Indonesian Journal for Physical Education and Sport
https://journal.unnes.ac.id/journals/inapes/index
e-ISSN 2774-4434 | inapes@mail.unnes.ac.id
https://doi.org/10.15294/inapes.xxxx

Review of the Physical Condition Components of Tapak Suci Student Activity Unit Athletes at Muhammadiyah University of Semarang

Sayid Fariz Bin Seh Abubakar[a], Ahad Agafian Duha[b], Muhammad Muhibbi[c], Danang Dwi Purwanto[d]
[abc]Universitas Muhammadiyah Semarang, Indonesia
[d]Universitas Muhammadiyah Yogyakarta, Indonesia

Correspondence: sayidfarizbsa@unimus.ac.id
Received: 29 May 2026 **Accepted:** 8 June 2026 **Published:** 9 June 2026

Abstract
This study aimed to describe the profile of physical condition components among Tapak Suci Student Activity Unit athletes at Universitas Muhammadiyah Semarang (UNIMUS), including endurance, muscular strength/endurance, speed, agility, and flexibility. This research used a quantitative descriptive design with a cross-sectional field-test approach involving 16 athletes, consisting of 11 male and 5 female athletes. Endurance was measured using the Multi Fitness Test (MFT); muscular strength/endurance was assessed using one-minute push-ups and one-minute sit-ups; speed was measured using a 30-meter sprint; agility was assessed using a 5-meter shuttle run; and flexibility was measured using the sit-and-reach test. Data were analyzed descriptively using the mean, standard deviation, minimum, maximum, and an internal five-class category distribution based on the equal-interval method. The results showed mean scores of 10.45 ± 0.80 for the MFT; 37.94 ± 6.51 repetitions for push-ups; 31.56 ± 6.38 repetitions for sit-ups; 3.37 ± 0.21 seconds for the 30-meter sprint; 13.07 ± 0.84 seconds for the shuttle run; and 31.56 ± 1.46 cm for the sit-and-reach test. These findings provide an objective basis for designing more specific training programs, particularly to improve endurance, change-of-direction ability, and flexibility.

Keywords: pencak silat; physical condition; endurance; speed; agility; flexibility

1. Introduction

The sparring category in pencak silat requires complex physical abilities because athletes must execute attacks, defenses, positional transitions, and rapid changes of direction throughout a match. These activities reflect the characteristics of an intermittent sport, with complementary aerobic and anaerobic demands.

At the Tapak Suci Student Activity Unit of Universitas Muhammadiyah Semarang, routine training has generally emphasized technical drills, sparring practice, and preparation for campus-level and regional competitions. However, preliminary coaching observations indicated that athletes' physical readiness was not yet evenly distributed; some athletes were able to maintain attack intensity and movement quality, whereas others showed early fatigue, slower change-of-direction ability, and inconsistent kicking range during training and match simulations. In addition, periodic documentation of physical condition test results had not been systematically used as the main basis for determining individualized training loads. This situation creates a practical gap between the physical demands of pencak silat competition and the availability of objective data used by coaches to plan training.

In the context of university sport student activity unit development, mapping athletes' physical condition is an important step for identifying readiness, determining training priorities, and monitoring training adaptations periodically. The use of practical and reliable field tests, such as the shuttle run and multistage shuttle run, can help coaches assess physical performance objectively.

Systematic assessment of physical condition is consistent with the principles of specificity and periodization in martial arts training. Test profiles enable coaches to identify dominant components and weaker components in each athlete so that training volume, intensity, and type can be adjusted appropriately. In a sport that demands a combination of reaction speed, short acceleration, and recovery ability between rounds, data-based training decisions are more effective than general approaches. Thus, physical evaluation functions not only as performance documentation but also as a basis for development monitoring, injury prevention, and the establishment of realistic and measurable training targets (Bompa & Buzzichelli, 2019; Suchomel et al., 2016).

