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# Physical Activity Level as A risk Factor for Low Back Pain Among Young Adults in Depok City

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## ABSTRACT

### Objective
To analyze the relationship between physical activity levels and low back pain (LBP) complaints among young adults in Beji District, Depok City, Indonesia.

### Methods
A quantitative cross-sectional study was conducted involving 287 respondents aged 18–29 years. The villages were randomly selected, while respondents were recruited using a convenience sampling technique. Physical activity levels were assessed using the Baecke Questionnaire, which evaluates work, sports, and leisure-time activities. LBP complaints were measured using the Nordic Body Map Questionnaire. Data were analyzed using the Chi-square.

### Results
Most respondents demonstrated a moderate level of physical activity, mild pain was the most commonly reported complaint in the middle back/waist, lower back, and buttock regions, while severe pain was reported by only a small number of respondents. Physical activity level was not significantly associated with the severity of middle back/waist pain (OR = 2.106; p = 0.551). However, significant associations were found between physical activity level and lower back pain severity (OR = 21.572; p < 0.001) and buttock pain severity (OR = 42.058; p < 0.001).

### Conclusion
Physical activity level was significantly associated with lower-back and buttock pain severity but not with middle back/waist pain severity. Moderate physical activity is associated with

a reduced risk of lower back and buttock pain among young adults. Promoting regular physical activity and ergonomic practices may support musculoskeletal health and reduce the risk of LBP.



## Background

Low back pain (LBP) is one of the most common musculoskeletal disorders worldwide and a leading cause of disability globally. The World Health Organization reported that approximately 1.71 billion people suffer from musculoskeletal disorders, with 619 million individuals experiencing LBP in 2020 (Bull *et al*., 2020). This number is projected to increase to 843 million by 2050 (World Health Organization/WHO, 2023). Major risk factors for LBP include structural disorders of the lower back resulting from excessive or non-ergonomic activities, as well as poor posture (Badan Kebijakan Pembangunan Kesehatan Kementerian Kesehatan Republik Indonesia, 2024; Utami, 2024). Imbalanced physical activity or physical inactivity may also increase the risk of developing LBP (Murtezani *et al.,* 2011). Conversely, regular physical activity, particularly exercises focusing on strengthening and improving the flexibility of back muscles, has been proven effective in preventing and reducing LBP symptoms (Geneen *et al*., 2017; Gordon & Bloxham, 2016).

LBP affects multiple aspects of health and well-being, creating substantial challenges for individuals, healthcare systems, and society. Individuals with LBP often experience limitations in daily activities, reduced quality of life, decreased work productivity, and increased healthcare utilization (Hartvigsen *et al*., 2018). The growing prevalence of LBP worldwide continues to place a considerable burden on healthcare systems and society. Given its impact on functional ability, quality of life, and healthcare resources, LBP remains a major challenge for public health and clinical practice (Hartvigsen *et al.,* 2018).

Despite the well-established benefits of physical activity, global data indicate that physical activity levels remain low. According to WHO (2024), approximately 1.8 billion adults worldwide are physically inactive, and this number is expected to continue increasing. In Indonesia, data from the Basic Health Research Survey (Kementerian Kesehatan Republik Indonesia/Kemenkes RI, 2019) show that the population's level of physical activity remains low, particularly in West Java Province, where Depok City is among the cities with the lowest levels of physical activity (60.55%) (Kemenkes RI, 2019). The 18–29 year age group, which represents young adults, demonstrates the lowest level of physical activity compared to other age groups. As Depok City is among the ten cities with the lowest physical activity levels in West Java and is projected to experience a 35% increase in the physically inactive population by 2030, further research is needed to understand the relationship between physical activity and LBP among young adults. Such research is essential for developing more effective interventions to reduce the burden of this health problem. This study aimed to examine the association between physical activity levels and LBP among young adults in Depok City. This study is expected to contribute to the scientific understanding of the association between physical activity and LBP complaints in young adults.

