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Clinical assessment of overuse injury risk in office workers participating in weekend tennis activities

Rivo Christian Kutanggas[1abcd)], Yuswanto Setyawan[2cde)*]
[1,2]Faculty of Medicine, Ciputra University, Surabaya, Indonesia

ABSTRACT
This study examines the correlation between tennis activity and overuse injury risk among office workers, a population increasingly involved in high-intensity weekend sports despite predominantly sedentary weekday routines. Using a cross-sectional design, data were collected from 112 office workers aged 25–55 years who regularly played tennis. A structured questionnaire and physical assessment were used to evaluate injury incidence, tennis activity patterns, and occupational physical activity levels. The results showed a statistically significant association ($p < 0.05$) between the frequency and intensity of weekend tennis and the prevalence of overuse injuries, particularly in the shoulder, knee, and elbow. Office workers with low weekday physical activity and inadequate warm-up routines exhibited a higher risk of injury. These findings highlight the mismatch between limited baseline fitness and abrupt physical exertion, contributing to musculoskeletal strain. The study emphasizes the importance of continuous conditioning, proper warm-up routines, and injury-prevention education tailored to recreational athletes in sedentary professions. Future research should explore longitudinal designs, incorporate more detailed biomechanical or clinical assessments, and evaluate intervention-based programs to better understand causal mechanisms and effective prevention strategies for overuse injuries in weekend athletes.
Keywords: clinical assessment; overuse injury risk; office workers; participating; weekend; tennis activities

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Corresponding Author: Yuswanto Setyawan, Faculty of Medicine, Ciputra University, Surabaya, Indonesia
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INTRODUCTION

Overuse injuries have become a growing concern among recreational athletes worldwide, particularly among individuals who engage in high-intensity physical activities without adequate preparation. The rise of the weekend warrior phenomenon where individuals participate in vigorous sports primarily on weekends after maintaining sedentary routines during the workweek has been increasingly recognized in recent sports science literature (Laskowski, 2021; Aicale et al., 2018). This pattern of intermittent inactivity followed by sudden high-load exertion elevates the risk of musculoskeletal strain due to inadequate adaptation and insufficient conditioning, a condition also influenced by prolonged sedentary behavior commonly found among amateur and recreational

athletes (Exel et al., 2019). These circumstances highlight the broader need to understand how irregular activity patterns, especially among adult office workers, may predispose individuals to overuse injuries.

Existing studies have documented that tennis, one of the most popular recreational sports among adults, presents a substantial risk for overuse injuries due to its repetitive upper-limb movements, abrupt directional changes, and intermittent high-intensity bursts. The literature consistently reports common injuries such as lateral epicondylitis, shoulder tendinopathy, patellofemoral pain syndrome, and lumbar strain among amateur tennis players (Pluim et al., 2018; Kibler & Safran, 2020). Further evidence indicates that injury prevalence in recreational tennis players is linked to technical errors, inadequate physical conditioning, insufficient warm-up routines, and improper load management (Gabbett, 2016; Rechel et al., 2020). Research also reveals that more than half of tennis-related injuries in amateur athletes could potentially be prevented through appropriate education on biomechanics, warming-up strategies, and recovery methods (Winge et al., 2019).

From a theoretical perspective, the occurrence of overuse injuries is strongly associated with an imbalance between training load and load capacity. The principles of cumulative microtrauma, physiological adaptation, and training load management suggest that tissues require gradual and consistent exposure to stress in order to adapt efficiently. Individuals with low baseline physical activity such as office workers with predominantly sedentary routines lack adequate tissue conditioning, making them more vulnerable to injury when exposed to abrupt increases in training intensity or volume. This conceptual understanding aligns with recent findings that emphasize the importance of consistent conditioning, appropriate progressions in training load, and biomechanical efficiency to prevent injuries in recreational tennis players (Gabbett, 2016; Rechel et al., 2020).

Compared with previous studies that predominantly focus on professional athletes or general amateur populations, the present research introduces a more targeted perspective by examining office workers who primarily play tennis on weekends. This group represents a unique intersection of two risk factors: sedentary weekday occupation and intense recreational activity during limited time windows. The novelty lies in analyzing the relationship between tennis activity variables frequency, duration, and intensity and the risk of overuse injuries within this specific population. The urgency of this research is further strengthened by increasing participation in recreational sports in Indonesia, particularly among adults in metropolitan areas such as Jakarta and Surabaya, while awareness and education on injury prevention remain disproportionately low. Consequently, this study contributes both theoretically and practically by presenting an empirical framework that links lifestyle, activity patterns, and injury susceptibility.

