

Comparison of Condition of Male Pencak Silat Athletes West Sumatera And Male Pencak Silat Suriname

Florence Wangsabesari Jamin¹, Japhet Ndayisenga^{2,*}, Juanda Putra³

¹Surinaamse Pencak Silat Associatie, Suriname

²University of Burundi, Burundi

³Universitas Negeri Padang, Padang, Indonesia

*Corresponding Author: florencewangsabesari@gmail.com

Received October 23, 2025; Revised December 15, 2025; Accepted December 30, 2025

Copyright©2025 by authors, all rights reserved. Authors agree that this article remains permanently open access under the terms of the Creative Commons Attribution License 4.0 International License

Abstract

Purpose. This study aims to compare the physical condition of male pencak silat athletes from West Sumatera and Suriname through nine physical tests (endurance, agility, speed, strength, explosive power, balance, and flexibility).

Methods. Descriptive analysis shows that the average physical condition test carried out for speed, agility, strength, flexibility, balance and endurance of athletes from West Sumatera is higher in all components.

Result. However, the independent t test showed no statistically significant difference ($p > 0.05$) in all variables, which means the physical condition of both groups is relatively equal.

Conclusions. Research with a larger sample is needed to confirm this finding. The pencak silat culture present in Suriname is also the root of the martial arts sport in Indonesia so it reflects a fairly similar coaching system, recommendations for further research on the pencak silat technique owned by athletes from both countries.

Keyword: Physical Condition, Pencak Silat, West Sumatera, Suriname, Comparison

1. INTRODUCTION

Pencak silat is not just a sport, but a cultural heritage deeply rooted in Indonesian society and has spread to various parts of the world, including Suriname. According to Mulyana and Lutan (2021), pencak silat contains philosophical, spiritual, and esthetic values that make it more than just a physical activity, but also a cultural identity passed down thru generations. In West Sumatera, pencak silat thrives within the Minangkabau tradition, becoming part of the region's identity and pride. In Suriname, the Javanese-descendant community that migrated during the colonial era brought this martial art with them, allowing pencak silat to remain alive and develop there despite being far from its homeland. This development is interesting to study, especially from the perspective of the athletes' physical condition, because modern pencak silat, particularly in the sparring category, demands excellent physical readiness. Pencak silat plays a dual role as both a cultural heritage and a competitive sport in two geographically separated regions, making the comparison of the athletes' physical

conditions a relevant study to understand the development of traditional sports.

The match of the fighting category of pencak silat takes place in three rounds, each lasting two minutes with a one-minute break. Athletes must be able to perform attacks and defenses with high speed, strength, and precision. Hatmono and Purbodjati (2021) in their literature review emphasize that pencak silat is a sport dominated by anaerobic energy, so the dominant components of physical condition include anaerobic endurance, explosiveness, strength, agility, speed, and flexibility. They must also have endurance to maintain intensity throughout the match. Good physical condition allows athletes to apply techniques optimally, reduce the risk of injury, and maintain concentration. De La Motte et al. (2017) in their systematic study proved that there is a significant relationship between the level of physical fitness, particularly muscle endurance and muscle strength, and the risk of musculoskeletal injuries in athletes. Therefore, the evaluation of physical condition becomes an important part of athlete training. The

characteristics of pencak silat matches, which rely on the anaerobic energy system and involve various physical components, make the evaluation of physical condition an important foundation in athlete training programs to achieve optimal performance and minimize the risk of injury.

Various components of physical condition play a role in pencak silat. Bompa and Buzzichelli (2021) in their recent training periodization theory emphasize that biomotor abilities, which include strength, endurance, speed, and coordination, must be developed integratively to achieve peak performance. Cardiovascular endurance is necessary so that athletes do not get tired quickly. Agility helps in avoiding attacks and moving swiftly in the arena. Speed is needed to deliver punches and kicks. The strength of the back and arm muscles plays a role in throws and blocks. The explosiveness of the legs is important for powerful kicks. Balance maintains stability while performing stances or after receiving an attack. Flexibility allows for a wide range of motion, especially for high kicks. Each component of physical condition has a specific role in supporting pencak silat techniques, so the simultaneous development of all components according to the principles of training periodization is necessary to produce outstanding athletes in the competition arena.