## Methods

This study employed an analytical research design with a cross-sectional approach. The study was conducted among young adults residing in Beji District, Depok City, Indonesia. Data were

collected between October 2024 and May 2025. The minimum sample size was estimated using G*Power version 3.1.9.4 for a chi-square test of independence with assumed an effect size of 0.30, a significance level (α) of 0.05, a statistical power of 0.95, and three degrees of freedom because the primary analysis used a 2 × 4 contingency table, resulting in a minimum required sample of 232 participants. After allowing for incomplete responses, 287 participants were included.

A cluster random sampling technique was employed at the village level. Three villages were randomly selected using the Wheel of Names web application, namely Kemiri Muka, Pondok Cina, and Kukusan. The final sample consisted of 287 young adults aged 18–29 years residing in the selected villages. Eligible participants were young adults aged 18–29 years who resided in Beji District, Depok City, and were willing to participate in the study. Participants were excluded if they submitted incomplete questionnaire responses or had a history of cancer, kidney disease, or abdominal aortic aneurysm.

Data were collected using questionnaires that had been tested for validity and reliability. First, respondents' characteristics were assessed, including age, gender, and occupation. Second, physical activity levels were assessed using the Baecke Questionnaire developed by Baecke, Burema, and Frijters (1981). The original questionnaire was designed to measure habitual physical activity across three domains: work, sports, and leisure time. For use in Indonesia, the questionnaire was adapted and tested by Supeni & Asmayuni (2007). The Indonesian version demonstrated good validity (r = 0.80) and acceptable reliability, with a Cronbach's alpha coefficient of 0.687 (Supeni & Asmayuni, 2007).

The Baecke Questionnaire consists of 22 items assesses habitual physical activity across three domains: occupational activity for the work index (8 items), sport activity for the sports index (10 items), and non-sports leisure- time activity for the leisure-time index (4 items) (Supeni & Asmayuni, 2007). For the work index, respondents answered questions using a five-point Likert scale (1–5). The scores from all items were summed and averaged to obtain the work index score. For the sports index, several aspects of sports participation, including the type of sport and the duration of participation in months and years, were combined and converted into scores before being averaged. For the leisure-time index, sedentary behavior levels were assessed using a five-point Likert scale (1–5), and the scores were averaged to obtain the leisure-time index score. The total physical activity score was obtained by summing the three index scores, with higher scores indicating a higher level of habitual physical activity. In this study, the observed total scores ranged from 4.8 to 12.8. Because no established cutoff was available for this population, a score of 8.8 was used to categorize participants into two groups. Respondents with total scores below 8.8 were classified as having lower physical activity, whereas those with scores of 8.8 or higher were classified as having higher physical activity.

Third, the Nordic Body Map Questionnaire (NBMQ), developed by Kuorinka *et al*. (1987), was used to assess musculoskeletal complaints. The Indonesian version has demonstrated acceptable reliability, with a Cronbach's alpha coefficient of 0.726, indicating adequate internal consistency in measuring musculoskeletal disorders (Ramdan, Duma, & Setyowati, 2019). Scoring of the NBMQ is conducted by summing the scores across all 28 body regions to obtain a total musculoskeletal complaint score. A higher total score indicates a greater level of musculoskeletal discomfort and a higher risk of musculoskeletal disorders. In this study, the LBP category specifically focuses on three anatomical regions: the middle back/waist area, the lower back region, and the buttocks region, which are considered the primary sites of LBP symptoms. Responses are recorded using a 4-point Likert scale, where (1) indicates no pain, (2) mild pain, (3) moderate pain, and (4) severe pain. Respondents rate the level of pain experienced in each body region within a specified recall period defined by the study design. This approach allows for a structured assessment of both the presence and intensity of musculoskeletal symptoms. The interpretation of the results is based on

the total score obtained, where lower scores indicate minimal musculoskeletal complaints, while higher scores reflect more severe and widespread discomfort.

Online and offline approaches were used to recruit study participants. The questionnaire link was distributed through social media platforms, including WhatsApp and Instagram, and was also shared through personal networks to reach individuals who met the inclusion criteria. Offline recruitment was conducted in public locations, such as the Pondok Cina Station area and several cafés, where potential participants were invited to take part in the study by scanning a QR code linked to the survey. The questionnaire was administered electronically using Google Forms. To prevent duplicate responses, the Google Forms settings were configured to allow only one submission per email address, ensuring that each participant could complete the questionnaire only once. In addition, all responses were reviewed during the data processing stage to identify any potential duplicates or inconsistencies before the data analysis was performed. The relationship between the independent variable (physical activity level) and the dependent variable (LBP complaints) was analyzed using the Chi-square test. All participants were informed about the study and provided informed consent before participation. Ethical approval was obtained from the Ethics Committee of the Faculty of Nursing, Universitas Indonesia, with approval number KET-051/UN2.F12.D1.2.1/PPM.00.02/2025.

