questions regarding exclusion criteria. The second part was the Roland-Morris Disability Questionnaire (RMDQ), which includes 17 questions designed to assess whether there is any disability caused by low back pain.

The RMDQ used in this study had been translated into Indonesian and previously validated by Ghina Widiasih in 2015 [15]. The researcher used this translated version, which was also validated by a prior researcher, Heydi Amorina Abigail Saragi Napitu, who found similar results. In their validity test, 7 out of 24 statements were deemed invalid, leaving 17 valid statements in the Indonesian version [16]. Therefore, this translated RMDQ can be considered reliable. To minimize bias, subjective variables such as “hunched body posture” and “sitting on a chair with or without a backrest” were clearly defined within the questionnaire instructions.

Data analysis was conducted using univariate and bivariate methods. Univariate analysis was performed to describe the frequency distribution of each variable studied and is presented as percentages in a table. Bivariate analysis was used to examine the relationship between the potential incidence of low back pain and sitting position among employees of the Merdeka Health Center, Bogor City. This analysis employed a non-parametric statistical test,

the Fisher Exact test, with results expressed as p-values. All analyses were performed using IBM SPSS Statistics software, version.

This study was conducted in accordance with the principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Health Research Ethics Committee of Universitas Kristen Indonesia, Jakarta (Reference No.: *14.A/Etik Penelitian/FKUKI/2024*). All participants were fully informed about the purpose, procedures, potential risks, and benefits of the study. Written informed consent was obtained from each respondent prior to data collection. Participation was voluntary, and confidentiality and anonymity of all participants were strictly maintained throughout the research process.

Results

A. Respondents Characteristics

The study was conducted at the Merdeka Health Center in Bogor City, and the results were obtained from primary data collected through questionnaires. A total of 35 respondents met the inclusion criteria and participated in the study.

Table 1 presents the characteristics of the respondents based on gender, age, and job description. The majority of respondents were female, with 29 out of 35 respondents (82.9 percent), meaning there were only 6 male health workers at the Merdeka Health Center. Regarding age, most respondents were between 26 and 35 years old, accounting for 14 out of 35 respondents (40 percent). This indicates that the health workforce at the Merdeka Health Center is dominated by young adults. In terms of job roles, 48.6 percent (17 people) were administrative workers, while 51.4 percent (18 people) were functional workers.

Table 1. Characteristics of the respondents.

Profile	Frequency	Percentage
Gender		
Male	6	17.1
Female	29	82.9
Age		
16 – 25	3	8.6
26 – 35	14	40.0
36 – 45	7	20.0
46 – 55	8	22.9
56 – 65	3	8.6
Job type		
Administrative	17	48.6
Functional	18	51.4

B. Frequency Distribution of Respondents Based on Sitting Position, Hunched Posture, Sitting Duration, and Incidence of LBP in the Past Week and Past Year

1. Frequency distribution of respondents based on sitting position, hunched posture, and sitting duration

Table 2 shows the distribution of respondents by sitting position, hunched posture, and sitting duration. Most respondents, 29 out of 35 (82.9%), reported sitting on a chair with a backrest, while 6 respondents (17.1%) sat on a chair without a backrest. Regarding sitting posture, 21 respondents (60%) reported sitting without a hunched back, whereas 14 respondents (40%) reported a hunched posture. In terms of sitting duration, the majority (22 respondents or 62.9%) reported sitting for less than 6 hours, while 13 respondents (37.1%) sat for 6 to 9 hours.

Table 2. Frequency distribution of respondents based on sitting position, hunched posture, and sitting duration.

Description	Frequency	Percentage
Sitting position		
Chair with a backrest	29	82.9
Chair without a backrest	6	17.1
Hunched posture		
Hunchback	14	40
Not hunched	21	60
Sitting duration		
< 6 hours	22	62.9
6 – 9 hours	13	37.1

2. Frequency distribution of respondents based on the incidence of LBP during the past week and past year

Table 3 presents data on the incidence of LBP in the past week and past year. The majority of respondents did not experience LBP during either period, with 25 out of 35 respondents (71.4%) reporting no pain.

Table 3. Frequency distribution of respondents based on the incidence of LBP during the last week and based on the incidence of LBP during the last year.