In addition to endurance, pencak silat also requires muscular strength/endurance to support postural stability and technical execution, speed to initiate attacks, agility for change-of-direction movements, and flexibility to support kicking quality and reduce injury risk (Chaabene et al., 2020). Therefore, physical condition evaluation should not be conducted partially but should include several key components relevant to match demands.

Documentation of the physical condition profile of pencak silat athletes at the university student activity unit level remains relatively limited. As a result, coaches often establish training programs based on general observation and are not fully supported by quantitative data. Therefore, this study aimed to describe the profile of physical condition components among UKM Tapak Suci UNIMUS athletes, including endurance, muscular strength/endurance, speed, agility, and flexibility, and to present internal categories so that test results can be more easily interpreted as a basis for designing data-based training programs.

2. Method

This study employed a quantitative descriptive method with a cross-sectional field-test approach. The descriptive method was used because the purpose of the study was to describe and interpret the current physical condition profile of athletes based on objective numerical test results, not to test the effect of an intervention or to examine causal relationships between variables. The cross-sectional approach was applied because all measurements were conducted at one measurement period during a series of physical condition tests for Tapak Suci Student Activity Unit athletes at Universitas Muhammadiyah Semarang.

The research subjects consisted of 16 athletes, including 11 male athletes and 5 female athletes. The sampling technique used was total sampling because all athletes who participated in the measurements were included as the research sample.

The measurement instruments included: (1) cardiorespiratory endurance using the Multi Fitness Test (MFT); (2) arm-shoulder muscular strength/endurance using one-minute push-ups; (3)

abdominal muscular strength/endurance using one-minute sit-ups; (4) speed using the 30-meter sprint; (5) agility using a 5-meter shuttle run; and (6) flexibility using the sit-and-reach test.

The test procedure began with 10-15 minutes of dynamic warm-up. Each test item was administered sequentially with sufficient rest intervals to reduce the effect of fatigue between items. For time-based variables, namely the 30-meter sprint and 5-meter shuttle run, lower values indicated better performance.

Data were analyzed descriptively using the mean, standard deviation, minimum, and maximum. Because standardized norms specific to university-level pencak silat athletes are not yet consistently available, internal norms were developed from the sample's observed minimum and maximum scores using the equal-interval formula: (maximum score - minimum score) / 5. Five categories were used: Very Poor, Poor, Moderate, Good, and Very Good. For repetition, level, and distance-based tests, higher scores indicated better performance, whereas for time-based tests, faster times were placed in better categories. Thus, these categories are sample-based internal norms, not national standards.

Table 1. Internal norm ranges used for test category classification

Category	MFT (level)	Push-up (reps)	Sit-up (reps)	30-m Sprint (s)	5-m Shuttle Run (s)	Sit & Reach (cm)
Very Poor	9.00-9.62	29.00-32.80	22.00-25.80	3.58-3.70	13.60-14.00	30.00-30.80
Poor	>9.62-10.24	>32.80-36.60	>25.80-29.60	>3.46-3.58	>13.20-13.60	>30.80-31.60
Moderate	>10.24-10.86	>36.60-40.40	>29.60-33.40	>3.34-3.46	>12.80-13.20	>31.60-32.40
Good	>10.86-11.48	>40.40-44.20	>33.40-37.20	>3.22-3.34	>12.40-12.80	>32.40-33.20
Very Good	>11.48-12.10	>44.20-48.00	>37.20-41.00	3.10-3.22	12.00-12.40	>33.20-34.00

Note. For the 30-m sprint and 5-m shuttle run, lower time indicates better performance; therefore, the category direction is reversed.

3. Result

Table 2. Sample composition by gender

Gender	n	%
Male	11	68.8
Female	5	31.2

The sample composition showed that most athletes who participated in the measurements were male (68.8%), while female athletes accounted for 31.2%. This distribution indicates that the physical condition profile obtained was mainly influenced by the characteristics of the male group, although the female data still provide a general overview of the condition of UKM Tapak Suci UNIMUS athletes as a whole.