## Results

Table 1 presents the characteristics of the respondents. The mean age of the respondents was approximately 24 years (range: 18–29 years; 95% CI 23.72-24.40). The majority of respondents were female (59.23%) and private-sector employees constituted the largest occupational group (36.58%). Table 2 shows that the majority of young adult respondents in Depok City had a moderate level of physical activity (66.2%). Mild pain was the most frequently reported category in the middle back/waist and lower-back regions, while no pain was the most frequent category for the buttock region. In addition to LBP, other musculoskeletal complaints were reported in several body regions. The highest prevalence of complaints was found on the right shoulder, followed by the lower neck and upper back. Complaints were also relatively common in the right shoulder (27.17%), upper back (24.04%), and lower neck (20.90%). These findings suggest that body regions associated with prolonged sitting, static working positions, and repetitive arm movements are at greater risk of developing musculoskeletal discomfort.

**Table 1.** Respondent Characteristics (n=287)

| Characteristics | Distribution |
|---|---|
| **Age**, Med (min-max) CI 95% | 24 (18-29) 23.72 – 24.40 |
| **Gender**, n (%) | |
| Male | 117 (39.72%) |
| Female | 170 (59.23%) |
| **Occupation** | |
| Civil Servant (Government Employee) | 31 (10.80%) |
| Private Employee | 105 (36.58%) |
| Entrepreneur | 52 (18.11%) |
| Student | 81 (28.22%) |
| Housewife | 12 (4.18%) |
| Unemployed | 6 (2.09%) |
| Others | 0 |

**Table 2.** Overview of Physical Activity Levels and LBP Complaints Among Young Adults in Depok City (n=287)

| Variable | Distribution. N (%) |
|---|---|
| **Physical Activity Level** | |
| Low Physical Activity | 97 (33.79%) |
| Moderate Physical Activity | 190 (66.20%) |
| Total | 287 (100%) |
| **LBP Complaints** | |
| **Middle Back/Waist** | |
| No pain | 132 (45.99%) |
| Mild pain | 98 (34.14%) |
| Pain | 48 (16.72%) |
| Severe pain | 9 (3.13%) |
| **Lower Back** | |
| No pain | 109 (37.97%) |
| Mild pain | 101 (35.19%) |
| Pain | 59 (20.55%) |
| Severe pain | 18 (6.27%) |
| **Buttocks** | |
| No pain | 147 (51.21%) |
| Mild pain | 87 (30.31%) |
| Pain | 40 (13.93%) |
| Severe pain | 13 (4.52%) |
| Total | 287 (100%) |
| **LBP Complaints** | |
| **Middle Back/Waist** | |
| Neck (upper) | 49 (17.07%) |
| Neck (lower) | 60 (20.90%) |
| Left shoulder | 52 (18.11%) |
| Right shoulder | 78 (27.17%) |
| Left upper arm | 48 (16.72%) |
| Upper back | 69 (24.04%) |
| Right upper arm | 42 (14.63%) |
| Left elbow | 44 (15.33%) |
| Right elbow | 59 (20.55%) |
| Left forearm | 37 (12.89%) |
| Right forearm | 57 (19.86%) |
| Left wrist | 41 (14.28%) |
| Right wrist | 54 (18.81%) |
| Left hand | 36 (12.54%) |
| Right hand | 36 (12.54%) |
| Left thigh | 45 (15.67%) |
| Right thigh | 45 (15.67%) |
| Left knee | 53 (18.46%) |
| Right knee | 46 (16.02%) |
| Left calf | 39 (13.58%) |
| Right calf | 28 (9.75%) |

| Variable | Distribution. N (%) |
|---|---|
| Left ankle | 44 (15.33%) |
| Right ankle | 48 (16.72%) |
| Left foot | 36 (12.54%) |
| Right foot | 32 (11.14%) |

