

Dominant Factors Of Pencak Silat Athletes In The Cempaka Putih Tulungagung Competition Category

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Article Info

Article history:

Accepted: 31 July 2026

Published: 17 Agustus 2026

Keywords:

Dominant Factor;

Physical Condition;

Martial arts;

Match Category.

Abstract

Pencak silat is a traditional Indonesian martial art that holds significant cultural, philosophical, and sporting value. The competition category in pencak silat is highly competitive as it involves direct interaction between athletes in dynamic, fast-paced, and stressful situations. The research question in this study is how physical condition contributes to the performance of pencak silat athletes in the competition category. The purpose of this study was to analyze the contribution of physical condition to the performance of pencak silat athletes in the competition category. This study used an ex post facto correlational design with a sample of 30 athletes taken from the Cempaka Putih Pencak Silat Center in Tulungagung Regency. Based on the results of multiple linear regression analysis, it can be concluded that physical condition significantly contributes to the performance of pencak silat athletes in the competition category. The coefficient of determination (R^2) value of 0.643 indicates that 64.3% of the variation in pencak silat athlete performance can be explained by physical condition components, which include speed, arm strength, leg strength, cardiovascular endurance, flexibility, jump height, and abdominal strength. Meanwhile, the remaining 35.7% was influenced by factors outside of this study. Among all the physical condition components studied, core strength was the only variable with a positive and significant effect on athlete performance, with a p-value of 0.004.

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1. INTRODUCTION

Pencak silat is a traditional Indonesian martial art with a rich cultural, philosophical, and athletic heritage. Over time, pencak silat has become a competitive sport, contested at national, regional, and international levels, including the Southeast Asian Games. Pencak silat matches are highly competitive, involving direct interaction between athletes in dynamic, fast-paced, and stressful situations. The increasing competition in these competitions demonstrates the increasingly complex demands on athletes, requiring not only technical mastery but also physical, psychological, tactical, and situational adaptability during matches.

Competition-specific physical condition is also a crucial component. In the sparring category, athletes require a combination of anaerobic endurance, leg muscle strength, speed, agility, flexibility, and high neuromuscular coordination. Fast-paced matches require athletes to perform repeated explosive movements without experiencing a significant decline in performance. Recent biomechanical studies have shown that the effectiveness of an athlete's attack is significantly influenced by body segment synchronization, pelvic rotation, joint angles, and limb end speed (Xue et al., 2025). Several previous studies have attempted to identify which

physical components are most dominant among pencak silat athletes. Bahriyanto et al. (2024) conducted a predominant analysis of physical condition in sparring-category pencak silat athletes and found leg muscle explosive power and agility to be prominent contributing components, while Nugroho and Doewes (2025) reported that anthropometric and cardiovascular endurance factors distinguished higher-performing fighting-category athletes. However, these studies generally examined physical components individually or focused on limb-based power and endurance measures, without simultaneously modeling a broader set of physical condition components, including core (abdominal) strength, within a single regression framework to determine their relative contribution to competition performance. This study positions itself within this gap by simultaneously analyzing seven physical condition components, speed, arm strength, leg strength, cardiovascular endurance, flexibility, jump height, and abdominal strength, to determine not only whether physical condition contributes to performance but which specific component is the dominant predictor among sparring-category pencak silat athletes at Cempaka Putih Tulungagung. Coaches often provide the same training menu for all athletes without considering the key variables that most influence success in the sparring category. Therefore, this study aims to analyze the contribution of physical condition to the performance of pencak silat athletes in the sparring category.

2. METHOD

This study used a quantitative approach with an ex post facto correlational design to examine the contribution and association between physical condition variables and athlete performance based on existing data without any special treatment or data manipulation in the field. The sampling procedure used was saturated sampling (total sampling), in which the entire population of male sparring-category athletes actively training at the Cempaka Putih Pencak Silat Center, Tulungagung Regency, was included as the study sample, on the consideration that the population size (30 athletes) was small enough to be studied in its entirety. The athletes' age ranged from 15 to 22 years, with a minimum training experience of two years and active participation in at least one official pencak silat sparring-category competition (district, provincial, or higher level) within the past year, which served as the inclusion criteria for this study. Athletes were excluded if they had sustained a musculoskeletal injury within the three months prior to data collection that could affect physical test performance, were not present for the complete battery of physical tests, or were not registered as active members of the Cempaka Putih Pencak Silat Center at the time of data collection. The subjects were 30 male athletes from the Cempaka Putih Pencak Silat Center in Tulungagung Regency who met the inclusion criteria above.

The data collection instrument used a series of specific physical condition tests including: Bleep Test (cardiovascular endurance), 30-meter Sprint (speed), Illinois Agility Test (agility), Vertical Jump (leg muscle explosive power), Standing Trunk Flexion (flexibility), Wall Toss Test (eye-hand coordination), and Foot-ankle coordination test. The quantitative data obtained were processed statistically using the Statistical Package for Social Sciences (SPSS) program, including descriptive analysis, classical assumption tests (normality, heteroscedasticity, multicollinearity), and multiple linear regression tests to measure the simultaneous and partial contribution of variables to match performance.

3. RESULTS AND DISCUSSION

The results of the descriptive statistical analysis of the raw input row data of 30 respondents provide a comprehensive visualization of the summary of the athletes' physical parameters.

