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The Impact of Work Posture on Knee Functionality in Young Farmers: A Study in Pancasari Village

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ABSTRACT

Introduction: Farming activities require intensive body use and often involve work postures that can affect knee functional health. This study aims to determine whether there is a relationship between work posture and knee functional ability in farmers in Pancasari Village.

Methods: This research employed an observational analytic method with a cross-sectional approach involving 64 farmers aged 25-35 years in Pancasari Village. The sampling technique used was purposive sampling. The independent variable measured was the farmers' work posture using the Ovako Work Posture Analysis System (OWAS). The dependent variable measured was knee functional ability using the Knee Injury and Osteoarthritis Outcome Score questionnaire.

Results: The non-parametric Spearman's rho analysis showed a p-value of 0.000 ($p < 0.05$) and a correlation coefficient of $r = -0.641$, indicating a significant negative relationship between work posture and knee functional ability.

Conclusion: There is a significant negative relationship between work posture and knee functional ability in farmers aged 25-35 years in Pancasari Village. These findings indicate the need for interventions to improve work posture to prevent a decline in knee function.

Keywords: Work posture, Knee functional ability, Farmers, OWAS (Ovako Work Posture Analysis System), Knee Injury and Osteoarthritis Outcome Score (KOOS)

INTRODUCTION

With its extensive agricultural sector, Indonesia has a significant portion of its population engaged in informal work in rural areas, particularly agriculture. This agrarian identity underscores the importance of understanding farmers' health risks, whose work activities make them susceptible to various health issues that can impact their productivity and long-term health. One critical aspect is work posture, especially the awkward postures often adopted by farmers. These awkward postures can lead to musculoskeletal injuries, particularly in the knee joints, which are crucial in supporting the body during work.

Awkward postures represent a biomechanical ergonomic hazard that, if maintained over long periods, can cause structural changes in the body. This has significant implications for the knee joints, essential for supporting the body during labor. Continuous adoption of awkward postures can increase the load on the knees, eventually leading to health problems that diminish the functional capacity of farmers' knees.

Knee functional ability encompasses every movement produced by skeletal muscles that requires energy expenditure to fulfill life's duties, integrated with the surrounding environment. Normal movement activities are crucial for supporting daily activities.[1] A decline in knee function can significantly affect the productivity of farmers. Previous research found that 53% of farmers experienced work disability for 12 months due to decreased knee function, highlighting the importance of knee health for the working capacity of farmers.[2]

A decline in knee functional ability can be caused by exposure to poor work postures, such as kneeling, bending the knees, and squatting. Several studies have identified these work postures as risk factors for health problems in farmers, particularly affecting the knee joints.[3] These findings are supported by previous observations indicating that 62.1% of 377 farmers experienced knee complaints due to awkward knee postures.[4] However, not all studies demonstrate a relationship between squatting or kneeling postures at work and the risk of decreased knee functional ability, making this relationship still a subject of debate.[5]

Awkward postures, such as squatting or kneeling, can place excessive load on the knee joint cartilage, triggering cartilage degeneration and joint instability. This occurs because the tibiofemoral load in a squatting posture (full flexion) ranges from 2.8 to 7.8 times body weight.[6] However, some studies state that this data was obtained without considering the effects of load distribution from tight-calf contact. Therefore, the forces acting on the tibiofemoral joint in high knee flexion postures may be smaller than the values estimated by these models. Data from instrumented tibias support this possibility, indicating that the magnitude of the force on the knee in this posture could be less than 50% of body weight.[7]

The weight load on the knee joint in a flexed position can stimulate fluid release from soft tissues around the joint, which reduces nutrient exchange with chronic exposure and causes temporary joint instability in the short term.[5] Prolonged knee flexion in the work posture of farmers can lead to ligament elongation and strain, thereby causing joint instability when the knee is extended.

In Bali in 2018, 477,439 people were working as farmers, with Buleleng Regency having the highest number of farmers at 103,339 individuals. Pancasari Village, located in Sukasada District, Buleleng, is one of the leading agricultural areas in Bali, and it is mainly known for horticulture.[8] Horticultural farmers cultivate fruit crops, vegetables, and ornamental plants. Previous findings indicate that out of 122 vegetable farmers studied, 63.9% reported knee complaints.[4] This is because most horticultural plants grow close to the ground, requiring farmers to adopt kneeling or squatting positions during their work activities.

