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Sports Injury Patterns and Incidence Among Adolescent Pencak Silat Athletes

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Abstract

The expanding popularity of Pencak Silat, particularly in the full-contact sparring category, exposes athletes to significant injury risks caused by intrinsic and extrinsic factors, including the implementation of complex new regulations. Therefore, a comprehensive understanding of these rules by referees is critical to mitigate injuries and prioritize athlete safety. This study aims to analyze the incidence of injuries among pencak silat athletes participating in the Pekan Olahraga Pelajar Daerah, a regional multi-event Regional Student Sports Week in Indonesia at the district level in the regencies of Banyumas, Cilacap, Purbalingga, and Banjarnegara, Central Java Province. This study employed a cross-sectional survey design, involving 142 adolescent pencak silat athletes selected through purposive sampling. Data were collected using a structured questionnaire adapted from Fuller et al and supplemented by interviews to validate responses. The questionnaire focused on athlete demographics, injury characteristics, and affected body regions. Data were analyzed using descriptive statistics, including frequency distribution and percentage calculations, to provide an empirical overview of injury patterns and incidence rates. The majority of injuries occurred during training sessions (87%) rather than competitions (27%). Chronic injuries were more prevalent (85%) compared to acute injuries (15%). The lower extremities were the most affected body parts (77%), particularly the knee (26%), ankle (24%), and hip (24%). Pencak silat athletes are more prone to chronic injuries, particularly in the lower extremities. Injury prevention efforts should focus on proper warm-up routines, injury education, and enhancing technical skills to minimize injury risks during both training and competition.

Keywords: *pencak silat, sports injuries, injury assessment, injury prevention.*

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INTRODUCTION

Pencak silat is one of the martial arts sports currently undergoing significant development, as evidenced by the numerous international events held, both single and multi-event competitions, such as the SEA Games, ASEAN University Games, Belgium Open Pencak Silat Championship, Asian Games, Pencak Silat World Championship, and others (Widorotama et al., 2024) (Mulyana & Lutan, 2021). Pencak silat is a martial art with graceful movements but also involves aggressive actions that can cause injuries during training or competition (Latif et al., 2022).

There are two competition categories in pencak silat, namely the wiraloka category or artistic performance, and the wiralaga category or sparring. The sparring category in pencak silat involves full body contact (Fatoni & Sudarmanto, 2018). Other sources explain that the sparring category involves two athletes from opposing corners facing each other with the objective of outperforming the opponent using various pencak silat techniques, such as kicks, punches, blocks, and throws (Mujahid & Subekti, 2021). Based on this, the sparring category has a higher potential risk of injury compared to the artistic category in pencak silat.

Several factors contribute to injuries among pencak silat athletes, which are categorized into intrinsic and extrinsic factors. Intrinsic factors include physiological, psychological, and social factors. Physiological factors include lack of rest, poor health, and fatigue. Psychological factors encompass stress, anxiety, and fear, while social factors involve disobedience to the coach, pressure during competition, and lack of attention from the coach. Extrinsic factors include sports facilities, competition rules, and the inherent nature of pencak silat, which requires athletes to remain highly cautious (Mujahid & Subekti, 2021) (Del Vecchio et al., 2018).

Sports injuries typically result from direct trauma or repetitive long-term training (Setiawan, 2011). Injuries are classified into three types: minor, moderate, and severe. Minor injuries cause no significant tissue damage, with swelling that does not affect performance. Moderate injuries involve tissue damage, pain, visible swelling, and performance disruption, such as grade I sprains and strains. Severe injuries cause major tissue damage, significant swelling, unbearable pain, and the inability to continue participating in sports.

One contributing factor to injuries, as identified by (Tri Wahyuningtyas et al., 2024) in their study titled Analysis of Referee and Jury Understanding of the Latest Pencak Silat Rules in Ponorogo Regency, is the increased incidence of injuries following the implementation of the latest competition rules by Persilat. The new regulations introduce additional technical rules, such as locks and pulls, which require greater attention. The understanding of competition rules among referees and juries also affects the proper management of matches, ensuring that any violations are addressed effectively while prioritizing athlete safety. Therefore, referees and juries must act fairly, uphold sportsmanship and integrity, and carry out their responsibilities according to the relevant regulations.

Research studies continue to underreport the frequency of injuries among pencak silat competitors. Because pencak silat is different from other martial arts, injuries must be specifically identified, especially in the sparring category. To give data as a guide for injury prevention strategies for pencak silat athletes, research on the frequency of injuries is crucial. Limited epidemiological data on pencak silat injuries, especially among adolescents in regional competitions. Given this justification, the researcher believes it is critical to look at the prevalence of injuries among pencak silat athletes who compete in sparring.