Table 3 demonstrates that the association between physical activity level and LBP complaints varied according to the pain location. The distribution of pain severity did not differ significantly according to physical activity level the middle back/waist region (OR = 2.106; p = 0.551). In contrast, significant associations were observed for lower back pain and buttock pain. Moderate physical activity was associated with a lower risk of lower back pain (OR = 21.572; p < 0.001) and buttock pain (OR = 42.058; p < 0.001) compared with low physical activity. Respondents with higher physical activity were more frequently represented in the no-pain categories, whereas participants with lower physical activity accounted for a greater proportion of the more severe pain categories. These findings indicate an association between physical activity level and lower-back and buttock pain severity; however, they do not establish that higher physical activity reduces risk or has a protective effect.

**Table 3.** Association Between Physical Activity Level and LBP Complaints

| | | **Middle Back/Lower Back Pain** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | No Pain | Mild Pain | Pain | Severe Pain | Total | OR | p |
| Physical Activity Level | Low | 45 (34.09%) | 32 (32.65%) | 15 (31.25%) | 5 (55.55%) | 97 | 2.106 | 0.551 |
| | Moderate | 87 (65.90% | 66 (67.34%) | 33 (68.75%) | 4 (44.44%) | 190 | | |
| | Total | 132 (100%) | 98 (100%) | 48 (100%) | 9 (100%) | 287 | | |
| | | **Lower Back Pain** | | | | | | |
| | | No Pain | Mild Pain | Pain | Severe Pain | Total | OR | p |
| Physical Activity Level | Low | 21 (19.26%) | 37 (36.63%) | 28 (47.45%) | 11 (61.11%) | 97 | 21.572 | <0.001 |
| | Moderate | 88 (80.73%) | 64 (63.36%) | 31 (52.54%) | 7 (38.88%) | 190 | | |
| | Total | 109 (100%) | 101 (100%) | 59 (100%) | 18 (100%) | 287 | | |
| | | **Buttock Pain** | | | | | | |
| | | No Pain | Mild Pain | Pain | Severe Pain | Total | OR | p |
| Physical Activity Level | Low | 30 (20.40%) | 32 (36.78%) | 23 (57.50%) | 12 (92.30%) | 97 | 42.058 | <0.001 |
| | Moderate | 117 (79.59%) | 55 (63.21%) | 17 (42.50%) | 1 (7.69%) | 190 | | |
| | Total | 147 (100%) | 87 (100% | 40 (100%) | 13 (100%) | 287 | | |

# Discussion

This study examined the relationship between physical activity levels and LBP among young adults in Depok City. The main finding was that physical activity level was associated with the severity distribution of lower-back and buttock pain but not with middle back/waist. In this study, for middle back/waist pain, moderate physical activity did not show a statistically significant association with a reduced risk of pain compared with low physical activity (OR = 2.106; p = 0.551). This finding suggests that factors other than physical activity level may play a more prominent role in the development of pain in the middle back/waist region among young adults. Middle back/waist pain may be influenced by prolonged sitting, poor posture during studying or working, ergonomic factors, psychological stress, and repetitive daily activities, which were not assessed in the present study. In contrast, significant associations were observed for lower back pain and buttock pain. Moderate physical activity was associated with a lower risk of lower back pain (OR = 21.572; p < 0.001) and buttock pain (OR = 42.058; p < 0.001) compared with low physical activity. These findings suggest that moderate physical activity may have a protective effect on the lower back and surrounding musculoskeletal structures. Regular physical activity can improve muscle strength, flexibility, endurance, and core stability, which help maintain proper spinal alignment and reduce mechanical stress on the lumbar region.

### Physical Activity Among Young Adults

The majority of young adults (66.2%) demonstrated a moderate level of physical activity, reflecting a positive awareness of the importance of maintaining an active lifestyle in daily routines. This finding is consistent with the study by Yuhasnara, Muslihah, & Fahmi (2022), which reported that most Indonesian adults during the COVID-19 pandemic engaged in moderate levels of physical activity (52.2%). Similarly, Putri (2023) found that 41.3% of adults in the Special Region of Yogyakarta also had moderate physical activity levels.