Table 3. Descriptive statistics of physical condition test results

Test (unit)	Mean	SD	Min	Max
MFT level 20 (level)	10.45	0.80	9	12.1
One-minute push-up (reps)	37.94	6.51	29	48
One-minute sit-up (reps)	31.56	6.38	22	41
30-m sprint (s)	3.37	0.21	3.1	3.7
5-m shuttle run (s)	13.07	0.84	12	14
Sit and reach (cm)	31.56	1.46	30	34

Table 4. Internal category distribution (five classes) by component (n = 16)

Category	MFT	Push-up	Sit-up	30-m Sprint	Shuttle Run	Sit & Reach
Very Poor	2	3	4	4	6	5
Poor	4	4	3	1	0	4
Moderate	5	2	1	1	5	2
Good	3	5	5	5	0	3
Very Good	2	2	3	5	5	2

In general, the results in Table 2 show that the athletes' mean endurance level was moderate, with an MFT score of 10.45 ± 0.80. This finding indicates that the athletes' aerobic capacity was sufficient to support match activities but still needs to be improved so that technical quality and decision-making can be maintained until the final round.

4. Discussion

The results of this study indicate that the physical condition profile of UKM Tapak Suci UNIMUS athletes was generally at an adequate level, but it was not evenly distributed across all fitness components. The sample composition, which was dominated by male athletes, must be considered in interpretation because the team mean profile was influenced more strongly by the physiological characteristics of the male group. In sport science, an imbalanced sex composition can affect the generalizability of findings, especially for components that are sensitive to differences in strength, endurance, speed, and training adaptation. Cowley et al. (2021) emphasized that women remain underrepresented in sport research; therefore, findings from studies dominated by male samples should be interpreted with caution and ideally complemented by sex-specific analysis. Thus, the findings of this study are more appropriately understood as an initial overview of the team's overall physical condition rather than as a definitive comparison between male and female athletes.

Physiologically, pencak silat is a martial art that requires a combination of aerobic endurance, anaerobic capacity, muscular strength, muscular endurance, speed, agility, flexibility, and the ability to maintain concentration during competition. Ruddock et al. (2021) explained that modern combat sports are characterized by high intensity and require conditioning strategies capable of developing aerobic, anaerobic, and neuromuscular qualities. Findings by Salsaputri et al. (2025) on pencak silat athletes also showed that power, speed, agility, and endurance are important components that distinguish athletes in sparring and artistic categories. Therefore, the physical condition test results in this study should be interpreted as indicators of athlete readiness to meet the explosive, repeated, and rapidly recovering movement demands of pencak silat.

The mean MFT score of 10.45 ± 0.80 indicates that the athletes' aerobic endurance capacity was in the moderate category based on the internal categories used. This condition suggests that most athletes already have a sufficient endurance foundation for training and competition, but further improvement is needed so that the quality of attacks, defenses, transitions, and decision-making remains stable until the final round. In combat sports, the aerobic system plays an important role in accelerating recovery between attacks and maintaining movement intensity, whereas the anaerobic system is required for explosive actions such as kicks, punches, evasions, catches, throws, and counterattacks. Yue et al. (2025), through a systematic review and meta-analysis, concluded that high-intensity interval training (HIIT) is effective in improving aerobic and anaerobic capacity in combat sport athletes, primarily because its training pattern resembles the intermittent and high-intensity characteristics of competition. Therefore, the MFT results in this study can serve as a basis for coaches to add pencak silat-specific interval training, such as combinations of rapid kicks and punches, footwork, shuttle movements, and active recovery.

The one-minute push-up result of 37.94 ± 6.51 repetitions and the one-minute sit-up result of 31.56 ± 6.38 repetitions indicate that the athletes' upper-body, shoulder, chest, and core muscular endurance was relatively adequate, although performance varied between individuals. Upper-body muscular endurance is important in pencak silat because it supports the stability of fighting stance, the ability to perform repeated punches, defense, pushing, pulling, and controlling opponents at close range. Core muscular endurance contributes to force transfer from the lower limbs to the upper body, maintains balance during kicking, and sustains posture when receiving physical contact. Patah et al. (2021) found that Tabata and circuit weight training can improve arm muscle strength, leg muscle strength, muscular endurance, flexibility, VO2max, and power in pencak silat athletes. Similarly, Cid-Calfucura et al. (2023) concluded that strength training in combat sport athletes contributes to improved physical performance, particularly when it is implemented in a structured manner and is specific to the needs of the sport.