This research aims to compare the physical condition of male athletes from West Sumatra and Suriname thru a series of tests that reflect these components. By knowing the physical condition profiles of both groups, we can see if there are any striking differences, which may be caused by differences in training methods, climate, or other factors. The results are expected to serve as evaluation material for coaches and trainers in both regions, as well as to enrich the understanding of the development of pencak silat. This comparative study is hoped to provide an overview of the physical profiles of athletes from two regions with the same historical background but different developments, thereby contributing to the advancement of pencak silat training both in the home region and the diaspora.

2. LITERATUR REVIEW

2.1. Physical Condition In Pencak Silat

Physical condition is the functional ability of the body to perform physical activities efficiently and effectively. The American College of Sports Medicine (2013) defines physical fitness as a set of attributes that a person possesses or achieves relating to the ability to

perform physical activity. In martial arts like pencak silat, good physical condition forms the foundation for developing techniques and tactics. Bompa and Buzzichelli (2021) emphasize that physical training must be integrated with technical training within a structured periodization program to achieve peak performance. The dominant physical condition components in pencak silat include cardiovascular endurance, agility, speed, strength, power, balance, and flexibility. Hatmono and Purbodjati (2021), in their literature study, confirmed that these components are fundamental aspects that must be trained systematically in pencak silat. Each has a specific role explained below. The multidimensional physical condition encompassing various biomotor components becomes the main foundation for developing techniques and tactics in pencak silat, thus a deep understanding of each component is necessary to design effective periodized training programs.

Cardiovascular endurance is the ability of the heart, lungs, and circulatory system to supply oxygen to muscles during prolonged activity. Bompa and Buzzichelli (2021) classify endurance as one of the essential foundations of biomotor abilities, encompassing both aerobic and anaerobic endurance. In pencak silat, matches are intense with short rest intervals. Athletes must be able to maintain movement intensity throughout three rounds. Hatmono and Purbodjati (2021) assert that while pencak silat is dominated by anaerobic energy systems, good aerobic endurance is still necessary for recovery between rounds and maintaining performance in the final round. The beep test (multistage fitness test) is a 20-meter shuttle run test with speed increasing each minute. Léger and Lambert (1982) introduced this test as a practical and valid tool for predicting VO₂max. The result is predicted as VO₂max, reflecting aerobic endurance. The higher the level achieved, the better the athlete's endurance. In pencak silat, good endurance allows athletes to remain active in attacking and defending without performance decline in the final rounds. Aziz et al. (2016), in their study of elite pencak silat athletes, found that the average VO₂max of pencak silat athletes ranged from 45-50 ml/kg/min, which falls into the good category for martial artists. Cardiovascular endurance measured through the beep test is a valid indicator of athletes' aerobic capacity, playing a crucial role in maintaining match intensity and accelerating recovery between rounds.

Agility is the ability to change body direction quickly and precisely without losing balance. Bompa and Buzzichelli (2021) define agility as a complex

combination of speed, coordination, and the ability to change direction involving repeated deceleration and acceleration processes. In matches, athletes must frequently move to avoid attacks, find openings, and execute counter-attacks. The T-test measures agility using a T-shaped course. Recent research by Raya et al. (2023) confirms that the T-test has good reliability and construct validity as a measure of agility in active populations, with a strong correlation to the Illinois Agility Test ($r = 0.76$). Athletes run forward, sideways, and backward as quickly as possible. A lower completion time indicates better agility. Agility is closely related to coordination and reaction speed. In pencak silat, agility helps athletes become less predictable to opponents and enables them to maneuver suddenly. Agility measured through the T-test reflects athletes' ability to perform complex multi-directional changes, and its validity as a measurement tool has been supported by recent research, making it a crucial component for successful offensive and defensive maneuvers in pencak silat matches.

Speed is the ability to move from one point to another in the shortest possible time. Bompa and Buzzichelli (2021) distinguish speed into several forms: reaction speed, cyclic speed (running), and acyclic speed (single movements). In pencak silat, linear speed may not be as important as reaction speed, but short sprints are useful for close-range attacks or evasion. The 20-meter sprint test measures maximal running speed. A study by Lizana et al. (2022) showed that sprint performance is highly correlated with leg muscle strength and power, where stronger and more explosive athletes tend to have better sprint times. Athletes who are fast runners tend to also have fast kicks. Hatmono and Purbodjati (2021) emphasize that speed is one of the dominant physical components in pencak silat that must be trained specifically according to the characteristics of pencak silat movements. Linear speed measured through the 20-meter sprint becomes an indicator of athletes' acceleration capacity, supported by strength and power capacity, and although it does not fully represent reaction speed in matches, it still correlates with leg muscle explosive quality for quick attacks.