This study investigates the relationship between work posture and knee functional ability among horticultural farmers in Pancasari Village, Sukasada District, Buleleng. The selection of farmers from Pancasari Village was motivated by the limited research on knee functional ability among horticultural farmers in this area. Based on the background information, the researcher believes that work posture can significantly impact knee functional ability. The research hypothesis posits that awkward work postures negatively affect knee functional ability among farmers. Therefore, the researcher is interested in exploring this topic under "The Relationship Between Work Posture and Knee Functional Ability of Farmers in Pancasari Village." This study is expected to contribute new data to existing research and expand knowledge on the connection between farmers' work posture and knee functional ability, serving as a reference and enhancing understanding in this field.

METHOD

This study employed a cross-sectional design conducted in Desa Pancasari, Sukasada District, Buleleng Regency, from June to December 2023. Sampling was performed twice in this primarily agricultural area. Participants were approached during their rest periods and were willing to participate in the study. Each participant was involved for one day during data collection. Data were collected using informed consent forms, screening for inclusion and exclusion criteria, knee functional ability measurements, and documentation of work postures using the Ovako Work Posture Analysis System (OWAS), which codes posture in the back, hands, legs, and load. Documentation involved direct measurements while participants engaged in fieldwork activities.

A purposive sampling technique was used to select 64 participants who met the inclusion criteria: being farmers aged 25-35 years, having a normal BMI (18.5-25.0 kg/m²), engaging in physical activity no more than three times a week or 150 minutes per week, literate, willing to be research participants, and capable of following instructions cooperatively. Exclusion criteria included a history of knee injury, BMI of 25.1-27.0, BMI > 27.0, and engaging in physical activity thrice or 150 minutes weekly. The sample size was calculated using the cross-sectional formula with a maximum estimated proportion of 0.187 based on previous references, with an additional 10% for dropout criteria.

The independent variable was farmers' work posture, while the dependent variable was knee functional ability. Farmers' posture was measured using OWAS, documenting posture during activities and ensuring measurement objectivity with a standardized method known for good validity and reliability. OWAS codes posture in the back, hands, legs, and load, providing an objective assessment based on clear and measurable criteria. Posture documentation was also done using cameras to ensure observation and posture analysis could be repeated and verified, enhancing assessment consistency among different observers. Data were analyzed using computer software to reduce subjectivity and improve data processing accuracy.

Researchers identified and controlled for age, BMI, history of knee injury, and physical activity to control confounding variables. Subjects were aged between 25-35 years to minimize age-related variation. BMI was controlled to mitigate the impact of weight and nutritional status on knee functional ability. Controlling for knee injury history ensured that previous injuries affecting knee functional ability did not influence measurements. Subjects' physical activity habits were also controlled to provide differences in knee functional ability were not due to varying levels of routine physical activity. By controlling these variables, researchers ensured a more accurate measurement of the relationship between work posture and knee functional ability without interference from unexamined variables.

The study conducted univariate and bivariate data analyses. Univariate analysis aimed to provide an overview of age, gender, BMI, work duration, tenure, weekly physical activity habits, work posture during farming, and knee functional ability percentages. Bivariate analysis aimed to determine the relationship between work posture and knee functional ability using Spearman's rho correlation test. Various statistical methods were applied to process age, BMI, work duration, and other variables. Age data were processed as frequencies and percentages, while BMI was categorized. Work duration was analyzed in frequencies, percentages, and average daily hours. Tenure was calculated in frequencies, percentages, and average years. Weekly physical activity habits were examined in frequencies and percentages. These data processing methods provided a clear overview of the study participants' characteristics using frequencies, percentages, and averages as analytical tools.

The study did not conduct specific subgroup or interaction analyses because the primary objective was to examine the general relationship between work posture and knee functional ability in the selected farmer population. Subgroup and interaction analyses might be necessary to explore differential effects among various groups or conditions, which were not the focus here. Therefore, such analyses were irrelevant to the study's objectives and not explicitly mentioned.