For the speed component, the mean 30-meter sprint time of 3.37 ± 0.21 seconds indicates relatively good acceleration ability, but the internal category distribution shows that athletes' abilities were not homogeneous. In pencak silat, speed is not only related to straight-line running but also to the ability to initiate attacks, move in and out of range, evade, and execute counterattacks in a short time. Therefore, sprint ability should be developed together with reaction training, footwork, and explosive technical drills. The NSCA emphasizes that modern strength and conditioning programs should integrate the principles of biomechanics, bioenergetics, strength training, power, speed, and agility so that training adaptations are relevant to competitive demands. This indicates that improving sprint performance in pencak silat athletes should not rely solely on general sprinting but should be combined with sport-specific movement patterns.

The 5-meter shuttle run result of 13.07 ± 0.84 seconds shows that agility and change-of-direction ability remain components that require particular attention. The internal category distribution shows a polarized pattern: some athletes were in the very poor category, whereas others were in the very good category. This condition may indicate differences in coordination, eccentric leg strength, body control during deceleration, and experience with specific movement training. In pencak silat, agility is crucial because athletes must be able to change direction rapidly when attacking, evading, performing sweeps, managing distance, and responding to the opponent's movement. Ruddock et al. (2021) emphasized that combat sport conditioning should be directed toward high-intensity abilities that match competition characteristics, rather than simply improving

general fitness. Therefore, shuttle run training should be developed into more specific forms, such as triangular attack-evade patterns, eight-direction stepping, reactions to visual cues, and combinations of footwork with kicking and punching techniques.

The flexibility component, measured using the sit-and-reach test, showed a mean of 31.56 ± 1.46 cm. This value indicates that hamstring and lower-back flexibility was relatively good and varied less than other components. Flexibility plays an important role in pencak silat, particularly in supporting kicking range of motion, technical efficiency, prevention of movement compensation, and postural control. However, because the sit-and-reach score range was relatively narrow, the internal category distribution should be interpreted with caution; a difference of 1-2 cm may shift a category even though it may not represent a substantial practical performance difference. Hernandez-Martinez et al. (2025) explained that combat sport training can improve standing long jump and sit-and-reach performance, especially among university students. This supports the need to maintain flexibility through a combination of dynamic stretching, mobility exercises, and kick-specific stretching.

Based on the internal category distribution, no component was entirely dominant in the good and very good categories. This condition indicates that UKM Tapak Suci UNIMUS athletes have adequate physical potential but still require a more individualized and periodized training program. Endurance, muscular endurance, speed, agility, and flexibility cannot be developed separately because pencak silat performance requires the integration of physical, technical, tactical, and mental abilities. Wu et al. (2024) explained that mental and physical fatigue can affect aerobic endurance, decision-making, tactical performance, and technical performance in athletes. This means that improving physical condition affects not only strength or movement speed but also the athlete's ability to maintain concentration, select appropriate techniques, and reduce errors during competition under fatigue.

The practical implication of this study is the need to design training programs based on test results. Athletes in the very poor and poor categories should receive priority development through corrective and progressive training, whereas athletes in the good and very good categories can be directed toward competition-specific training. Programs can be organized into several focuses: improving endurance through interval training and tempo runs, improving muscular endurance through circuit training, improving speed through short sprints and reaction drills, improving agility through change-of-direction drills, and improving flexibility through structured mobility and stretching. The FITT principle in ACSM's Guidelines for Exercise Testing and Prescription can be used as a basis for determining training frequency, intensity, time, and type, while NSCA strength and conditioning principles can be used to organize load progression, recovery, and training specificity.