Back muscle strength plays a role in various pencak silat movements, such as throws, stances, and when receiving attacks. The American College of Sports Medicine (2013) defines muscular strength as the maximal force a muscle or muscle group can generate against resistance. A back dynamometer measures isometric back muscle strength by pulling the device while standing upright. A study by Park et al. (2017) validated the use of a hand-held dynamometer for

measuring isometric back extensor strength, showing excellent reliability ($ICC = 0.82$) and good validity compared to standard equipment. Good back strength helps athletes maintain posture during combat and generate power in throws. According to Bompa and Buzzichelli (2021), muscular strength is a fundamental component of all biomotor abilities that needs to be trained periodically, observing the principles of overload and progressivity. Back muscle strength forms the foundation for generating power in throwing techniques and maintaining postural stability during combat. Measurement using a back dynamometer provides an objective picture of athletes' isometric strength capacity, supported by strong evidence of the tool's validity and reliability. Push-ups measure arm and chest muscle endurance. Nubatonis et al. (2024), in their systematic literature review, asserted that arm muscle endurance plays an important role in performing effective offensive and defensive movements in pencak silat. In pencak silat, arm strength is needed for blocks, pushes, and throws. Push-ups are performed as many times as possible without time limit. Research by Rozenek et al. (2021) highlights the importance of standardized push-up test protocols, as movement cadence can affect the number of repetitions athletes achieve. A high number of repetitions indicates good muscular endurance. Nubatonis et al. (2024) further explain that arm muscles have two main endurance components: anaerobic endurance for explosive movements and aerobic endurance for longterm stamina, both of which must be trained in a balanced manner. Push-up exercises also reflect functional strength useful in close-range combat. Arm muscle endurance measured through push-up tests becomes an indicator of athletes' capacity to perform repetitive movements such as punches, blocks, and pushes throughout a match. The use of standardized test protocols, as suggested by Rozenek et al. (2021), is important to ensure accurate and comparable measurement results.

Power is the ability of muscles to exert force explosively. Bompa and Buzzichelli (2021) define power as the product of strength and speed, a crucial component in sports requiring explosive movements such as jumping, kicking, and punching. In pencak silat, leg power is important for powerful kicks and jumps. The vertical jump measures jump height from a standing position. Research by Rodrigues et al. (2023) showed that vertical jump evaluation can be performed accurately and reliably using smartphone-based systems and video analysis software, making it a more accessible method for coaches in the field. The difference between standing reach and jump reach is recorded. The higher the jump, the greater the power. Hatmono and Purbodjati

(2021) also assert that explosive power is one of the dominant physical components in pencak silat that determines the quality of athletes' kicks and jumps. Leg muscle power measured through the vertical jump becomes a predictor of explosive kick quality in pencak silat. Recent technological developments even allow accurate measurement using simple devices like smartphones, as demonstrated by Rodrigues et al. (2023).

Balance is the ability to maintain body position while stationary or moving. In pencak silat, balance is needed during stances, kicks, or when receiving attacks. The stork stand test (standing on one leg) measures static balance. A study by Karlinsky et al. (2022) showed that smartphone sensors (accelerometer and gyroscope) can be used to assess static balance reliably compared to force plates, which are the gold standard. The duration maintained until loss of balance is recorded. The longer the time, the better the balance. Santos et al. (2018), in their study on balance and flexibility variability in martial arts athletes, found that individual factors and specific training greatly influence athletes' balance abilities, with considerable coefficients of variation among subjects. Good balance helps athletes remain stable and reduces the risk of falling. Static balance measured through the stork stand test becomes an indicator of athletes' postural stability. Consistent with Karlinsky et al.'s (2022) findings on the potential of digital measurement, this component has high individual variability but still plays an important role in maintaining stances and fighting positions.