To address missing data, imputation methods were employed to minimize bias and ensure accurate analysis. Initially, each variable in the dataset was examined to identify missing values. Mean values replaced missing quantitative data, while mode values were used for missing qualitative data. These steps ensured that all missing values were handled correctly without errors in the imputation process. Sensitivity analysis was conducted to test the reliability of

study findings against variations in handling missing data and assumptions used in the analysis. This involved testing multiple alternative scenarios for imputation, such as using median values for quantitative data and the second most frequent values for qualitative data. Data were reanalyzed using these alternative scenarios, and results were compared with the original findings to assess how sensitive the results were to the method of handling missing data. Results from all alternative scenarios were reported and discussed to evaluate the stability and reliability of the research findings.

This study received ethical approval from the Research Ethics Commission of the Faculty of Medicine, Udayana University, with ethical clearance number 1509/UN14.2.2.VII.14/LT/2023. The study aimed to contribute significantly to understanding the relationship between work posture and knee functional ability among horticultural farmers through these methodological approaches.

RESULTS

This study utilized a cross-sectional method involving farmers. The research began with the licensing process, followed by screening the target population based on inclusion criteria to identify study subjects, data collection according to research variables, data analysis, and reporting of results. The study involved 64 farmers from Desa Pancasari, Sukasada District, Buleleng, as research subjects. The selection process commenced by screening individuals who met the inclusion and exclusion criteria. The study targeted farmers aged between 25 to 35 years who worked as farmers, had an average Body Mass Index (BMI) range (18.5-25.0 kg/m²), engaged in physical activity no more than three times a week or 150 minutes per week, were literate, willing to participate as research subjects, and capable of following instructions cooperatively. From the screened population, 64 individuals met all criteria and were included in the study.

Several reasons for non-participation were identified during the selection process, including a history of knee injury, BMI above 25.0 kg/m², and more intense physical activity than the specified criteria. Additionally, dropout criteria were set for participants who could not attend the research sessions or withdrew from the study. This research was conducted directly in Desa Pancasari over two days using a door-to-door method to ensure optimal participation and data collection from farmers, as outlined in Diagram 1.

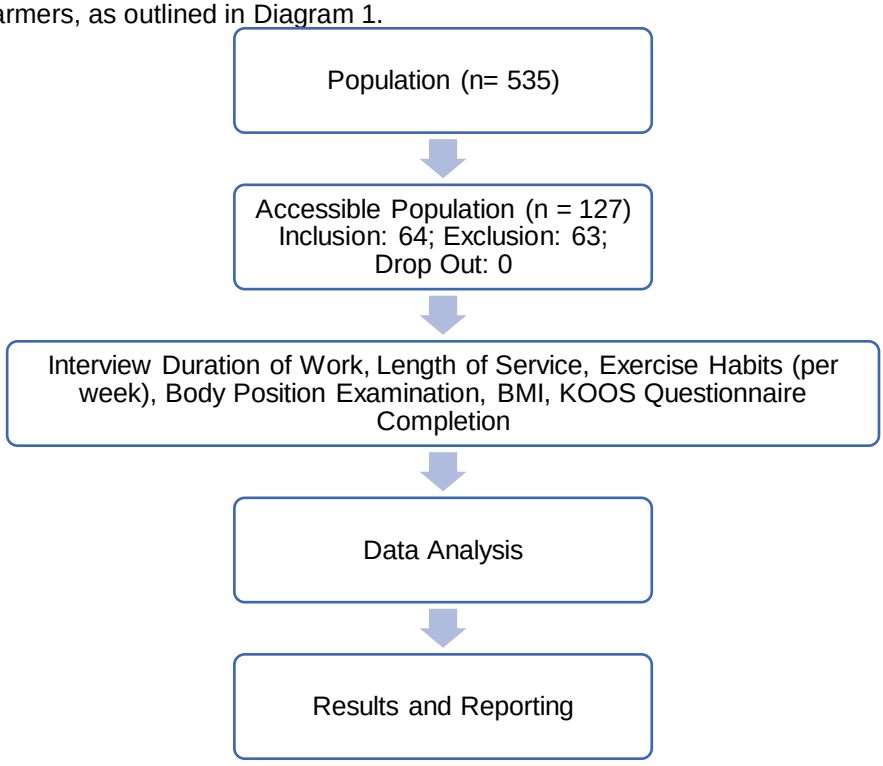

Diagram 1. Research Flow

The following are the characteristics of the research subjects, including age, gender, body mass index (BMI), duration of employment, tenure, exercise habits, work posture, and functional knee ability, as shown in Table 1.

