



Profile of the Flexibility of PPLM Martial Arts Athletes

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Abstract

Flexibility is an essential component of physical fitness that plays a crucial role in supporting performance and preventing injuries in martial arts athletes. This study aimed to determine the flexibility profile of martial arts athletes at the Student Training and Education Center (PPLM) Jakarta. This research employed a quantitative descriptive method with a survey approach. The subjects consisted of 20 martial arts athletes from taekwondo, pencak silat, and karate. The instruments used were the Sit and Reach Test to measure lower body flexibility and the Shoulder Flexibility Test (Back Scratch Test) to assess right and left shoulder flexibility. Data were analyzed using descriptive statistics. The results showed that the average lower body flexibility was 23.4 cm, categorized as moderate. Meanwhile, upper body flexibility showed average values of 3.1 cm for the right shoulder and 2.8 cm for the left shoulder, both categorized as high. In conclusion, the flexibility profile of PPLM Jakarta martial arts athletes is generally good, with upper body flexibility being more dominant than lower body flexibility. These findings indicate the need for a more balanced flexibility training program to optimize performance and reduce injury risk.



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Introduction

Flexibility is one of the key components of physical fitness that plays a vital role in supporting an athlete's performance. According to (Maksum, 2007) in his book, there are ten components of physical fitness: strength, endurance, muscular power, speed, flexibility, agility, coordination, balance, accuracy, and reaction time. In the context of martial arts, flexibility is key to successfully executing various techniques, such as kicks, strikes, evasion, and grappling. The ability of joints and muscles to move through a wide range of motion allows athletes to perform techniques efficiently and reduces the risk of muscle and joint injuries. Therefore, optimal flexibility is an essential requirement in athlete development, particularly in martial arts, which demand speed, strength, and fluidity of movement simultaneously.

According to (Alim, 2015), flexibility training is crucial for supporting athletic performance because flexibility significantly influences other biomotor components. Good flexibility not only contributes to the effectiveness of movements but also to injury prevention. Athletes with low flexibility are more prone to muscle strain, restricted movement, and reduced biomechanical efficiency. In martial arts, the dynamic nature of competition demands that athletes make rapid and extreme positional changes. Therefore, assessing athletes' flexibility levels is a strategic step in optimizing performance and maintaining athletes' physical health during both training and competition.

Physiologically, flexibility is influenced by several factors, such as joint structure, muscle and tendon elasticity, age, gender, and training habits. Training programs that do not systematically incorporate stretching exercises can hinder the development of flexibility. In the context of training at PPLM Jakarta, athletes generally focus on strength, speed, and technique training, while flexibility training is often treated as a supplementary component. According to (Bhakti & Adi S, 2022), physical conditioning training is a crucial factor in the development process for achieving maximum training goals—of course, through systematic and continuous development—so that the training performed by athletes can be optimized. Physical ability is closely related to foot speed, core strength, eye-foot coordination, and lower-body muscle strength, all of which influence an athlete's performance both during training and competition (Adityatama, 2017). This situation highlights the need to evaluate the current level of athletes' flexibility so that training programs can be refined to be more balanced and

data-driven. The systematic development of such programs must be carried out by individuals competent in their respective fields (Gery et al., 2025)

Research on the flexibility profiles of martial arts athletes also holds high scientific relevance in the field of sports science, particularly within the disciplines of exercise physiology and biomechanics (Suharno, 2021). Several previous studies (Nurjaya, 2023) have shown that flexibility plays a significant role in the effectiveness of martial arts techniques such as high kicks and body rotation movements. However, most of these studies have only examined the effects of training on flexibility; few have mapped the actual flexibility profiles of athletes based on standardized tests such as the Sit and Reach Test and the Shoulder Flexibility Test. Therefore, this study aims to fill this gap by presenting comprehensive data on the flexibility profiles of martial arts athletes at the Jakarta Student Education and Training Center (PPLM).