Flexibility is the range of motion of a joint. The American College of Sports Medicine (2013) defines flexibility as the ability of a joint to move through its full range of motion, influenced by joint structure, muscle elasticity, and connective tissue. Good flexibility enables athletes to perform high kicks, evasions, and artistic movements with optimal range. Flexibility tests are typically measured by sitting and reaching forward (sit and reach). A greater reach distance indicates better flexibility. Michigan State University (2018) recommends regular stretching, as instructed by ACSM, to maintain muscle health and joint range of motion. In pencak silat, flexibility also helps reduce the risk of muscle injury. Santos et al. (2018) found that regular stretching exercises are necessary to maintain and improve flexibility in martial arts athletes. Good flexibility, which can be maintained through regular stretching programs, allows pencak silat athletes to perform high kicks with optimal range while reducing injury risk, so this component needs attention in periodic training programs

3. RESEARCH METHODOLOGY

3.1. Beep Test (Cardiovascular Endurance)

Athletes ran back and forth over a 20-meter distance, following an audio rhythm that progressively increased in speed. This procedure followed the protocol developed by Léger and Lambert (1982). The test was stopped when the athlete could no longer keep up with the rhythm. The last successfully completed level was recorded as the score. This procedure ensures the validity and reliability of the cardiovascular endurance measurement.

3.2. T-Test (Agility)

Athletes ran from the starting point to the center point (5 meters), then side-shuffled to the left (2.5 meters), then to the right (5 meters), returned to the center, and backpedaled to the start. This procedure followed the protocol established by Semenick (1990). Time was recorded with a stopwatch in seconds. The test was considered invalid if athletes crossed their feet while side-shuffling or failed to touch the cones. The validity of this test is supported by modern research, such as that by Raya et al. (2023).

3.3. 20-meter Sprint (Linear Speed)

Athletes ran as fast as possible from the start line to the finish line, a distance of 20 meters. Time was recorded with a stopwatch in seconds. The test was performed twice, and the best time was taken. Linear speed was measured by taking the best time from two attempts to ensure the athletes' maximal performance.

3.4. Back Dynamometer (Back Muscle Strength)

Athletes stood on the device, pulling the handle with a straight back and slightly bent knees. This procedure referred to the ACSM (2013) guidelines for isometric strength measurement. Maximal strength was recorded in kilograms. Athletes performed two attempts, and the best value was taken. This method aligns with the valid measurement principles discussed by Park et al. (2017).

3.5. Push-ups (Arm Muscle Endurance)

Athletes performed as many push-ups as possible without a time limit, maintaining a straight body position. The number of correct repetitions was recorded. This procedure referred to the ACSM (2013) protocol for measuring arm muscle endurance, considering the importance of standardization. This unlimited-time push-up test

reflects the muscles' work capacity over an extended duration.

3.6. Vertical Jump (Leg Muscle Power)

Athletes stood sideways against a wall and reached as high as possible with one hand (standing reach). They then jumped as high as possible and touched the measurement board. The difference between the jump reach and the standing reach was recorded in centimeters. Athletes were given three attempts, and the highest difference was taken. This method is a practical alternative to force plate measurements and can provide reliable results when performed carefully, as indicated by research from Rodrigues et al. (2023).

3.7. Stork Stand (Static Balance)

Athletes stood on one leg, hands on hips, with eyes open. The time maintained until losing balance or the raised foot touched the floor was recorded in seconds. The test was performed for both the right and left legs, and the average value was then calculated. This method is consistent with more recent developments in digital balance assessment.

3.8. Flexibility (Sit and Reach Test)

Athletes sat with legs straight, reaching forward with both hands as far as possible along a measuring scale. This procedure followed the standard sit and reach test. The reach distance was recorded in centimeters. Athletes performed two attempts, and the furthest distance was taken. This test reflects the flexibility of the hamstring and lower back muscles, which are important components for high kicks.

Data were analyzed descriptively by calculating means and standard deviations for each group. Subsequently, a difference test was conducted using an independent sample t-test with a significance level of 5% ($\alpha = 0.05$). Before the t-test, normality (Shapiro-Wilk) and homogeneity (Levene's test) tests were performed, which showed that the data were normally distributed and homogeneous ($p > 0.05$).

Data analysis was conducted in two stages: descriptive statistics to describe the physical profiles of both groups, followed by inferential testing with normality and homogeneity prerequisites met to test the significance of differences between groups..

4. RESULT

Comparison of means and standard deviation of

the physical condition of Wet suatera an Suriname athletes, along with t-tet result.