Table 1. Sample Characteristics

Variables	Frequency (n)	Percentage (%)
Age		
25 - 29	20	34,4
30 - 33	44	65,6
Gender		
Male	30	46,9
Female	34	53,1
BMI (Body Mass Index)		
Normal	64	100,0

Continuation of Table 1. Sample Characteristics

Variables	Frequency (n)	Percentage (%)
Work Duration (Hours/day)		
≤8 Hours	60	93,8
8 Hours	4	6,2
Work Tenure (Years)		
<6 Years	20	31,3
6-10 Years	27	42,2
10 Years	17	26,6
Exercise Habit (Weekly)		
2 times (≥ 30 minutes)	4	6,3
2 times (< 30 minutes)	5	7,8
1 time (< 30 minutes)	6	9,4
1 time (60 minutes)	1	1,6
Never	48	75,0
Work Posture		
Safe (1)	14	21,9
Requires attention in the future (2)	16	25,0
Action needed soon (3)	7	10,9
Immediate action required (4)	27	42,2
Functional Ability of Knee (%)		
No (KOOS 100)	6	9,4
Mild (KOOS 67-99)	58	90,6

Based on Table 1, most subjects were aged 30-33 years, totaling 44 individuals (65.6%). Females constituted a larger group with 34 individuals (53.1%), and 93.8% had a work duration of ≤8 hours. The tenure was between 6-10 years for 42.2% of the subjects, with 75.0% of farmers reporting never engaging in physical exercise. Regarding work posture, 27 individuals (42.2%) were found to require immediate action with a score of 4, and 58 individuals exhibited mild functional knee impairment with KOOS scores ranging from 67-99 (90.6%).

In this study, continuous variables were categorized to analyze various aspects of the study population and their impact on the research variables. Age, for example, was defined as the period from birth to the time of measurement and obtained from identification cards (such as KTP or family cards). The sample age range used in this study was 25-35 years. Body Mass Index (BMI) was used to determine nutritional status and assess whether individuals were underweight or overweight. BMI is calculated by dividing weight in kilograms by the square of height in meters (kg/m^2). BMI classification for the Indonesian population is based on clinical experience and research from developing countries, divided into underweight (BMI < 17.0 for severe underweight and 17.0 - 18.4 for mild underweight), normal (BMI 18.5 - 25.0), and overweight (BMI 25.1 - 27.0 for mild overweight and > 27.0 for severe overweight).

Work duration was categorized based on the number of hours worked per day, with two main groups: ≤8 hours (standard work duration) and >8 hours (extended work duration). Physical activity was also categorized based on frequency and duration of exercise sessions per week: ≥2 times per week (≥30 minutes per session), two times per week (<30 minutes per session), one time per week (<30 minutes per session), and never. Additionally, knee injury history was classified based on medical records into two categories: present and absent. These categories aid in understanding the relationship between these variables and the observed research outcomes.

Table 2. Relationship Between Work Posture and Functional Knee Ability

Correlation between Variables	Correlation	p Value
Functional Knee Ability Work Posture	-0.641	0.000

Table 2 shows a significant relationship between functional knee ability and work posture among farmers in Pancasari Village, as evidenced by a p-value of 0.000 ($p < 0.05$) and a correlation coefficient of -0.641, indicating a negative correlation. A negative value indicates an inverse relationship with a strong correlation, falling from 0.60 to 0.799. This inverse relationship means that as work posture among farmers increases, functional knee ability decreases.

