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Physical Activity and Musculoskeletal Complaints in Older Adults: A Cross-Sectional Study

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Abstract

Background: Musculoskeletal complaints are common among older adults and may interfere with daily functioning. Physical activity is widely promoted to maintain health in older populations; however, inappropriate intensity may be associated with musculoskeletal complaints, particularly in community-dwelling older adults.

Objective: To examine the association between physical activity level and musculoskeletal complaints among older adults in Badung, Bali.

Methods: This observational study employed a cross-sectional design and involved 50 community-dwelling older adults aged ≥60 years, recruited using total sampling in February 2025. Physical activity was assessed using the International Physical Activity Questionnaire (IPAQ), while musculoskeletal complaints were measured using the Nordic Body Map (NBM). Data were analyzed using the chi-square test, and the magnitude of association was expressed as a prevalence ratio (PR) with a 95% confidence interval (CI).

Results: A significant association was observed between physical activity level and musculoskeletal complaints ($p = 0.001$). Older adults with higher levels of physical activity showed a higher prevalence of musculoskeletal complaints compared to those with moderate physical activity.

Conclusion: Physical activity level was significantly associated with musculoskeletal complaints among older adults. These findings indicate the importance of appropriate physical activity regulation and monitoring in older populations to minimize musculoskeletal complaints.

Keywords
Aged; Motor Activity; Musculoskeletal Pain; Cross-Sectional Studies; Surveys and Questionnaires

Introduction

Musculoskeletal complaints are a major health concern among older adults and represent one of the leading causes of functional limitation, reduced mobility, and decreased quality of life in later life.[1] Age-related physiological changes, including reduced muscle mass, decreased joint flexibility, and degenerative alterations in cartilage and bone structure, contribute substantially to the vulnerability of older adults to musculoskeletal problems.[2] These conditions often interfere with activities of daily living and may accelerate functional decline if not properly managed.

Regular physical activity is widely recommended as a key strategy to maintain physical function, musculoskeletal health, and overall well-being among older adults. Appropriate levels of physical activity have been shown to improve muscle strength, balance, bone density, and joint mobility, thereby reducing the risk of falls and functional impairment.[3] However, physical activity among older adults is a complex phenomenon. While insufficient activity is associated with deconditioning and musculoskeletal weakness, excessive or inappropriate physical activity—particularly without adequate rest, supervision, or adaptation to age-related limitations—may exacerbate musculoskeletal complaints.[4]

Epidemiological data indicate that musculoskeletal complaints such as low back pain, knee pain, shoulder pain, and generalized musculoskeletal discomfort are highly prevalent among older populations worldwide.[5] In Indonesia, the proportion of older adults continues to increase rapidly, with several provinces, including Bali, having entered the category of an aging population structure.[6,7] This demographic transition underscores the growing public health relevance of musculoskeletal health in older adults, particularly within community settings where older individuals often remain physically active through daily household, social, and occupational activities.

Previous studies examining the association between physical activity and musculoskeletal complaints among older adults have reported inconsistent findings. Some studies suggest that higher levels of physical activity are associated with lower musculoskeletal complaints due to improved physical conditioning and joint stability.[8] Conversely, other studies indicate that higher physical activity levels, especially when involving repetitive movements, prolonged loading, or inadequate recovery, are associated with increased musculoskeletal complaints.[9] These discrepancies may be influenced by differences in study design, measurement tools, population characteristics, and contextual factors such as lifestyle and environmental demands.

Despite the growing body of literature, evidence regarding the association between physical activity and musculoskeletal complaints among community-dwelling older adults in local Indonesian settings remains limited. In particular, there is a lack of data from smaller community units such as banjar-level populations, where patterns of physical activity may differ from those observed in urban or institutionalized older adults. Understanding this association at the local community level is essential for informing context-specific preventive strategies and physiotherapy interventions tailored to older adults.

Therefore, this study aimed to examine the association between physical activity level, as measured by the International Physical Activity Questionnaire (IPAQ), and musculoskeletal complaints, assessed using the Nordic Body Map (NBM), among older

adults in Banjar Pelasa, Badung, Bali. This study specifically sought to provide empirical evidence on whether different levels of physical activity are associated with the prevalence of musculoskeletal complaints in a community-dwelling older population.

Methods

This study employed an observational cross-sectional design conducted in Banjar Pelasa, Kuta District, Badung, Bali, Indonesia. Data collection was carried out in February 2025 within a community-dwelling older adult population. The cross-sectional design was selected to assess the association between physical activity level and musculoskeletal complaints at a single point in time in a real-world community setting.

The study population comprised all registered older adults residing in Banjar Pelasa. Eligibility criteria included individuals aged ≥60 years, permanently residing in Banjar Pelasa, able to communicate verbally, and willing to participate in the study. Exclusion criteria were a history of acute musculoskeletal injury within the previous three months, severe cognitive impairment, or medical conditions that limited participation in interviews. A total sampling technique was applied due to the relatively small population size, resulting in 50 eligible participants included in the analysis.