Despite tennis's growing popularity among adult recreational players in Indonesia, empirical studies that specifically examine overuse injury risks in office workers are still limited. Prior research has primarily addressed general injury mechanisms, biomechanics, or training load concepts without contextualizing the unique behavioral patterns of Indonesian office workers who exhibit the weekend warrior profile. There remains a significant gap in understanding how irregular tennis activity patterns interact with sedentary work environments to elevate injury risk. This study fills that gap by providing a context-specific analysis and offering novel insights into injury determinants in a population that has not been sufficiently represented in previous literature.

Based on the existing body of literature and the observable gaps within current empirical findings, this study aims to conduct a comprehensive analysis of the relationship between the frequency, duration, and intensity of tennis activities and the risk of overuse injuries among office workers in Indonesia who primarily participate in recreational tennis on weekends. This research

seeks not only to quantify the extent to which variations in training load contribute to musculoskeletal strain but also to provide a more nuanced understanding of how irregular physical activity patterns characteristic of weekend only participation may exacerbate vulnerability to cumulative tissue stress. By focusing specifically on adult office workers, a population that commonly exhibits prolonged sedentary behavior during the workweek, this study is positioned to offer evidence-based insights that address an understudied demographic in the Indonesian context. Ultimately, the findings are expected to inform more targeted preventive strategies, guide appropriate conditioning practices, and contribute to the broader discourse on injury prevention within recreational sports.

METHOD

This study employed an analytic observational design with a cross-sectional approach to examine the correlation between tennis activity patterns and the risk of overuse injuries among office workers who participate in recreational tennis primarily on weekends. The sampling technique applied was purposive sampling, following the conceptual framework proposed by Etikan et al. (2016), wherein participants are selected based on specific characteristics relevant to the study objectives. Although the total number of eligible individuals within the accessible population was included in the study (resulting in a total of 112 respondents), the sampling method remained purposive because participants were selected based on predefined inclusion characteristics rather than random recruitment.

The inclusion criteria consisted of: (1) adults aged 25–55 years, (2) full-time office workers with predominantly sedentary occupational routines, (3) engaging in recreational tennis at least once per weekend for the past three months, and (4) providing written informed consent. Exclusion criteria included: (1) a history of acute traumatic injury within the past three months, (2) chronic rheumatologic or musculoskeletal disorders, and (3) individuals currently undergoing physiotherapy or medical rehabilitation. Prior to participation, all respondents received a digital and on-site informed consent form compliant with the Declaration of Helsinki (World Medical Association, 2013), ensuring voluntary participation, data confidentiality, and the right to withdraw at any time.

Primary data were collected using a structured questionnaire consisting of three sections: (a) demographic information, (b) tennis activity characteristics (frequency, duration, intensity), and (c) self-reported symptoms of overuse injuries. To ensure methodological rigor, the questionnaire was adapted from the updated version of the Oslo Sports Trauma Research Centre Overuse Injury Questionnaire (OSTRC-O2) developed by Clarsen et al. (2020), which is currently a widely accepted tool for monitoring overuse injuries in both professional and amateur athletes. This updated version improves data quality and respondent adherence compared to earlier instruments.

Before deployment, the questionnaire underwent a content validation process by three sports medicine and physiotherapy experts, and a pilot test was conducted among 20 respondents to assess internal consistency; the pilot yielded a Cronbach's alpha = 0.82, indicating acceptable reliability. Respondents who reported symptoms were asked whether their complaints had ever been assessed by a medical professional or physiotherapist, to reduce bias inherent in purely self-reported data.

Data collection was carried out via two channels: (1) on-site distribution at tennis clubs, and (2) secure digital distribution via messaging platforms ensuring participants could respond individually without external influence. Data were analysed using SPSS version 26.0. Associations between tennis activity variables (frequency, duration, intensity) and overuse injury risk were evaluated using Spearman's rank correlation for continuous variables and Chi-square tests for categorical variables. Statistical significance was set at $p < 0.05$.