DISCUSSION

This study was conducted from June to December 2023 in Pancasari Village, Sukasada, Buleleng, involving 64 research subjects. A purposive sampling technique was employed for subject selection. Farmers aged 25-35 years in Pancasari Village, Sukasada, Buleleng, were included as subjects in this study.

The selection of the age range 25-35 years as inclusion criteria was based on physiological, biomechanical, and theoretical considerations. Physiologically, within this age range, the human body is still in its peak physical fitness phase, characterized by high bone mineral density and optimal muscle mass. The biomechanical theory supports that bone structure and connective tissue can withstand intensive physical loads and stress at this age.

The average work duration of the research subjects was eight years, with the majority of farmers having a tenure of 6-10 years (42.2%). Intensive physical activity over the years can lead to repeated stress on joints, including the knee joints, potentially reducing knee functional ability.[9] This study supports the finding that longer tenure is associated with decreased functional knee ability among farmers.[10]

The analysis of work posture using the Ovako Work Posture Analysis System (OWAS) indicates that a significant portion of farmers (47.57%) have work postures categorized as 4, requiring "immediate action" to minimize

injury risks. This finding aligns with previous research emphasizing the need for improving work posture in agricultural tasks to reduce injury risks and enhance work efficiency.[11]

The analysis of functional knee ability using the Knee Injury and Osteoarthritis Outcome Score (KOOS) indicates that most farmers (90.6%) experience mild impairment in functional knee ability, falling within the KOOS score range of 67 to 99. The average score for functional knee ability in the research sample is 88, highlighting the negative impact of repetitive physical activities on farmers' knee health.[10]

Potential biases that may affect the results of this study include uncontrolled environmental and psychosocial factors. One significant factor is non-ergonomic work posture, which can increase the risk of knee musculoskeletal disorders. When farmers work in unnatural postures for extended periods, it can lead to excessive pressure on the knee joints, ligaments, and tendons, ultimately causing muscle fatigue and long-term injuries. Moreover, repetitive movements can result in the accumulation of pressure and mechanical trauma on muscles and joints. High-frequency awkward body postures without adequate relaxation can reduce blood supply and lead to knee injuries.

Long work duration is also a critical factor contributing to the accumulation of pressure and stress on knee joints. Fatigue from long work hours can decrease performance and comfort, increasing the risk of musculoskeletal disorders. Additionally, environmental and body temperature differences can force the body to expend energy to adapt, potentially reducing muscle energy supply and impairing workers' task performance.

Psychosocial factors such as stress levels, job satisfaction, and social support can also influence farmers' physical and mental health. High-stress levels and lack of social support can exacerbate health conditions and hinder the ability to maintain good work posture. Furthermore, individual variability, such as age, gender, and health status, can affect research outcomes. For example, older age increases the risk of musculoskeletal disorders due to natural joint degeneration. By considering these factors, the study can more accurately evaluate the relationship between work posture and functional knee ability among farmers.

The Relationship Between Work Posture and Functional Knee Ability Among Farmers in Pancasari Village

The analysis of work posture about functional knee ability among farmers, as shown in Table 3, reveals significant results ($p = 0.000$, $p < 0.05$) with a correlation coefficient of -0.641 between these variables. This indicates a meaningful relationship with a strong negative correlation between work posture and functional knee ability among farmers in Pancasari Village, Sukasada, and Buleleng. As the risk level of farmers' work posture increases, there is a corresponding decrease in their functional knee ability.

The decrease in functional knee ability among farmers can be attributed to non-ergonomic work postures, including awkward knee postures. Based on the OWAS analysis, most farmers' work postures in Pancasari Village, precisely the "squatting" posture coded as "4141," involve high flexion movements at the knee joint. Several researchers have suggested that the static application of high joint forces in such postures can impose excessive loads on the knee joint cartilage, potentially initiating cartilage degeneration. This occurs because the tibiofemoral load during squatting postures (full flexion) ranges from 2.8 to 7.8 times body weight.[6] This is consistent with Rachmi's study, which demonstrated that squatting posture impacts knee functional ability. Rachmi found a correlation between squatting work positions and squatting duration exceeding 109 minutes with knee pain.[12] Puntumetakul suggests that musculoskeletal disorders in the knee joints can occur during flexion and trunk rotation, which may increase shear force, torsion, and compression on the knee joint structures.[13]