The exposure variable was physical activity level, assessed using the International Physical Activity Questionnaire (IPAQ). Physical activity was categorized into moderate and high levels according to the standard IPAQ scoring protocol. The outcome variable was musculoskeletal complaints, measured using the Nordic Body Map (NBM). Musculoskeletal complaints were classified into “mild” and “severe” categories based on the total NBM score, consistent with established categorization approaches in previous studies. Potential confounding variables considered in this study included age and sex.

Data were collected through face-to-face structured interviews conducted by trained research assistants. Prior to data collection, interviewers received standardized training on questionnaire administration to ensure consistency and minimize interviewer bias. Each interview lasted approximately 20–30 minutes. Participants were provided with standardized explanations of each questionnaire item, and clarification was offered when needed. Data completeness was checked immediately after each interview to reduce missing data.

Physical activity was assessed using the Indonesian version of the International Physical Activity Questionnaire–Short Form (IPAQ-SF). Physical activity levels were classified into moderate and high categories based on MET-minutes/week according to the official IPAQ scoring protocol. The IPAQ-SF has demonstrated acceptable reliability and validity for population-based studies, including older adults. Musculoskeletal complaints were measured using the Nordic Body Map (NBM) questionnaire. The severity of musculoskeletal complaints was categorized into mild and severe based on the total NBM score, following previously published scoring criteria. The NBM has been widely used to assess musculoskeletal symptoms in occupational and community settings. Both instruments were administered in Indonesian to ensure participant comprehension.

Potential sources of bias included recall bias and social desirability bias due to self-reported data. These were minimized by using standardized interview procedures, providing neutral instructions, and ensuring that interviewers were not informed of the study hypothesis. Consistent data collection procedures were applied across all participants.

This study used total sampling due to the limited number of older adults registered in Banjar Pelasa. Therefore, no formal sample size calculation was performed. This study is considered exploratory, and the results should be interpreted with caution due to limited statistical power.

Data were analyzed using statistical software. Descriptive statistics were used to summarize participant characteristics. The association between physical activity level and musculoskeletal complaints was examined using the chi-square test. The magnitude of association was expressed as a prevalence ratio (PR) with a 95% confidence interval (CI), calculated based on observed frequency distributions. Statistical significance was set at $p < 0.05$. No missing data were identified in the final dataset. Potential confounding variables, including age and sex, were considered in the interpretation of results. However, multivariable analysis was not performed due to the limited sample size.

This study received ethical approval from the Ethics Committee of the Faculty of Health Sciences, Universitas Bali Internasional (No. 02.0468/UNBI/EC/II/2025). Written informed consent was obtained from all participants prior to data collection. Participant confidentiality was maintained by anonymizing all data and restricting access to the research team.

Results

A total of 50 community-dwelling older adults residing in Banjar Pelasa were assessed for eligibility during the study period. All eligible individuals met the inclusion criteria and agreed to participate. No participants were excluded or declined participation. Consequently, all 50 participants were included in the final analysis.

The study included 50 older adults, with the majority aged 60–74 years (90%) and a smaller proportion aged 75–90 years (10%). Female participants accounted for 58% of the sample, while males comprised 42%. These findings indicate that the study population was predominantly younger-old adults and female, reflecting the demographic profile of older adults in the community setting.

Table 1. Baseline Characteristics of Participants (n = 50)

Characteristic	n	%
Age group (years)		
60–74	45	90.0
75–90	5	10.0
Sex		
Male	21	42.0
Female	29	58.0

Most participants were classified as having a high level of physical activity (74%), while the remaining participants had a moderate activity level (26%). Musculoskeletal complaints were prevalent in the study population, with 78% of participants reporting severe complaints and 22% reporting mild complaints.

Table 2. Association Between Physical Activity Level and Musculoskeletal Complaints

Physical Activity Level	Mild complaints n (%)	Severe complaints n (%)	Total n (%)
Moderate	7 (53.8)	6 (46.2)	13 (26.0)
High	4 (10.8)	33 (89.2)	37 (74.0)
Total	11 (22.0)	39 (78.0)	50 (100)

A statistically significant association was observed between physical activity level and musculoskeletal complaints (chi-square test, p = 0.001). Older adults with a high level of physical activity had a higher prevalence of severe musculoskeletal complaints compared to those with moderate physical activity. The prevalence ratio indicated that participants with high physical activity had approximately 1.9 times higher prevalence of severe musculoskeletal complaints than those with moderate activity (PR = 1.93; 95% CI: 1.07–3.47).

Discussion

This study demonstrated a significant association between physical activity level and musculoskeletal complaints among community-dwelling older adults in Banjar Pelasa, Badung, Bali. Older adults with higher levels of physical activity showed a higher prevalence of severe musculoskeletal complaints compared to those with moderate activity levels. These findings highlight the importance of considering not only the presence of physical activity but also its intensity and appropriateness for older populations.