Table 1. Average Physical and Performance Test Results

Variables	Minimum	Maximum	Mean	Std. Deviation
Weight	30.10	31.90	31.12	0.54
Speed	4.55	4.90	4.71	0.09
Arm Strength	25.00	38.00	30.70	4.04
Leg Strength	88.00	118.00	102.23	8.39
Cardiovascular Endurance	38.80	50.50	43.59	3.22
Flexibility	26.00	38.00	31.23	3.65

Jump Height	45.00	58.00	50.40	4.09
Abdominal Strength	24.00	36.00	29.87	3.41
Athlete Performance	18.00	28.00	22.83	2.59

The results of the Classical Assumption Test indicate that the residuals are normally distributed (Kolmogorov-Smirnov $p = 0.128 > 0.05$). The heteroscedasticity assumption using the Glejser test shows no symptoms of heteroscedasticity (all variables $p > 0.05$). Similarly, the multicollinearity test shows a VIF value < 10 and Tolerance > 0.1 for all independent variables, indicating that the regression prerequisites are met.

Table 2. Results of Partial Hypothesis Testing (t-Test)

Independent Variables	Coefficient (B)	t Statistics	P Value	Conclusion
(Constant)	3.248	0.174	0.864	Not Significant
Speed	2.119	0.509	0.616	Not Significant
Arm Strength	0.079	0.599	0.555	Not Significant
Leg Strength	-0.116	-1.856	0.077	Not Significant
Cardiovascular Endurance	-0.156	-0.699	0.492	Not Significant
Flexibility	0.202	1.165	0.257	Not Significant
Jump Height	0.056	0.489	0.629	Not Significant
Abdominal Strength	0.559	3.213	0.004	Positive & Significant

Based on simultaneous testing (F Test), the F-count value was 5.649 with a probability < 0.001 ($p < 0.05$), so H1 was accepted. The coefficient of determination (R-squared) value of 0.643 indicates that 64.3% of the variation in athlete performance can be explained by the physical condition components together, while the remaining 35.7% is influenced by technical, tactical, psychological, and competition environment aspects.

In a partial discussion, it was found that core strength was the single most dominant variable significantly influencing performance. The abdominal muscles are part of the core muscles, which play a crucial role in maintaining body stability, maintaining balance, and transferring energy between the upper and lower extremities during repeated explosive movements in pencak silat competitions (Moh Nur Kholis, 2023; Nugroho & Doewes, 2025).

This finding is consistent with Wahyu Kuswantokho (2020), who reported a significant relationship between abdominal muscle strength, leg muscle explosive power, and hip joint flexibility with crescent kick speed among pencak silat athletes, reinforcing that core-generated force underlies not only stability but also the speed of scoring techniques. Similarly, Moh Nur Kholis (2023) found that leg length and lower-body proportions were associated with pencak silat achievement, suggesting that anthropometric and strength factors centered on the trunk-to-limb kinetic chain, rather than any single peripheral component in isolation, are what most consistently predict competitive success. However, the present finding that leg strength did not emerge as a statistically significant individual predictor ($p = 0.077$) contrasts somewhat with Bahriyanto et al. (2024), who identified leg muscle explosive power and agility as prominent physical components among sparring-category pencak silat athletes; this discrepancy may be explained by the fact that Bahriyanto et al. (2024) evaluated components individually rather than within a combined regression model, where shared variance between leg strength and abdominal strength (both reflecting lower-body and core force production) may have reduced leg strength's unique statistical contribution once core strength was accounted for. In terms of speed, the non-significant contribution of the 30-meter sprint result ($p = 0.616$) in this study also diverges from findings in related combat sports; Bridge et al. (2014), in a review of taekwondo athlete profiles, and Wazir et al. (2019), in a study of elite taekwondo performance characteristics, both identified explosive speed and reaction time as differentiating factors for combat-sport performance. This divergence may reflect a genuine sport-specific difference, since pencak silat sparring scoring rewards controlled, technique-accurate strikes delivered from a stable base rather than pure linear sprint speed, again pointing to the centrality of core stability highlighted by the present study's dominant predictor. Meanwhile, Nugroho et al. (2025), examining body

composition and physical fitness characteristics of elite Indonesian pencak silat competitors, similarly found that trunk-related strength and body composition factors distinguished higher-performing athletes more consistently than isolated limb-speed measures, lending further support to the present study's core strength finding. Taken together, these comparisons suggest that while multiple physical components contribute to pencak silat sparring performance, the relative dominance of core strength observed here reflects a broader, sport-specific pattern in which trunk stability and force-transfer capacity, rather than any single limb-based component, most directly determine competitive success.

4. CONCLUSION

Physical condition simultaneously contributed significantly, amounting to 64.3%, to the performance of pencak silat athletes in the competitive category at Sasana Cempaka Putih Tulungagung. Partially, core strength was the only physical condition component that had a positive and significant effect on improving athletes' winning performance ($p = 0.004$). The other six physical condition components examined, namely speed, arm strength, leg strength, cardiovascular endurance, flexibility, and jump height, did not show a statistically significant individual contribution ($p > 0.05$ for each). This indicates that, although these components contribute collectively to the overall regression model, none of them individually distinguishes athlete performance to the extent that core strength does.

5. ACKNOWLEDGMENTS

The author would like to thank Mr. Dr. Zainal Afandi, M.Pd. as the Rector of UN PGRI Kediri, Mr. Dr. Nur Ahmad Muharram, M.Or. as the Dean of FIKS, Mr. Weda, M.Pd. as the Head of Physical Education Study Program, and Mrs. Dr. Puspodari, M.Pd. and Mr. Moh. Nurkholis, M.Or. as the supervisors for their guidance and support in completing this scientific work.

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