This study utilized the Knee Injury and Osteoarthritis Outcome Score (KOOS) questionnaire to evaluate the functional knee ability of farmers. The analysis revealed that most farmers experience pain when bending their knees, with a mean score of 88.72% for the pain subscale. In the symptom subscale, most farmers reported crepitus or clicking sounds during knee movements, with a mean score of 89.78%. Difficulties in daily activities, such as squatting in the toilet and picking up objects while bending the knees, were reflected in the mean score of 92.52% for the activities of daily living subscale. These findings are consistent with Nugroho's study (2019), which indicated a significant relationship between daily activities, functional sports activities, quality of life, and decreased functional knee ability among farmers.[14]

The decline in functional knee ability and osteoarthritis are intricately interconnected, where each condition can influence and exacerbate the other. Non-ergonomic work postures can accelerate the progression of osteoarthritis in the knees, while osteoarthritis can significantly reduce functional knee ability.[10] Afiffa's study demonstrates the relationship between work positions and the occurrence of knee osteoarthritis among farmers. Afiffa revealed that when performing tasks that heavily rely on knee support, especially squatting, the weight borne by the knees can increase up to 10 times. The cartilage in the joints is too thin to cushion such excessive loads effectively. Excessive loads can lead to microfractures in the subchondral trabeculae, forming callus and bone remodeling. This stiffness in the bone makes it ineffective as a mechanical cushion and becomes a predisposing factor for joint cartilage degeneration. [10]

The more risky the work posture, the more significant the impact on farmers' functional knee ability decline. Work posture categorized as 4, specifically squatting posture with OWAS code "4141," biomechanically induces significant knee joint flexion, where the knee is bent to achieve the squatting position. Physiologically, sustained knee flexion over prolonged periods in squatting can lead to changes in the muscle and ligament tissues around the knee, affecting knee joint flexibility.[15]

Squatting posture affects collagen tissue adaptation in the ligaments and connective tissues around the knee. During prolonged and repetitive static physical activity such as squatting posture, collagen tissues tend to undergo structural changes, increasing stiffness and density. This can reduce tissue elasticity and limit the knee joint range of motion. Furthermore, repetitive squatting posture can cause stiffness and reduced elasticity in the muscles and ligaments around the knee due to repeated stretching. This stiffness can hinder tissue's ability to stretch and return to its original position, reducing knee joint flexibility.[15]

Repetitive activities that impose excessive stress on knee tissues can lead to scar tissue formation or fibrosis. Scar tissue is stiffer and less elastic than normal tissue, restricting joint movement and reducing flexibility, ultimately impacting functional knee ability, as flexibility is a crucial component of knee function.[15]

External validity refers to the extent to which the findings of a study can be generalized or applied to populations beyond the research sample used. In the context of the survey conducted in Pancasari Village, Sukasada, Buleleng, several factors must be considered to assess the external validity of these research findings.

This study was conducted on farmers aged 25-35 years in Pancasari Village, with a sample size of 64 individuals. Sample characteristics such as age, gender, work duration, and exercise habits have been detailed extensively. The homogeneity of the sample in terms of profession and geographic location may limit external validity because the findings may need to be generalizable to farmers in different places or with other characteristics.

The working conditions of farmers in Pancasari Village may have specific characteristics, such as the types of crops grown and farming techniques used, which may differ from other regions. For instance, the frequent use of squatting posture impacts knee functional ability and may be specific to this area. If working conditions vary elsewhere, such as different types of crops or farming methods, the findings of this study may only partially apply. Environmental and cultural factors also play a crucial role in external validity. Pancasari Village may have different environmental conditions, such as temperature, humidity, and topography, compared to other areas. Additionally, cultural practices related to work and health may vary, influencing the generalizability of the research findings.

Considering the variation in local conditions, this study can serve as a valuable reference for similar studies in other regions. To enhance external validity, it is recommended that additional research be conducted with more diverse samples in terms of geographic location and demographic characteristics of farmers. Therefore, while this study provides valuable insights into the relationship between work posture and knee functional ability among farmers in Pancasari Village, caution is needed when applying these findings to other populations. Further research encompassing a range of farming conditions and farmer characteristics is necessary to ensure broader generalization.