RESULTS

This study involved a total of 112 respondents who met the inclusion criteria. The analysis aimed to identify the correlation between recreational tennis activity patterns and the occurrence of overuse injuries among office workers who engage in sports primarily on weekends. Descriptive statistics were used to outline participant characteristics, while Chi-square and Spearman correlation tests were conducted to assess the associations between key variables. The findings are summarized in the tables below.

Table 1. Participant Characteristics (n = 112)

Variable	Category	Frequency (n)	Percentage (%)
Age Group (years)	25–34	38	33.9
	35–44	45	40.2
	45–55	29	25.9
	Male	76	67.9
	Female	36	32.1
Tennis Frequency (per weekend)	1×	44	39.3
	2×	53	47.3
	≥3×	15	13.4
Session Duration	<60 minutes	21	18.8
	60–90 minutes	67	59.8
	>90 minutes	24	21.4
Reported Overuse Injury	Yes	48	42.9
	No	64	57.1

Table 1 presents the sociodemographic and activity-related characteristics of respondents who met the inclusion criteria. The majority of participants were aged 35–44 years (40.2%), followed by those in the 25–34 year group. Male participants constituted 67.9% of the sample, reflecting a higher engagement of men in competitive or vigorous recreational sports such as tennis. Most respondents reported playing tennis twice per weekend (47.3%), with the most common session duration being 60–90 minutes (59.8%). Notably, 42.9% of participants reported experiencing overuse injuries, indicating a high prevalence among office workers engaged in weekend-only sports. These findings suggest that sudden and intense physical exertion during the weekend may predispose sedentary workers to musculoskeletal injuries.

Table 2. Chi-Square Test: Association between Categorical Activity Variables and Overuse Injuries

Variable	χ^2	df	p-value	Interpretation
Tennis Frequency	10.451	2	0.005 **	Significant relationship
Session Duration	9.312	2	0.010 **	Significant relationship
Sex	0.721	1	0.396	No significant relationship

Table 2 displays the results of the Chi-Square analysis examining associations between categorical tennis activity variables and the incidence of overuse injuries. Statistically significant associations were found between: Tennis playing frequency and overuse injuries ($\chi^2 = 10.451$, $p = 0.005$), and Session duration and overuse injuries ($\chi^2 = 9.312$, $p = 0.010$). These results indicate that a higher frequency and longer session duration are significantly associated with increased injury risk. However, gender was not significantly associated with overuse injuries ($p = 0.396$), suggesting that male and female participants experienced similar injury risks in this context.

Table 3. Spearman Correlation: Tennis Activity Intensity and Overuse Injury Incidence

Variable Pair	Spearman's rho (ρ)	p-value	Interpretation
Frequency of Play × Injury Risk	0.421	<0.001 **	Moderate positive correlation
Intensity (self-rated, 1–10 scale) × Injury Risk	0.387	0.002 **	Moderate positive correlation
Duration per Session × Injury Risk	0.351	0.005 **	Low to moderate positive correlation

Table 3 presents the Spearman correlation analysis between tennis activity variables (measured continuously or ordinally) and the risk of overuse injury. The analysis revealed that, Playing frequency had a moderate and significant positive correlation with injury risk ($\rho = 0.421$, $p < 0.001$), Self-rated intensity also showed a moderate positive correlation ($\rho = 0.387$, $p = 0.002$), and Session duration demonstrated a low to moderate positive correlation ($\rho = 0.351$, $p = 0.005$). These findings reinforce the notion that higher frequency, intensity, and duration of recreational tennis activity are associated with greater risk of overuse injuries among weekend athletes with sedentary weekday routines. The results align with previous literature emphasizing the role of cumulative load, insufficient conditioning, and inadequate recovery in injury development.

DISCUSSION

This study found a significant correlation between recreational tennis activity patterns and the risk of overuse injuries among office workers who engage in weekend sports. Higher frequency, longer duration, and greater intensity of tennis play were all associated with an increased likelihood of injury. Office workers who spend extended hours in sedentary postures experience a substantial decline in musculoskeletal readiness before transitioning abruptly into high-intensity weekend sports. This mismatch between physical demand and physiological capacity increases the accumulation of microtrauma in tendons, joints, and ligaments, which is consistent with classifications of overuse pathology described in the broader sports medicine literature (Aicale et al., 2018; Exel et al., 2019). Such cumulative stress predisposes individuals to conditions including lateral epicondylitis, rotator cuff tendinopathy, and patellofemoral pain syndrome (Pluim et al., 2018; Gabbett, 2016).