Description	Frequency	Percentage
LBP occurrence in the past week		
LBP	10	28.6
No LBP	25	71.4
LBP occurrence in the past year		
LBP	10	28.6
No LBP	25	71.4

C. Bivariate Analysis

1. Relationship of job type to the incidence of LBP in the past week

Table 4. The relationship of job type to the incidence of LBP in the past week.

Job Type	LBP in the Past Week				P-Value	Odd Ratio
	Yes	%	No	%		
Administrative	4	40	13	52	0.396	0.615
Functional	6	60	12	48		

This table shows the distribution of LBP among administrative and functional workers during the past week. Although functional workers reported a higher number of cases (6 people) compared to administrative workers (4 people), the statistical analysis revealed a p-value of 0.396. Since this is above the 0.05 significance threshold, we conclude that job type is not significantly associated with the occurrence of LBP in this sample over the past week. This suggests that factors other than job role may contribute more to LBP in this population.

2. Relationship between sitting position at work and LBP during the past week

Table 5. The relationship between sitting position at work and LBP during the past week.

Sitting Position	LBP in the Past Week				P-Value	Odd Ratio
	Yes	%	No	%		
Chair with a backrest	8	80	21	84	0.564	1.313
Chair without a backrest	2	20	4	12		

The data indicate that among respondents who experienced LBP in the past week, 8 sat on chairs with backrests while 2 sat without backrests. Despite this, the p-value of 0.564 shows no significant relationship between sitting position and LBP incidence. This implies that simply sitting on a chair with or without a backrest may not be enough to affect the risk of developing LBP in the short term. Other ergonomic or behavioral factors might play a more important role.

3. Relationship between hunched posture at work and LBP during the past week

Table 6. The relationship between hunched posture at work and LBP during the past week.

Hunched Posture	LBP in the Past Week				P-Value	Odd Ratio
	Yes	%	No	%		
Yes	7	70	7	28	0.029	6.000
No	3	30	18	72		

This table highlights a statistically significant relationship between hunched posture and LBP during the past week. Seven respondents with a hunched posture reported pain, compared to three without such posture. The p-value of 0.029 is below the 0.05 threshold, and the odds ratio of 6 means those with hunched posture are six

times more likely to experience LBP. These results emphasize that posture is a crucial ergonomic factor in the development of LBP.

4. Relationship between sitting duration at work and LBP incidence in the past week

Table 7. The relationship between sitting duration at work and LBP incidence in the past week.

Sitting Duration	LBP in the Past Week				P-Value	Odd Ratio
	Yes	%	No	%		
6 – 9 hours	4	40	9	36	0.560	0.844
< 6 hours	6	60	16	64		

The analysis here shows no significant association between sitting duration and LBP over the past week. Four respondents who sat for 6 to 9 hours and six who sat for less than 6 hours experienced LBP. While some respondents who sat for longer periods (6–9 hours) reported pain, the p-value of 0.560 suggests that sitting duration alone did not significantly influence LBP occurrence. This may indicate that factors like posture or movement during sitting are more important than duration alone.

5. Relationship of job type to the incidence of LBP in the past year

Table 8. The relationship of job type to the incidence of LBP in the past year.

Job Type	LBP in the Past Year				P-Value	Odd Ratio
	Yes	%	No	%		
Administrative	3	30	14	56	0.155	0.337
Functional	7	70	11	44		

Regarding the incidence of LBP over the past year, 7 functional workers and 3 administrative workers reported experiencing pain. The p-value of 0.155, however, indicates no statistically significant difference based on job type. This finding suggests that long-term risk of LBP may not differ substantially between job roles in this population, and other risk factors should be explored.

6. Relationship between sitting position at work and LBP during the past year

Table 9. The relationship between sitting position at work and LBP during the past year.

Sitting Position	LBP in the Past Year				P-Value	Odd Ratio
	Yes	%	No	%		
Chair with a backrest	8	80	21	84	0.564	1.313
Chair without a backrest	2	20	4	12		

Similar to the short-term findings, no significant association was found between sitting position and LBP over the past year. Although more respondents with pain sat on chairs with backrests (8 people) compared to without (2 people), the p-value of 0.564 indicates that sitting position, defined by backrest use, does not significantly affect the risk of LBP in the long term.