CONCLUSION

The study found a significant correlation between non-ergonomic work postures, like squatting posture, and reduced knee functional ability among Desa Pancasari, Sukasada, Buleleng farmers. Most farmers showed mild to moderate decreases in knee function, necessitating immediate improvements in their work postures based on OWAS analysis. The study recommends expanding sample diversity in future research to include various ages and genders, employing longitudinal designs for deeper insights, and measuring additional variables like fatigue and work intensity. Implementing ergonomic work practices, regular health programs, and preventive measures can enhance farmers' health, productivity, and quality of life.

DAFTAR PUSTAKA

1. Repo JP, Tukiainen EJ, Roine RP, Ilves O, Järvenpää S. Reliability and validity of the Finnish version of the Lower. Disabil Rehabil. 2016;
2. Manuel Barneo-Alcántara, Manuel Díaz-Pérez, Marta Gómez-Galán, José Pérez-Alonso ÁJCF. Musculoskeletal Risks of Farmers in the Olive Grove (Jaén-Spain) Manuel. MDPI. 2020;10(511):2–38.
3. Pollard JP, Porter WL, Redfern MS. Forces and Moments on the Knee During Kneeling and Squatting. Centers for Disease Control. 2013;
4. Dianat I, Afshari D, Sarmasti N, Sharifi M, Azaddel R. Work posture , working conditions and musculoskeletal outcomes in agricultural workers. Int J Ind Ergon. 2020;77.
5. Ezzat AM, Li LC. Occupational Physical Loading Tasks and Knee Osteoarthritis : A Review of the Evidence. 2014;66(3).
6. Lee C, Hong W. Analysis on Biomechanical Differences Depending on Changes in Postures during Farm Work. J Ergon Soc Korea. 2016;5(35):307–17.
7. Kajaks T, Costigan P. The effect of sustained static kneeling on kinetic and kinematic knee joint gait parameters. Appl Ergon. 2015;46:224–30.
8. Ayu I, Astuti D, Agung A, Sawitri S, Wirawan DN. Association of Pesticide Use and Personal Protective Equipments with Health Complaints among Horticulture Farmers in Buleleng, Bali Ida. Public Health and Preventive Medicine Archive. 2018;4(1):74–81.
9. Aldo Fatejarum S. Hubungan Postur Kerja dan Repetisi terhadap Kejadian Keluhan Muskuloskeletal pada Petani. 2018;5:518–23.
10. Ra'ida Afiffa Aurelia Shafira Hera Putri, Muhammad In'am Ilmiawan D. Faktor-Faktor yang Berhubungan dengan Kejadian Osteoarthritis Lutut pada Petani di Desa Bhakti Mulya Kecamatan Bengkayang. Jurnal Media Kesehatan. 2022;18(1):1–15.
11. Fathimahhayati LD, Pawitra TA, Tambunan W, Hartono M. Working posture analysis on oyster mushroom farmers using OWAS method in Lempake, Samarinda, East Kalimantan. Jurnal Ilmiah Pertanian. 2021;18(1):1–11.
12. Rachmi IM, W. RA, Murdana IN. Hubungan Nyeri Lutut dengan Posisi Kerja Berjongkok dan Faktor Risiko Lainnya pada Peternak Sapi Perah Studi di Provinsi Jawa Barat. eJournal Kedokteran Indonesia. 2018;6(2):91–6.
13. Puntumetakul R, Neubert MS, Buranruk O, Boucaut R. Knee musculoskeletal impairments and associated pain factors among rice farmers. J Back Musculoskelet Rehabil. 2018;1:1–7.
14. Nugroho A. Gambaran Karakteristik Nyeri Lutut Pada Petani di Area Kecamatan Panti, Kabupaten Jember. 2019.

15. Dt SS, Paramitha IA, Sabrina ME. Analisa Fleksibilitas Hamstring dan Faktor Resiko terhadap Pemendekan Otot Hamstring pada Remaja Dewasa di Wilayah Ambokembang. 2024;12:57–63.

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