Research that specifically maps the flexibility profiles of martial arts athletes based on empirical data within a student training environment, such as the Jakarta Student Education and Training Center (PPLM), remains very limited. Effective and efficient movement can be supported by good biomotor abilities (Saleh et al., 2022). One factor that supports kicking accuracy is flexibility (Rozikin & Hidayah, 2015). Research by (Suharno, 2021) shows that improving flexibility through static stretching exercises over six weeks has a positive impact on the effectiveness of kicking techniques in taekwondo athletes. Meanwhile, (Nurjaya, 2023) emphasizes that flexibility has a strong relationship with coordination and reaction speed in pencak silat athletes. (Prabowo et al., 2024) add that different types of stretching exercises have varying effects on improving flexibility, with dynamic stretching yielding more significant results than static stretching in the context of martial arts. Athletes with high flexibility have a 25% lower risk of muscle injury compared to athletes with low flexibility.

According to (Baechle, T. R., & Earle, 2016), flexibility is the ability of a joint to move through its full range of motion without significant restriction, thereby enabling a person to perform movements efficiently and effectively. In martial arts such as taekwondo, pencak silat, or karate, flexibility plays a direct role in executing techniques like kicks, evasion maneuvers, and blocks, which require high mobility in the hip, shoulder, and lower back joints. Athletes with good flexibility have biomechanical advantages, including energy efficiency, a wide range of motion, and

a lower risk of injury during both training and competition.

For example, in martial arts such as taekwondo, pencak silat, karate, judo, and wushu, flexibility plays a key role in the effectiveness of techniques. Movements such as high kicks, evasion, or blocks require the hip, lower back, and shoulder joints to move to their fullest extent. Flexibility also affects coordination, balance, and speed of movement. Athletes with low flexibility will struggle to perform techniques that require extreme body rotation, while athletes with optimal flexibility can reduce the risk of injury due to muscle strain or sudden movements. Therefore, flexibility assessment is part of the basic physical condition evaluation in martial arts athlete training. According to (Medicine, 2020) flexibility measurements are conducted to assess the degree of joint and muscle flexibility in centimeters. The two most commonly used measurement tools are the Sit and Reach Test—which measures lower back and hamstring flexibility—and the Shoulder Flexibility Test (Back Scratch Test)—which measures right and left shoulder flexibility. These tests have high reliability and validity and are easy to apply across various age groups and sports.

This study is based on the framework that flexibility is the result of the interaction between biological factors (muscle and joint structure), training factors (frequency and intensity), and sport-specific characteristics. By using the Sit and Reach Test and the Shoulder Flexibility Test, empirical data were obtained regarding the upper and lower body flexibility of PPLM Jakarta martial arts athletes. The physical literacy framework serves as an integrative approach capable of unifying the physical, cognitive, and affective domains (Awal, 2025). The data will be analyzed descriptively to develop a flexibility profile for the athletes, which will serve as the basis for scientifically grounded training planning. The research roadmap for this study was developed in accordance with the 2025–2030 research priorities of the Faculty of Sports Science and Health at UNJ, specifically the development of sports science based on physiological data and athlete performance. This study falls under the cluster “Measurement of Physical Condition and Athlete Performance Development.” Furthermore, this research aligns with the strategic direction of the Jakarta State University Research Master Plan (RIP) for 2025–2030, namely the strengthening of research based on competitive advantages in the fields of education and sports. This research supports one of the main pillars of the UNJ RIP, namely “Sport Science and Technology for Human Performance Enhancement,” with the ultimate goal of

producing a scientifically grounded model for athlete development.

Methods

This study employs a quantitative descriptive method using a survey approach, aiming to describe the flexibility profile of martial arts athletes at the Jakarta Student Education and Training Center (PPLM) based on physical fitness measurements without any intervention (treatment). According to (Sugiyono, 2022) quantitative descriptive research is used to objectively describe a phenomenon through numerical data that can be statistically analyzed. This approach was chosen because it aligns with the study's objective, which is to obtain an empirical picture of the athletes' upper- and lower-body flexibility levels as a basis for evaluating training programs. The study was conducted using a field survey approach with standardized measurement instruments that had been tested for validity and reliability. The research took place on Wednesday, September 10, 2025, at the Sports Hall of the Faculty of Sports Science and Health (FIKK), Jakarta State University. The timing was chosen based on the athletes' regular training schedules to avoid disrupting ongoing training activities.