7. Relationship between hunched posture at work and LBP during the past year

Table 10. The relationship between hunched posture at work and LBP during the past year.

Hunched Posture	LBP in the Past Year				P-Value	Odd Ratio
	Yes	%	No	%		
Yes	7	70	7	28	0.029	6.000
No	3	30	18	72		

Consistent with findings from the past week, hunched posture is strongly associated with LBP over the past year. Seven respondents with hunched posture reported pain compared to three without. The p-value of 0.029 and odds ratio of 6 confirm that individuals with hunched posture are significantly more likely to suffer from LBP. This underscores the importance of correcting posture to prevent chronic LBP.

Discussion

A. Relationship Between Job Type and the Incidence of LBP

From a total of 35 respondents, 4 individuals in the administrative section and 6 individuals in the functional section reported experiencing LBP in the past week. For the past year, 3 administrative workers and 7 functional workers reported similar complaints. The results of the Fisher Exact test analysis showed a p-value of 0.396 for the past week and 0.155 for the past year. Since both values are greater than the significance level of 0.05, the analysis fails to reject the null hypothesis (H0), indicating no significant relationship between job type and the incidence of LBP.

These findings are consistent with the study conducted by Sumangando et al. (2017) titled “The Relationship Between Nurses' Workload and the Incidence of LBP in Implementing Nurses at RS TK.III R.W. Monginsidi Manado.” Their research also found no significant relationship between workload and LBP, as evidenced by a Fisher Exact test result of 0.365, which was above the 0.05 threshold.

Based on theory and supporting literature, it is understood that workload is not the only factor contributing to the incidence of LBP. Other risk factors include age, gender, body mass index (BMI), lifestyle, and smoking habits [16].

B. Relationship Between Sitting Position and LBP

The results of the Fisher Exact test analyzing the relationship between sitting position and the incidence of LBP yielded a p-value of 0.564 for both the past week and the past year. Since the p-value is greater than 0.05, the result is not statistically significant. Therefore, the null hypothesis (H0) is accepted, and the alternative hypothesis (H1) is rejected, indicating no significant relationship between sitting position and LBP. A p-value less than 0.05 is generally considered the threshold for statistical significance.

These findings are consistent with a study by Shafira Nur Aisyah (2021), which reported a p-value of 0.406 and concluded that there was no significant relationship between sitting position and LBP. The study suggested that other contributing factors such as physical activity, smoking habits, and BMI may play a greater role in the onset of LBP [17]. Similarly, a study by Natasya in 2018 reported a p-value of 0.741, also indicating no significant relationship between sitting position and LBP complaints [17].

The ideal sitting posture is defined as sitting upright with shoulders back and the buttocks touching the chair. In contrast, less-than-ideal or non-ideal sitting positions include slouching, crossing the legs, or letting the feet hang. Proper workstation setup and appropriate seating are essential to reduce health risks and minimize potential hazards related to poor ergonomics [18].

C. Relationship Between Stooped Posture and the Incidence of LBP

The results of the Fisher Exact test analyzing the relationship between hunched posture at work and the incidence of LBP showed a p-value of 0.029 for both the past week and the past year. Since the p-value is less than 0.05, this result is considered statistically significant. Therefore, the alternative hypothesis (H1) is accepted, and the null hypothesis (H0) is rejected. This indicates a significant relationship between hunched posture and the incidence of LBP across both time periods.

This finding is consistent with research at the PT Mitra Bumi Palm Oil Factory in Kampar Regency, which reported a p-value of 0.000. This study concluded that awkward working postures, such as looking upward for extended durations or remaining in a bent

position during tasks like harvesting or collecting, were significantly associated with LBP [19].

Poor posture while working, especially a hunched or forward-leaning posture, can contribute to LBP. This issue may result from chairs that do not meet ergonomic standards, such as those lacking a proper backrest, or from poor sitting habits. An inadequate workplace setup, including chairs without wheels, backrests, or armrests, can restrict movement and lead to frequent twisting of the upper body, which increases the risk of musculoskeletal problems [20].