While the full-contact nature of the sparring (wiralaga) category is a core appeal of Pencak Silat internationally, it carries inherent injury risks that remain under-researched compared to other combat sports. Current literature significantly lacks specific data on injury prevalence among adolescent practitioners, a critical demographic for the sport's future generation. Neglecting this gap creates a 'blind spot' in athlete safety management, where untreated injuries in youth can lead to chronic conditions and early dropout rates globally. This study addresses this urgent need by providing empirical data on injury patterns at the grassroots competition level. The findings are intended to serve as a universal baseline for developing safer training methodologies and medical protocols, effectively bridging the gap between traditional training practices and modern sports science to safeguard young athletes' careers internationally.

METHODS

Research Design

This study used a cross-sectional survey method. Data were collected from athletes participating in the multi-event Regional Student Sports Week (POPDA) at the district level in the Banyumas Residency area.

Participants

Participants were representatives from the regencies of Banyumas, Cilacap, Purbalingga, and Banjarnegara in 2025. Data collection took place during and after the POPDA event, which took place between November 2024 and January 2025. The study population consisted of 350 pencak silat athletes competing in the POPDA at the district level.

Instruments

The questionnaire was adapted from the consensus statement on injury surveillance by (Fuller et al., 2007) and translated into Indonesian. To ensure comprehensive data collection, the questionnaire items were structured to capture key injury-related variables, including athlete characteristics (age, weight, height, and training load) and detailed injury profiles. The injury data were categorized based on (1) Injury Setting (training or competition); (2) Injury Type (acute or chronic); (3) Injury Region (upper or lower extremity); and (4) Specific Injury Location (e.g., shoulder for upper extremities, and knee, hip, ankle/foot, or other areas for lower extremities).

Procedure

The sampling technique used was purposive sampling, which was chosen to ensure that participants possessed specific characteristics relevant to the research objectives. Sample selection was based on the following inclusion criteria: (1) athletes with a history of injury, and (2) athletes with minimal district-level competition experience. These inclusion criteria were established to ensure the representativeness of the sample in reflecting the study's focus on athletes with relevant injury experiences and competitive exposure. Exclusion criteria were: (1) athletes who had not participated in a training program in the past two months, and (2) athletes who were unwilling to provide the information required for the study. Based on the selection, a total of 142 athletes were included in the research sample.

Researchers sought consent from athletes' parents/legal guardians by distributing consent forms, followed by questionnaires and interviews to gather additional information. During questionnaire completion, researchers guided participants to ensure accurate understanding, while informal interview sessions aimed to clarify athletes' written responses.

The study protocol was reviewed and approved by the Health Research Ethics Committee, Faculty of Health Sciences, Universitas Jenderal Soedirman, with approval number 2005/EC/KEPK/X/2025. Data were collected from POPDA athletes at their respective locations.

Data Analysis

Data collected from the questionnaire were analyzed using descriptive statistical methods, including frequency distribution and percentage calculations, to identify patterns in injury incidence, severity, and affected body regions. The quantitative data analysis was performed using IBM SPSS Statistics version 26, which facilitated accurate computation and tabulation of the descriptive results. The interview responses were qualitatively analyzed to provide additional insights and validate the quantitative findings. The qualitative data were transcribed, categorized, and summarized to identify recurring themes related to injury causes and athlete experiences. This combined approach ensured a comprehensive understanding of injury patterns among adolescent pencak silat athletes.

RESULTS

The total sample size was 142 athletes who had experienced injuries. Table 1 presents the baseline characteristics of the 142 study participants. The athletes had a mean age of 16.6 ± 1.2 years, with a mean body weight of 62.4 ± 13.8 kg and a height of 167.2 ± 4.82 cm. The recorded training load was 3.5 sessions per week with an average duration of 60–90 minutes per session, indicating a moderately intense training profile for this age group.

Table 1. Samples Profile

Variables	Samples (n=142)
Age (years)	16.6 ± 1.2
Weight (kg)	62.4 ± 13.8
Height (cm)	167.2 ± 4.82
Training Sessions/Week	3.5
Duration/Session (min)	60-90

Table 2 outlines the injury profile of the athletes. Training was the most common setting for injuries (87.32%), followed by competition (26.76%); the cumulative percentage exceeds 100% as approximately 20 athletes (14.08%) were injured in both contexts. In terms of pathology, chronic injuries dominated (85.21%) over acute injuries (14.78%). Anatomically, the lower extremities were the most impacted region (77.46%), while 29.57% of athletes reported upper extremity injuries. Again, these figures reflect multiple injuries per athlete, with approximately 10 athletes (7.03%) sustaining injuries in both upper and lower body regions.