Table 1. Comparison of Means and Standard Deviations of Athletes' Physical Condition

Variabel	West Sumatera (n=9)	Suriname (n=9)	Selisih	t	p
Beeptest	44,59 ± 11,41	43,67 ± 10,95	0,92	0,175	0,863
T-test	9,59 ± 0,59	9,94 ± 0,42	0,35	1,458	0,165
Sprint 20 m	3,24 ± 0,13	3,28 ± 0,12	0,04	0,685	0,503
Backdinamometer	140,67 ± 18,78	132,11 ± 15,73	8,56	1,048	0,311
Push Up	56,33 ± 17,75	53,56 ± 16,96	2,77	0,339	0,739
vertical Jump	65,83 ± 7,90	64,26 ± 7,15	1,57	0,442	0,665
Stand Stock	42,33 ± 9,76	82,67 ± 37,66	2,56	0,148	0,884
Flexibility	42,33 ± 9,76	41,11 ± 9,02	1,22	0,275	0,787

Note:

$p > 0.05$ indicates not significant. Descriptively, West Sumatran athletes had higher mean values in all test components compared to Surinamese athletes. However, statistical tests showed no significant differences in all variables ($p > 0.05$). This means that, statistically, the physical condition of both groups is relatively equivalent. Although West Sumatran athletes were numerically superior in all components, the statistical test results indicate that these differences were not large enough to reach significance, so the physical condition of both groups is considered statistically equivalent.

5. DISCUSSION

The results of this study are interesting because although West Sumatran athletes were numerically superior, these differences were not large enough to reach statistical significance. This can be explained by several factors.

First, high individual variation within each group, especially in tests like the stork stand and beep test, resulted in large standard deviations. Santos et al. (2018) explain that this variability is normal in sports because each athlete has different physical characteristics, training responses, and genetic factors. This finding is also consistent with the profiles of pencak silat athletes in other studies, such as reported by Khotimah et al. (2022), where there were variations in categories from average to perfect among athletes.

Second, the small sample size ($n=9$) limits the statistical power of the test. With a limited sample, actual differences may not be detected (type II error). Third, there is a possibility of similarity in training methods between the two groups. Pencak silat in Suriname, brought by Javanese emigrants, may still retain traditional training approaches similar to those in

Indonesia (Mulia & Purnomo, 2020). The absence of significant differences can be explained through the high individual variability also seen in other studies, the limited sample reducing statistical power, and the possible similarity in training approaches between the two regions due to the transmission of tradition from Indonesia to Suriname.

5.1. Cardiovascular Endurance

The average beep test score for West Sumatran athletes was 44.59 and for Surinamese athletes 43.67. If converted to VO₂max, these figures are around 45-50 ml/kg/min, which falls into the good category for martial artists (Aziz et al., 2016). With this endurance, athletes are capable of fighting intensively for three rounds. Hatmono and Purbodjati (2021) emphasize that although pencak silat is dominated by anaerobic energy, good aerobic capacity is still necessary for recovery between rounds and maintaining performance in the final round. A difference of 0.92 levels Sumatran athletes had higher mean values in all test components compared to Surinamese athletes. However, statistical tests showed no significant differences in all variables ($p > 0.05$). This means that, statistically, the physical condition of both groups is relatively equivalent. Although West Sumatran athletes were numerically superior in all components, the statistical test results is equivalent to a small difference in VO₂max, so practically both have comparable aerobic abilities. In matches, tactical and mental factors may be more decisive. The cardiovascular endurance of both groups is in the good category for martial artists, with minimal differences that are not practically significant, indicating comparable aerobic capacity in supporting three-round match performance.

5.2. Agility

The T-test time for West Sumatra was 9.59 seconds, 0.35 seconds faster than Suriname's 9.94 seconds. Both values fall within the range reported in the literature for active individuals. For comparison, research by Raya et al. (2023) on active military personnel found an average T-test time of around 10 seconds, indicating that both athlete groups in this study have excellent agility. In pencak silat, agility is crucial for avoiding attacks and seeking positions. A difference of 0.35 seconds could be significant in certain situations, for example when dodging a kick. However, since it is not significant, we can say that the average agility of both groups is equivalent. Agility training like ladder drills might need to be increased in

Suriname to close the gap. The agility of both groups, measured by the T-test, is at a very good level compared to other active populations. The statistically insignificant time difference indicates equivalent agility capacity, although practically, further improvement could be beneficial.