Moderate physical activity, such as walking, recreational cycling, or performing physically demanding household tasks, has been shown to provide various physiological benefits, including strengthening muscles, maintaining flexibility, and improving blood circulation. Evidence supporting these benefits was reported by Gobbo *et al.* (2019), who demonstrated that regular walking exercises and muscle-strengthening activities significantly improved spinal function and reduced LBP. In contrast, physical activity that is too low does not provide sufficient stimulation for muscle contraction, resulting in reduced blood circulation, limited nutrient supply to the intervertebral discs, and increased muscle stiffness. This finding is supported by Lim and Hong (2010), who stated that physical inactivity may contribute to stiffness and pain in the muscles supporting the spine. Furthermore, Alzahrani *et al*. (2022) reported that sitting for more than eight hours per day was associated with a 24% reduction in back muscle elasticity.

Without appropriate health promotion efforts or physical activity interventions, individuals with low levels of physical activity are at greater risk of developing musculoskeletal complaints. This observation is consistent with the findings of Adienugraha (2024), who reported that a lack of awareness regarding proper posture can negatively affect daily activities. LBP is often associated with repetitive movements, prolonged sitting, forward-bending postures, and daily activities involving static positions. The longer an individual remains seated, the greater the pressure and strain placed on the posterior longitudinal ligament, particularly when prolonged sitting is accompanied by poor postural habits such as slouching or bending forward (Adienugraha, 2024).

### LBP and Other Musculoskeletal Complaints

LBP was identified as a relatively common complaint among young adults in Depok City, particularly among respondents with low levels of physical activity. This finding is in line with Oliveira *et al.* (2019), who reported that insufficient physical activity leads to decreased muscle

strength and flexibility, thereby contributing to the development of chronic LBP. In contrast, respondents who engaged in moderate physical activities, such as walking or performing household chores, reported fewer LBP complaints. Similarly, Shiri *et al*. (2010) found that moderate physical activity can reduce the risk of LBP by up to 23% and plays a protective role in preventing intervertebral disc degeneration. In addition to LBP, this study also identified a relatively even distribution of musculoskeletal complaints affecting the right shoulder, upper back, and lower neck regions. This pattern is consistent with the findings of Biruk, Eniyew, & Alelign (2024), who reported a high prevalence of musculoskeletal disorders in body regions such as the lower back, neck, upper back, and shoulders, which are closely associated with static working postures. Work activities involving minimal movement, such as prolonged computer use without adequate breaks, place excessive stress on the muscles and joints of the upper body. Consequently, these conditions contribute significantly to the development of musculoskeletal complaints, particularly among individuals in the productive age group.

**Respondent Characteristics**

The age distribution of respondents was relatively even across the young adult age range, although it was slightly concentrated among individuals in their mid-twenties. This finding indicates that most respondents were in the early to middle stages of young adulthood, a period generally characterized by high productivity and active engagement in physical activities. The age range of 18–29 years used in this study is consistent with the classification of young adulthood proposed by Potter *et al*. (2016). The study findings also revealed that the majority of respondents were female. Based on occupational status, private-sector employees constituted the largest proportion of respondents, while unemployed individuals represented the smallest category. This finding is consistent with data from the Depok City Statistics Agency, which reported that laborers, employees, and salaried workers represented the largest occupational group among residents aged 15 years and older, accounting for 64.49% of the population compared with other employment categories (Badan Pusat Statistik Kota Depok, 2025).

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design only allows the identification of associations between physical activity and LBP complaints at a single point in time and does not permit direct conclusions regarding causality. Second, the study did not specifically control for several potential confounding factors that may influence LBP complaints, including body mass index (BMI), working posture, sitting duration, stress levels, and ergonomic factors. These variables may have affected the observed relationship and should be considered in future research.

## Conclusion

Overall, the findings of this study highlight the importance of engaging in moderate-intensity physical activity as a preventive measure against LBP complaints. An active lifestyle should be encouraged from a young age, particularly among individuals in the productive age group, to maintain musculoskeletal health. Therefore, health promotion programs emphasizing the importance of adequate physical activity and proper workplace ergonomics are recommended to reduce the prevalence of LBP among young adults.

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