Table 2. Injury Characteristics

Variables	Incidences	Percentage (%)
Training	124	87.32
Competition	38	26.76
Acute Injury	21	14.78
Chronic Injury	121	85.21
Upper Extremity	42	29.57
Lower Extremity	110	77.46

Table 3 details specific injury locations across body regions. Regarding the upper extremity, injuries were predominantly located in the shoulder (57.14%), while other areas accounted for 42.86%. Conversely, in the lower extremity, injury distribution was relatively uniform, involving the knee (26.36%), hip (23.64%), ankle/foot (24.55%), and other areas (25.45%). This distribution pattern indicates that lower extremity injuries are more diverse and not concentrated in a single specific location. Considering the incidence in both conditions, there is a distinct contrast between the focal nature of upper extremity injuries and the diffuse nature of lower extremity injuries.

Table 3. Injury Locations

Variables	Location	Incidences	Percentage (%)
Upper Extremity	Shoulder	24	57.14
	Other	18	42.86
Lower Exterimity	Knee	29	26.36
	Hip	26	23.64
	Ankle/Foot	27	24.55
	Other	28	25.45

DISCUSSION

The descriptive characteristics of the samples indicate that the average age of the athletes was 16.6 years, suggesting that most were in the mid-adolescent stage, a critical period for physical and skill development in sport, especially at pencak silat as a combat sport. The mean body weight (62.4 ± 13.8 kg) and height (167.2 ± 4.82 cm) reflect a generally proportional physique suitable for optimal performance in combat sports. On average, athletes trained approximately 3 to 4 times per week, with each session lasting between 60 to 90 minutes, indicating a consistent and structured training regimen that supports both physical conditioning and technical mastery.

Table 2 presents injury characteristics showed that most injuries occurred during training (87.32%), while a smaller proportion took place during competition (26.76%). This pattern suggests that the repetitive and high-intensity nature of training sessions may expose athletes to greater physical strain and risk of overuse injuries compared to competitive events. Chronic injuries represented the majority of reported cases (85.21%), indicating that prolonged training loads and insufficient recovery might have contributed to the persistence of musculoskeletal problems. In terms of injury location, the lower extremities were most frequently affected (77.46%), consistent with the dominant use of kicking and footwork techniques in pencak silat, whereas upper extremity injuries (29.57%) were less common and may be linked to blocking or striking movements.

Table 3 presents injury locations, showing 28 incedences (54.9%) with the shoulder being the most frequently injured upper extremity, and 35 incedences(26.72%) of the knee being the most common lower extremity injury.

The study results showed that most injuries, 87.32% occurred during training

sessions, and 38% occurred during competition. These results align with previous studies on martial arts such as taekwondo (Geβlein et al., 2020), judo, karate, and wushu (Garcia-Isidoro et al., 2021), which reported a higher incidence of injuries during training. The increased risk of injury during training is likely due to excessive training hours, repetitive techniques, and lower safety awareness compared to competition sessions. Furthermore, training sessions involve repetitive movements such as kicks, throws, and defences, which result in accumulated stress on the musculoskeletal system. This suggests the need for injury prevention efforts and strategies that focus on training modifications, proper technique supervision, and structured recovery programs within training programs (Hammami et al., 2018).

The incidence of chronic injuries is high, with findings of 85.21% compared to acute injuries at 14.78%. This suggests that repetitive training significantly contributes to injury risk. Chronic injuries are often associated with prolonged mechanical stress, improper movements, and inadequate recovery periods. This condition has also been observed in other combat sports, such as judo (K. S. Kim et al., 2015), taekwondo (H. C. Kim & Park, 2023), and wrestling (Park et al., 2019), where long-term excessive training and competition cause joint and soft tissue damage. In pencak silat, frequent kicking techniques and improper mechanics contribute to the prevalence of chronic injuries. To address these issues, a combination of structured recovery sessions, injury prevention education, and structured strength training are needed to improve joint stability and reduce long-term injury.

These results demonstrate the importance of implementing data-driven injury prevention strategies for adolescent pencak silat athletes. Coaches should develop modified training programs based on the latest scientific research, focusing on gradual progression, attention to intensity, and structured and targeted strength training to strengthen joint stability. Furthermore, education on injury prevention measures and self-identification techniques should be provided to athletes to help them recognize early signs of overexertion-related injuries. Future research should examine the effectiveness of specific intervention programs, such as neuromuscular training or biomechanical analysis, in reducing injury rates in pencak silat (Latif et

al., 2022) (Del Vecchio et al., 2018).

Table 3 provides information on injury incidence across various body areas. Data indicate that the lower extremities experienced the highest injury incidence at 77.46%, and the knees were the most common injury area at 26.36%. These results are consistent with previous research in martial arts, which reported that lower extremity injuries typically occur due to extensive kicking and rapid changes in direction (H. C. Kim & Park, 2023). In pencak silat, techniques involving the lower extremities, such as crescent kicks, scissoring, and defensive moves, place significant stress on the knee joint, increasing the risk of ligament strain, meniscus injury, and overuse damage..