The population for this study consisted of all martial arts athletes affiliated with the Jakarta PPLM in 2025, representing the sports of taekwondo, pencak silat, and karate. The study sample comprised 20 athletes, selected using total sampling, given the relatively small and homogeneous population. The instruments used in this study included the Sit and Reach Test, to measure lower back and hamstring flexibility, and the Shoulder Flexibility Test (Back Scratch Test), to measure right and left shoulder flexibility. Both tests were conducted according to the standard procedures of the American College of Sports (Medicine, 2020). The measurement results were recorded in centimeters (cm) and subsequently analyzed descriptively.

The flexibility measurement data were analyzed using descriptive statistics with the aid of IBM SPSS Statistics software, version 26. The analysis was conducted to describe the athletes' flexibility characteristics based on the results of each instrument. The descriptive statistics calculated included: sample size (n); mean; standard deviation; minimum value; and maximum value.

Next, the measurement results were classified into flexibility level categories based on the interpretation norms used as a reference in the study, resulting in categories such as high, moderate, or low. The analysis results were then presented

in the form of descriptive statistical distribution tables and graphs to facilitate the interpretation of the flexibility profiles of the PPLM Jakarta athletes. The analysis was conducted descriptively without hypothesis testing because the purpose of the study was to describe the actual flexibility status of the athletes, not to test relationships or influences between variables. This aligns with the study's objective of mapping the athletes' flexibility profiles based on the results of the Sit and Reach Test and the Shoulder Flexibility Test (Back Scratch Test).

Results

This study was conducted on September 10, 2025, at the Jakarta Student Education and Training Center (PPLM), located at the POPKI Sports Hall in Cibubur. The research subjects were 20 martial arts athletes representing three sports: taekwondo, pencak silat, and karate. The primary objective of this study was to describe the upper and lower body flexibility profiles of PPLM Jakarta athletes using two standard tests: the Sit and Reach Test and the Shoulder Flexibility Test (Back Scratch Test).

Data collection was conducted with the assistance of coaches from each sport and supervisors from the Faculty of Sports Science and Health (FIKK UNJ). All test procedures followed the guidelines of the American College of Sports Medicine (Medicine, 2020) to ensure the validity and reliability of the measurement results.

Table 1.1 Flexibility Measurement Results for Martial Arts Athletes at PPLM Jakarta

Types of Tests	n	Mean	SD	Min	Max	Dominant Category
Sit and Reach (cm)	20	23.4	4.8	14	33	Medium
Back Scratch (Kanan) (cm)	20	3.1	3.0	-1	8	High
Back Scratch (Kiri) (cm)	20	2.8	3.0	-2	7	High

Flexibility measurement data were obtained from two main instruments: the Sit and Reach Test (for the lower body) and the Back Scratch Test (for the upper body). The following are the results of the descriptive statistical analysis of 20 PPLM martial arts athletes.