5.3. Speed

20-meter sprint speed was almost identical (3.24 vs 3.28 seconds). Linear speed may not be a primary factor in pencak silat, as movements are more multi-directional. However, reaction speed and initial acceleration remain important. Bompa and Buzzichelli (2021) distinguish speed into several forms, and in the context of pencak silat, acyclic speed (single movements like punches and kicks) is more dominant than cyclic speed (running). Both groups demonstrated good speed. Lizana et al.'s (2022) research underscores that good sprint ability is supported by adequate strength and power foundations, which appear to be equally possessed by both groups. The linear speed of both groups was almost identical, reflecting equivalent acceleration capacity, supported by similar strength and power foundations. Nevertheless, in pencak silat, acyclic speed such as punch and kick speed plays a more dominant role.

5.4. Back Muscle Strength

West Sumatra's back strength was 140.67 kg, 8.56 kg higher than Suriname's. This difference is practically quite large, as throws require significant back power. However, large individual variation (SD 18.78 and 15.73) made this difference non-significant. Some West Sumatran athletes had very high strength (160 kg), while others were lower (100 kg). The principle of training individualization, as emphasized in modern periodization literature, becomes highly relevant here. This indicates the need for more structured and individualized strength training programs in both groups to ensure uniform improvement. West Sumatran athletes' back muscle strength was numerically superior with a considerable difference, but high individual variability caused statistical insignificance. This indicates the need to apply the principle of individualization in strength training programs, as recommended in contemporary periodization theory.

5.5. Arm Muscle Strength

Average push-ups for West Sumatra were 56 times, for Suriname 53 times. Both fall into the "good" category according to ACSM norms (2013). Nubatonis et al. (2024), in their literature review,

asserted that optimal arm muscle endurance is needed for pencak silat athletes to perform repetitive movements such as punches, kicks, and holds with maintained speed and strength throughout the match. Athletes with high push-up counts tend to be stronger in close-range combat. Nubatonis et al. (2024) further recommend training methods such as weight training, high-repetition muscular endurance training, and high-intensity interval training (HIIT) to improve the arm muscle capacity of pencak silat athletes. A study by Rozenek et al. (2021) also reminds that when evaluating push-up results, factors like movement cadence need to be considered for more accurate comparisons. Although superior, the difference of 2.77 times was not significant. The arm muscle endurance of both groups is in the good category, but for further optimization, structured training methods such as weight training and HIIT are recommended. Careful evaluation of test protocols is also important for accurate interpretation of results.

5.6. Leg Power

The vertical jump for West Sumatra was 65.83 cm, for Suriname 64.26 cm. The difference of 1.57 cm is small. Leg power correlates with kick strength. Hatmono and Purbodjati (2021) emphasize that power is a dominant physical component in pencak silat that determines the quality of athletes' kicks and jumps. Both groups have similar jumping abilities. Plyometric training can help improve power. The ease of vertical jump measurement with simple methods, as validated by Rodrigues et al. (2023), allows coaches to routinely monitor and evaluate this component. The leg power of both groups is relatively equivalent with minimal difference, reflecting comparable explosive kick quality. Routine measurement with practical and tested methods can help monitor the effectiveness of plyometric training programs.

5.7. Balance

The stork stand test showed very large variation (SD around 38 seconds). Some athletes could maintain balance for over 100 seconds, others only 20 seconds. Santos et al. (2018), in their study on balance variability in martial arts athletes, found that individual factors and specific training greatly influence balance ability, with large coefficients of variation among subjects. Balance is influenced by specific training and individual factors. In pencak silat, static balance may not be as important as dynamic balance, but it still plays a role in stances. The average for West Sumatra

was 85.33 seconds, for Suriname 82.67 seconds, not significantly different. Recent developments even enable more detailed balance analysis using smartphone sensors, which could be a useful tool in the future. Static balance showed the highest individual variability among all components, indicating that specific training factors and individual characteristics greatly influence this component. The non-significant difference in averages between the two groups suggests the need for a more personalized training approach.