In addition, upper extremity injuries accounted for 29.57% of the total cases, with the shoulder being the most frequently injured area (57.14%). The high incidence of shoulder injuries can be caused by repetitive blocking movements, grappling techniques, and improper fall mechanics during defensive movements performed by athletes (Elahi et al., 2024)(Su et al., 2024) (Jensen et al., 2017) (Diesselhorst et al., 2013). Similar things also occur in other martial arts such as judo and wrestling, where repetitive throwing and gripping movements contribute to shoulder strain and rotator cuff injuries (Park et al., 2019) (K. S. Kim et al., 2015).

To address this, injury prevention strategies should focus on strengthening the knee and shoulder stabilizer muscles, improving training methods and techniques to reduce stress on the joints, and implementing mobility exercises to increase endurance and resistance in high-risk areas (Patenteu et al., 2024) (Tulendiyeva et al., 2021) (Emery & Pasanen, 2019) Furthermore, coaches should emphasize proper fall procedures and defensive techniques to minimize forces and loads on vulnerable joints.

To reduce the risk of acute and chronic injuries, several preventative measures must be implemented. First, training programs should include regular warm-ups and proper cool-downs to improve health and reduce muscle stiffness. Second, improvements in basic technique should be made to minimize errors in movement execution, especially for techniques with high potential for injury, such as kicks and takedowns. Third, adequate recovery time should be provided between training sessions to prevent overuse injuries. Furthermore, previous research has shown that

the use of protective gear, such as shin guards and knee braces, can significantly reduce the impact forces associated with repetitive kicking techniques (Kim et al., 2021). Finally, periodized training sessions that balance intensity, strength conditioning, and active recovery should be structured to improve both short- and long-term athlete performance.

The results of this study reveal the incidence of injuries among adolescent pencak silat athletes in the Banyumas residential area. The results indicate that sports injuries frequently occur during training sessions. These findings align with research by (Setiawan, 2011) (Emery, 2003), who stated that the general causes of sports injuries include: (1) inadequate warm-up, (2) insufficient preparation, (3) excessive fatigue, (4) overly intense training loads, (5) lack of training discipline, (6) violation of rules, (7) interactions with teammates or opponents, (8) substandard training facilities, (9) climate or temperature conditions, (10) technical errors, (11) lack of knowledge about sports injuries, (12) poor training management or coaching mistakes, (13) inappropriate sports equipment or attire, and (14) impaired physical condition and coordination.

Training injuries primarily occur during the specific preparation and pre-competition phases. This is due to the high-intensity anaerobic training typically performed by athletes under the guidance of coaches during these phases. According to (Hidayat & Haryanto, 2022), the combination of physical and technical training during this period is characterized by high intensity, allowing athletes to adapt to pre-competition training, which further reduces their performance in the actual competition. Throughout this phase, frequent physical contact during training includes punches, kicks, evasive maneuvers, and other techniques, significantly increasing the athlete's risk of injury.

In the competitive category, injuries to the lower extremities are more common due to the predominant use of lower extremity techniques such as kicks, scissoring movements, and other basic leg-based techniques in pencak silat. This pattern aligns with previous research showing that the nature of pencak silat techniques makes athletes more likely to have a higher risk of injury to the lower extremities than to the upper extremities.

There are several limitations to this study that need to be considered. The

cross-sectional approach provides only a snapshot of the situation, so it cannot explain cause-and-effect relationships. The purposive sampling technique also means that the results may not fully represent all pencak silat athletes. In addition, because the information was based on self-reports, there is a chance that some athletes might have forgotten or misjudged certain details about their injuries

CONCLUSION

Pencak silat athletes are highly susceptible to both acute and chronic injuries, with the lower extremities being the most vulnerable area due to the dynamic nature of the sport and the frequent impacts. Repetitive technical movements, including punches, blocks, and evasive movements, increase the risk of overuse injuries, which can significantly impact long-term performance and the longevity of an athlete's career. Therefore, injury prevention efforts should be prioritized through a variety of approaches and methods. Implementing and practicing a structured and specific warm-up to support pencak silat movements can improve muscle readiness and flexibility, thereby reducing the likelihood of injuries such as sprains and strains. Furthermore, comprehensive injury education programs as well as other preventative measures should be integrated into training programs and accepted by athletes and coaches to ensure a shared awareness of risk factors and encourage early detection of injuries. Furthermore, refining technical skills through appropriate coaching and biomechanical assessments can minimize the risk of unnecessary injury to vulnerable body parts, ensuring more efficient and injury-resistant movements. By paying attention to these aspects, the overall burden and risk of injury in pencak silat can be reduced, thus enabling athletes to perform optimally while maintaining long-term physical health.

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