The observed association may be explained by age-related musculoskeletal vulnerability combined with exposure to repetitive or prolonged physical loading. Although physical activity is essential for maintaining muscle strength, joint mobility, and balance in older adults, excessive intensity or insufficient recovery may exceed the adaptive capacity of aging musculoskeletal tissues.[10,11] Degenerative changes in cartilage, reduced muscle mass, and decreased tendon elasticity may increase susceptibility to pain and discomfort when physical demands are not adequately matched to functional capacity.

Previous studies have reported mixed results regarding the relationship between physical activity and musculoskeletal complaints in older adults. Some investigations suggest that regular physical activity is protective against musculoskeletal disorders by improving neuromuscular control and reducing functional decline.[12,13] In contrast, other studies have reported higher musculoskeletal complaints among older adults engaged in physically demanding activities, particularly those involving repetitive movements or high mechanical load.[4,14] The findings of the present study are consistent with the latter group, suggesting that higher physical activity levels may be associated with increased musculoskeletal complaints in certain community contexts.[15,16]

Contextual factors may further explain these findings. In community settings such as Banjar Pelasa, physical activity among older adults often consists of household tasks, informal labor, social activities, and prolonged standing or walking, rather than structured exercise programs. These activities may lack adequate warm-up, ergonomic adaptation, or rest periods, potentially increasing the likelihood of musculoskeletal complaints. This context-specific pattern of physical activity may differ substantially from structured exercise interventions commonly evaluated in clinical trials.

From a physiotherapy perspective, these findings underscore the need for targeted community-based strategies to optimize physical activity among older adults. Rather than discouraging physical activity, physiotherapists should focus on promoting appropriate intensity, safe movement patterns, and adequate recovery. Practical implications include routine screening for musculoskeletal complaints, education on activity pacing and ergonomic principles, prescription of low-impact exercises, flexibility and strengthening programs, and timely referral to physiotherapy services for persistent or severe symptoms.

Several limitations of this study should be acknowledged. First, the cross-sectional design precludes any inference of causality or temporal direction between physical activity and musculoskeletal complaints. Second, physical activity and musculoskeletal complaints were assessed using self-reported questionnaires, which may be subject to recall bias and misclassification. Third, potential confounding factors such as body mass index, comorbidities, and occupational history were not included in the analysis, which may have influenced the observed association. Finally, the relatively small sample size and community-specific setting limit the generalisability of the findings to broader older adult populations. Residual confounding cannot be excluded, as multivariable adjustment was not performed.

Despite these limitations, this study provides valuable local evidence on the association between physical activity and musculoskeletal complaints among community-dwelling older adults. The findings highlight the importance of context-sensitive physical activity recommendations and support the role of physiotherapy in promoting safe and sustainable physical activity among older populations. Future research using longitudinal or interventional designs is warranted to clarify causal pathways and to evaluate the effectiveness of tailored physiotherapy-based interventions.

Conclusion

This study found a significant association between physical activity level and musculoskeletal complaints among community-dwelling older adults in Banjar Pelasa, Badung, Bali. Older adults with higher levels of physical activity showed a higher prevalence of musculoskeletal complaints compared to those with moderate physical activity levels. These findings indicate that physical activity intensity, rather than physical activity alone, is an important factor associated with musculoskeletal health in older populations.

The results of this study emphasize that physical activity among older adults should be appropriately regulated and adapted to individual functional capacity. While physical activity remains essential for maintaining mobility, strength, and overall health, activities performed at excessive intensity or without adequate recovery may contribute to musculoskeletal complaints. Therefore, a balanced approach to physical activity that considers intensity, duration, and recovery is necessary to optimize health outcomes in older adults.

From a physiotherapy and community health perspective, these findings support the importance of routine musculoskeletal screening, education on safe and age-appropriate physical activity, and early physiotherapy intervention for older adults experiencing persistent musculoskeletal complaints. Community-based physiotherapy programs focusing on low-impact exercises, flexibility training, muscle strengthening, and ergonomic education may help reduce musculoskeletal burden while maintaining functional independence among older adults.

Given the cross-sectional nature of this study, causal relationships cannot be inferred. Future research using longitudinal or interventional designs is recommended to further clarify the temporal relationship between physical activity and musculoskeletal complaints and to evaluate the effectiveness of structured physiotherapy-based activity programs in community-dwelling older populations.

Author Contribution

Luh Putu Wulan Aristina Dewi: Conceptualization; Methodology; Data curation; Formal analysis; Investigation; Writing – original draft.
I Putu Astrawan: Formal analysis; Validation; Writing – review & editing.
I Gusti Ngurah Mayun: Methodology; Supervision; Writing – review & editing.
Ida Ayu Astiti Suadnyana: Investigation; Data curation; Writing – review & editing.

All authors have read and approved the final manuscript and take responsibility for the integrity and accuracy of the work.

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Conflict of Interest Statement

The authors declare no conflict of interest related to this study.

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Ethics Statement

This study was approved by the Ethics Committee of the Faculty of Health Sciences, Universitas Bali Internasional (No. 02.0468/UNBI/EC/II/2025). Written informed consent was obtained from all participants prior to data collection. All participants were informed about the study objectives, procedures, and their right to withdraw at any time. Confidentiality and anonymity of participant data were strictly maintained throughout the study.

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