A forward-leaning sitting position that bends the body at less than 90 degrees places additional load on the lumbar spine. This increases the pressure on intervertebral discs by shifting the body's center of gravity and raising the load on the lumbar region by more than 25 percent. According to Dubey et al. (2019) as cited in Janna (2021), in the article *Ergonomics for Desk Job Workers*, proper posture not only maintains the natural curvature of the spine but also reduces strain on the musculoskeletal system. Working for extended periods in non-ergonomic positions can lead to muscle pain due to increased pressure and fatigue [21].

D. Relationship Between Sitting Duration and the Incidence of LBP

The results of the Fisher Exact test analyzing the relationship between sitting duration at work and the incidence of LBP showed a p-value of 0.560 for the past week and 0.440 for the past year. Since both values are greater than 0.05, the result is not statistically significant. Therefore, the null hypothesis (H0) is accepted, and the alternative hypothesis (H1) is rejected. This indicates that there is no significant relationship between sitting duration and the incidence of LBP. A p-value less than 0.05 is generally used as the threshold for statistical significance.

This finding is consistent with research by Ni Made and Novendy (2022), which employed an observational analytic method with a cross-sectional design. Their study found no correlation between sitting duration and the incidence of LBP, with a reported p-value of 0.595 [15].

Although LBP can occur in many workplace scenarios, the risk is generally higher when sitting for long periods in a static position. Prolonged static sitting may result in continuous muscle contractions and narrowed blood vessels. This can obstruct blood flow, leading to ischemia, where tissues receive less oxygen and nutrients. Prolonged muscle contraction may also cause the accumulation of lactic acid, contributing to discomfort and pain [22].

LBP is a chronic condition that often develops gradually over time. Extended work hours, particularly those exceeding eight hours, may increase stress on the lumbar spine, especially when combined with poor ergonomic posture [23]. The ideal amount of efficient working time in a week ranges from 40 to 48 hours, distributed over 5 to 6 working days. An additional workload should not exceed 30 minutes per session to prevent fatigue and overuse [1].

The lack of a significant relationship between sitting time and LBP in this study may also be influenced by other factors such as age, gender, smoking habits, work patterns, and BMI [24].

Study Limitations and Recommendations for Future Works

This study has several limitations that should be acknowledged. First, the sample size was relatively small (35 respondents), which may limit the generalizability of the findings to broader populations or different occupational settings. Second, the cross-sectional design precludes establishing causal relationships between sitting posture and LBP, as it captures only a snapshot in time rather than temporal changes or cumulative effects. Third, data were collected through self-reported questionnaires, which can introduce recall bias or social desirability bias, potentially affecting the accuracy of responses regarding posture habits and pain experiences. Additionally, the study focused primarily on a single health center, which may not reflect ergonomic conditions and occupational health risks in other healthcare facilities or different types of workplaces. Other potential confounding factors, such as BMI, physical activity levels outside work, psychosocial stress, or prior history of musculoskeletal disorders, were not comprehensively analyzed in this study, although these may significantly influence the incidence of LBP.

Future research should consider larger and more diverse samples across multiple healthcare facilities or other occupational sectors to enhance the generalizability of findings. Longitudinal study designs would be beneficial to establish causal relationships between sitting posture and the development of LBP over time. Objective measurements of posture using ergonomic assessment tools, direct observation, or wearable sensors could reduce bias compared to self-reported data. Moreover, including additional variables such as BMI, physical activity, psychosocial factors, and ergonomic workstation assessments could provide a more comprehensive understanding of the multifactorial nature of LBP. Finally, intervention studies evaluating ergonomic improvements, posture correction programs, or workplace exercise initiatives may help identify effective strategies to prevent LBP among employees.

Conclusion

The results of this study indicate that there is no statistically significant relationship between sitting position while working and the incidence of LBP among employees at the Merdeka Health Center in 2024 (p = 0.564). These findings suggest that factors other than sitting posture may have a greater influence on the occurrence of LBP. This highlights the importance of conducting a more comprehensive ergonomic and occupational health assessment to identify additional risk factors in similar workplace environments.

Conflict of Interest

The authors declare that there is no conflict of interest.

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