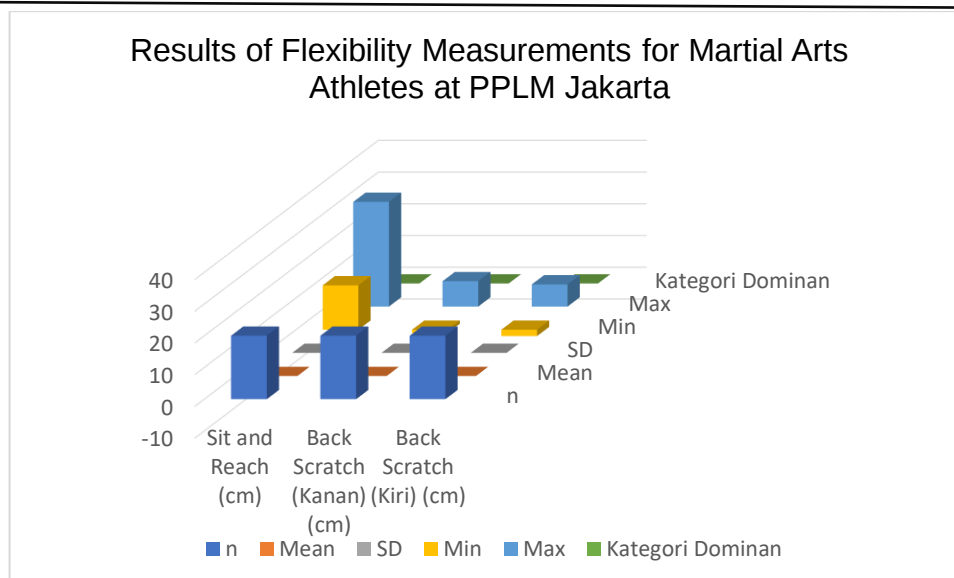


Figure 1. Graph of Flexibility Measurement Results for PPLM Jakarta Martial Arts Students

Based on the graph above, it can be seen that lower-body flexibility has an average value of 23.4 cm, which falls into the moderate category. Meanwhile, upper-body flexibility—for both the right and left shoulders—shows average values of 3.1 cm and 2.8 cm, respectively, which are categorized as high.

Discussion

The results of the study show that upper-body flexibility is better than lower-body flexibility, which means that the current training program for PPLM Jakarta athletes places greater emphasis on the shoulder and upper back muscles. This is consistent with the characteristics of martial arts, which involve a great deal of arm movement, shoulder rotation, and blocking techniques. However, lower-body flexibility, which is still in the moderate category, requires special attention, as flexibility in the hamstrings and hips is crucial for achieving height and speed in kicks.

This study supports the findings (Suharno, 2021) which states that martial arts training can improve shoulder flexibility through repetitive movements involving rotation of the upper body joints. These findings are also consistent with research (Nurjaya, 2023) which found that increased shoulder flexibility has a positive impact on the effectiveness of offensive and defensive movements in pencak silat.

From a physiological perspective, flexibility is influenced by muscle elasticity, muscle temperature, and a routine stretching regimen. Based on field observations, some PPLM Jakarta athletes warm up with dynamic stretching before practice, but the frequency of independent flexibility training remains low. This may be the reason

why lower-body flexibility is not as optimal as upper-body flexibility.

The results of this study have practical implications for coaches and administrators at PPLM Jakarta:

1. A structured flexibility training program should be implemented, with a balanced proportion of static and dynamic stretching exercises for both the upper and lower body.
2. Mapping flexibility results can serve as the basis for individual evaluations of each athlete to adjust training loads and prevent injuries.
3. These flexibility profile data can be used as the basis for developing a flexibility training model in follow-up research next year under the FIKK UNJ research development program.

This study has several limitations that should be noted:

1. The sample size was relatively small (20 athletes), so the results do not yet represent all martial arts athletes in DKI Jakarta.
2. Factors such as age, gender, and sport discipline were not analyzed in depth due to data limitations.
4. This study is descriptive in nature; therefore, it has not analyzed the cause-and-effect relationship between flexibility and technical performance.

Nevertheless, this study still makes a significant contribution by providing baseline data on the flexibility profiles of PPLM Jakarta martial arts athletes as a reference for the development of training models in the future.

Conclusion

Based on the research findings, data analysis, and discussion, several conclusions can be drawn: the lower-body flexibility profile of PPLM Jakarta martial arts athletes, as measured by the Sit and Reach Test, showed an average value of 23.4 cm, falling into the moderate category. Meanwhile, the upper-body flexibility profile of PPLM Jakarta martial arts athletes, as measured by the Shoulder Flexibility Test (Back Scratch Test), showed an average value of 3.1 cm for the right shoulder and 2.8 cm for the left shoulder, both of which fall into the high category. Overall, the flexibility profile of PPLM Jakarta athletes falls into the “good” category, with upper-body flexibility tending to be higher than lower-body flexibility. This indicates the need for a balanced training regimen between the upper and lower body to optimize movement performance in martial arts.

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