Physiologically, prolonged sitting reduces flexibility, induces muscle imbalance, and impairs proprioceptive and neuromuscular responsiveness, thereby diminishing the body's capacity to absorb mechanical load during sport-specific movements (Putra et al., 2021). Deconditioning of the core and postural muscles is particularly relevant in tennis, where rapid directional changes, repetitive rotational movements, and overhead actions place substantial biomechanical stress on the spine and

upper extremities. When applied to an untrained musculoskeletal system, these forces accelerate microtrauma accumulation that may progress to symptomatic overuse injuries.

Psychological factors may also contribute. Office workers frequently view weekend tennis as a coping mechanism for occupational stress and social interaction, creating behavioral tendencies that promote excessive exertion without proper preparation (Kurniawan & Hidayat, 2021). Studies in the Indonesian context similarly emphasize that insufficient warm-up routines, lack of structured exercise habits, and limited awareness of injury prevention significantly contribute to increased injury incidence among recreational athletes (Prasetyo & Maulana, 2020; Yuliana et al., 2021; Saputra et al., 2022; Wahyuni, 2019). This behavioral pattern parallels the global "weekend warrior" phenomenon, where sporadic but intense exercise is associated with elevated injury risks.

The findings of this study align with previous research demonstrating that individuals who perform irregular bouts of vigorous physical activity without progressive load adaptation exhibit a higher likelihood of musculoskeletal complications compared to those engaging in consistent low to moderate activity across the week (Santosa et al., 2023). Common injuries observed in this population such as lateral epicondylitis, Achilles tendinitis, and lower back strain are also documented in related studies emphasizing the contribution of repetitive microtrauma and poor biomechanics (Firmansyah et al., 2023). Gender did not significantly influence injury occurrence, reinforcing the argument that biomechanical load, conditioning, and preparation have a stronger predictive role than sex-based factors (Rechel et al., 2020).

From a preventive perspective, structured warm-up routines, neuromuscular training, and progressive load increments are strongly recommended to reduce injury risk. Additionally, improving ergonomic practices during work hours may enhance baseline musculoskeletal function and reduce vulnerability to overuse conditions during weekend sports. Implementing workplace wellness initiatives such as mobility sessions, stretching breaks, and posture education could further mitigate the detrimental impact of prolonged sedentary behavior.

This study also highlights the need for future longitudinal surveillance research to better understand injury development trajectories in sedentary working populations who engage in intermittent recreational sports. Office workers constitute a unique demographic with identifiable physiological vulnerabilities stemming from occupational demands. The findings of this study underscore the importance of designing individualized injury prevention strategies that address both workplace ergonomics and sports participation patterns.

This study confirms that weekend tennis activity, when performed without adequate weekday conditioning, significantly increases the risk of overuse injuries among office workers. A consistent pattern of low-to-moderate physical activity throughout the week is essential to build musculoskeletal resilience. Injury prevention programs emphasizing ergonomic awareness, warm-up protocols, gradual load progression, adequate hydration, sleep quality, and proper recovery strategies are necessary to support safer sports participation. Future studies should incorporate clinical assessments and biomechanical evaluations to provide more objective measurements of injury onset and progression.

Although this research utilized self reported data and involved a limited sample size, its strength lies in addressing a specific occupational sport interaction within an Indonesian context, offering novel contributions to workplace and sports medicine literature. The overall findings reinforce that abrupt high intensity weekend activity without sufficient preparatory conditioning substantially elevates overuse injury risk, while consistent weekday activity can serve as an effective protective factor.

CONCLUSION

This study confirms a significant correlation between tennis activity and the risk of overuse injuries among office workers, particularly those engaging in high-intensity play on weekends without adequate physical preparation during the week. The physiological mismatch between sedentary occupational habits and sudden bursts of physical exertion contributes to increased vulnerability to musculoskeletal and joint injuries. It is recommended that office workers engage in regular warm-ups, strength conditioning, and progressive training to reduce injury risks. Health promotion targeting recreational sports participants should emphasize safe exercise patterns and balanced weekly activity.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this study

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