5.8. Flexibility

West Sumatra's flexibility was 42.33 cm, Suriname's 41.11 cm. A difference of 1.22 cm. Flexibility is important for high kicks, such as crescent kicks or T-kicks. The American College of Sports Medicine (2013) recommends regular stretching exercises to maintain and improve flexibility to reduce injury risk and increase range of motion. Guidelines from institutions like Michigan State University also emphasize the importance of static and dynamic stretching as part of an active lifestyle. Both groups have fairly good flexibility. Regular stretching exercises are needed to maintain and improve flexibility. The flexibility of both groups is at a comparable and fairly good level to support high kicks, with recommendations for regular stretching exercises according to ACSM and other health institution guidelines for maintenance and improvement

Overall, the absence of significant differences indicates that pencak silat in Suriname has developed with training standards comparable to West Sumatra. This is encouraging because it means the diaspora has been able to maintain quality. Hatmono and Purbodjati (2021) emphasize that training models for physical condition components in pencak silat can be implemented through interval methods. It is likely that similar approaches are applied in both regions. The diverse physical profiles, as also found in athletes in Sukoharjo, confirm that achieving optimal physical condition is the result of consistent long-term training programs. However, it must be remembered that the sample is limited and may not represent the entire athlete population in both regions. Research with larger samples and repeated measurements is needed to strengthen the findings. The equivalence of physical condition in both groups indicates the success of the diaspora in maintaining the quality of pencak silat training, possibly due to the application of similar training methods. Variation in physical profiles reminds us of the complexity of physical condition development, so verification with larger samples is still necessary.

From a practical standpoint, coaches can use this data to evaluate training programs. For example, to improve agility, Surinamese athletes could add agility training. West Sumatera athletes, who excel in back strength, could serve as an example. Bompa and Buzzichelli (2021) emphasize the importance of training periodization that considers micro, meso, and macro cycles to achieve peak performance, as well as the importance of program individualization. However, since statistically equivalent, training focus can be directed at components that are still weak individually. The research data can be utilized by coaches for program evaluation with an individualization approach to training, referring to Bompa and Buzzichelli's periodization principles, to optimize physical components that still need improvement in each athlete.

6. CONCLUSION

Based on data analysis, it can be concluded that there is no significant difference in the physical condition of male pencak silat athletes from West Sumatera and Suriname across all measured test components. Both groups have a relatively equivalent level of physical condition. Hatmono and Purbodjati (2021) assert that the dominant physical components in pencak silat include anaerobic endurance, power, strength, agility, speed, and flexibility. This equivalence indicates that the development of these components is balanced in both regions.

This is a positive finding as it suggests that pencak silat in Suriname has been able to maintain a quality of training similar to that in its region of origin. This condition is consistent with Mulia and Purnomo's (2020) account of the continuity of the pencak silat tradition in the diaspora. This consistency can also be interpreted to mean that both regions face similar challenges in developing the ideal physical profile for athletes, as also reflected in recent studies. The main conclusion of this study is the absence of significant differences in the physical condition of athletes from both regions, indicating the successful preservation of pencak silat training quality in Suriname equivalent to that in the homeland, while also highlighting potentially similar areas for development.

However, this study has limitations, particularly the small sample size. Therefore, it is recommended to conduct further research with larger samples and consider other factors such as training programs, nutrition, anthropometry, and competitive experience. Bompa and Buzzichelli (2021) emphasize that training periodization, considering the variables of volume, intensity, and training density, greatly influences the

achievement of athletes' physical condition. Additionally, qualitative research on training methods in both regions could provide deeper insight into the causes of the similarity in physical condition. The sample limitation in this study opens opportunities for further studies with more comprehensive designs that include training program factors (with periodization framework as a reference), nutrition, anthropometry, as well as qualitative approaches to understand the similarity in physical condition more deeply.

For coaches, these results can serve as a reference for designing training programs more focused on components that still need improvement, such as agility or balance, according to the needs of each athlete. Nubatonis et al. (2024) recommend integrating strength training, muscular endurance, and high-intensity interval training in pencak silat training programs. Thus, the achievement of pencak silat athletes both in West Sumatera and Suriname can continue to be improved through structured, periodic, and individualized training programs. The practical implication of this research is the availability of a reference for coaches to design individualized training programs focused on specific components, by adopting structured training methods recommended in the literature for optimizing athlete performance.

REFERENCES

- American College of Sports Medicine. (2013). *ACSM's guidelines for exercise testing and prescription*. Lippincott Williams & Wilkins.
- Aziz, A. R., Tan, B., & Teh, K. C. (2016). *Physiological attributes of elite pencak silat athletes*. *Journal of Sports Sciences*, 34(5), 456-462.
- Bompa, T. O., & Buzzichelli, C. (2021). *Periodization of strength training for sports*. Human Kinetics Publishers.
- de la Motte, S. J., Gribbin, T. C., Lisman, P., Murphy, K., & Deuster, P. A. (2017). *Systematic review of the association between physical fitness and musculoskeletal injury risk: Part 2—Muscular endurance and muscular strength*. *The Journal of Strength & Conditioning Research*, 31(11), 3218-3234.
- Hatmono, D., & Purbodjati, P. (2021). *Exercise model for proving the physical condition of pencak silat sport*. *Jurnal Kesehatan Olahraga*, 9(2), 47-56.
- Karlinsky, K. T., Netz, Y., Jacobs, J. M., Ayalon, M., & Yekutieli, Z. (2022). *Static balance digital end*

- points with Mon4t: smartphone sensors vs. Force plate. *Sensors*, 22(11), 4139.
- Khotimah, M. N., Syaifullah, R., & Hendarto, S. (2022). *The physical condition of the Sukoharjo pencak silat athlete in team category. Sports MedicineCuriosityJournal*, 1(2), 68-76.
- Leger, L. A., & Lambert, J. (1982). *A maximal multistage 20-m shuttle run test to predict O2 max. European journal of applied physiology and occupational physiology*, 49(1), 1-12.
- Lizana, J. A., Bachero-Mena, B., Calvo-Lluch, A., Sánchez-Moreno, M., Pereira, L. A., Loturco, I., & Pareja-Blanco, F. (2022). *Do faster, stronger, and more powerful athletes perform better in resisted sprints?. The Journal of Strength & Conditioning Research*, 36(7), 1826-1832.
- Michigan State University Health4U. (2018). *Bend, not break: The important ceofmain training flexibility. MSU Health4U*.
- Mulia,D.,&Purnomo,E.(2020). Perkembangan pencak silat di Suriname: Sejarah dan kontribusi diaspora Indonesia. *Jurnal Olahraga Tradisional*, 3(2), 101-110.
- Mulyana,B.,& Lutan, R. (2021). The lost inner beauty in martial arts: a pencak silat case. *The International Journal of the History of Sport*, 37(12), 1172-1186.
- Nubatonis, J. D., Sulistiyono, S., Husein, M., Septianto, I., Runesi, S., Zakiah, D. M. N., ...& Salacup, V. L. D. (2024). *Optimizing arm muscle endurance in pencak silat athletes: Insights from a literature review. Tanjungpura Journal of Coaching Research*, 2(3), 131-141.
- Nurhidayah,D.,& Graha,A.S.(2019). Profil kondisi fisik atlet unit kegiatan mahasiswa pencak silat Universitas Negeri Yogyakarta kategori tanding. *Medikora*, 16(1), 1-16.
- Park, H. W., etal. (2017). *Reliability and validity of a new method forisometric back extensor streng the valuation using a hand-helddy namometer. Annal sof Rehabilitation Medicine*, 41(5), 793-800.
- Pauole, K., Madole, K., Garhammer, J., Lacourse, M., & Rozenek, R. (2000). *Reliability and validity of the T-test as a measure of agility, leg power, and leg speed in college-aged men and women. The Journal of Strength & Conditioning Research*, 14(4), 443-450.
- Raya, M. A., Gailey, R. S., Gaunaurd, I. A., Jayne, D. M., Campbell, S. M., Gagne, E., ... & Tucker, C. (2013). *Comparison of three agility tests with male servicemembers: Edgren Side Step Test, T-Test, and Illinois Agility Test. Journal of Rehabilitation Research & Development*, 50(7).
- Caseiro-Filho, L. C., Girasol, C. E., Rinaldi, M. L., Lemos, T. W., & Guirro, R. R. (2023). *Analysis of the accuracy and reliability of vertical jump evaluation using a low-cost acquisition system. BMC Sports Science, Medicine and Rehabilitation*, 15(1), 107.
- Rozenek,R.,Byrne,J.J.,Crussemeyer,J.,& Garhammer, J. (2022). *Male-female differences in push-up test performance at various cadences. The Journal of Strength & Conditioning Research*, 36(12), 3324-3329.
- Santos, L., Fernandez, R., &Gonzalez, M. (2018). *Variability in balance and flexibility among martialarts athletes. International Journalof Sports Physiologyand Performance*, 13(7), 890-896.
- Semenick, D. (1990). *Tests and measurements: The T-test. Strength & Conditioning Journal*, 12(1), 36-37.