Accordingly, the physical condition profile of UKM Tapak Suci UNIMUS athletes indicates that the athletes' fitness foundation has been established but is not yet optimal and is not evenly distributed. The components that require primary attention are aerobic endurance, agility, and the equalization of muscular endurance across individuals. These findings can serve as a basis for coaches to design training programs that are more objective, data-based, and aligned with the characteristics of pencak silat. Future studies are recommended to use larger samples, conduct separate analyses by sex, sparring/artistic category, weight class, training experience, and level of

achievement, and use external comparison norms so that interpretation of the results becomes stronger.

5. Conclusion and Recommendation

The conclusion of this study indicates that the measurement of physical condition among UKM Tapak Suci UNIMUS athletes provides an important scientific basis for understanding the physical readiness of pencak silat athletes in supporting training and competition demands. These findings reinforce that pencak silat performance is determined not only by technical mastery but also by the integrated development of endurance, muscular strength, speed, agility, and flexibility, which must be developed in a balanced manner. This study advances practical knowledge in university athlete development by providing an initial data-based profile that coaches can use to design training programs that are more objective, directed, and aligned with individual athlete needs rather than relying solely on subjective observation. In application, the results of this study can serve as a basis for periodic evaluation, mapping training priorities, designing conditioning programs, and monitoring the ongoing development of UKM Tapak Suci UNIMUS athletes. Future research is recommended to involve larger sample sizes, distinguish analyses by sex, competition category, weight class, training experience, and achievement level, and examine the effectiveness of specific training programs in improving physical components that still need development so that the findings can contribute more broadly to the advancement of sport science in pencak silat development within higher education institutions.

References

American College of Sports Medicine. (2025/2026). *ACSM's guidelines for exercise testing and prescription* (12th ed.). Wolters Kluwer.

Aziz, A. R., Tan, B., & Teh, K. C. (2002). Physiological responses during matches and profile of elite pencak silat exponents. Journal of Sports Science and Medicine, 1(4), 147–155.

Bompa, T. O., & Buzzichelli, C. (2019). Periodization: Theory and methodology of training (6th ed.). Human Kinetics.

Bridge, C. A., Jones, M. A., Drust, B., & Turner, A. N. (2014). The activity profile in elite taekwondo competition is modulated by match context. International Journal of Sports Physiology and Performance, 9(2), 214–221.

Cid-Calfucura, I., Herrera-Valenzuela, T., Franchini, E., Falco, C., Alvial-Moscoso, J., Pardo-Tamayo, C., Zapata-Huenullán, C., Ojeda-Aravena, A., & Valdés-Badilla, P. (2023). Effects of strength training on physical fitness of Olympic combat sports athletes: A systematic review. *International Journal of Environmental Research and Public Health, 20*(4), 3516.

Cowley, E. S., Olenick, A. A., McNulty, K. L., & Ross, E. Z. (2021). "Invisible sportswomen": The sex data gap in sport and exercise science research. *Women in Sport and Physical Activity Journal, 29*(2), 146–151.

Chaabene, H., et al. (2020). Effects of resistance training on change-of-direction speed: A systematic review and meta-analysis. Sports, 8(7), 89. https://doi.org/10.3390/sports8070089

Dos'Santos, T., Thomas, C., McBurnie, A., Comfort, P., & Jones, P. A. (2021). Change of direction speed and technique modification training improves 180° turning performance, kinetics, and kinematics. Sports, 9(6), 73. https://doi.org/10.3390/sports9060073

Franchini, E., Del Vecchio, F. B., Matsushigue, K. A., & Artioli, G. G. (2011). Physiological profiles of elite judo athletes. Sports Medicine, 41(2), 147–166.

Franchini, E., Cormack, S., & Takito, M. Y. (2019). Effects of high-intensity interval training on Olympic combat sports athletes' performance and physiological adaptation: A systematic review. Journal of Strength and Conditioning Research, 33(1), 242–252. https://doi.org/10.1519/JSC.0000000000002957

Haff, G. G., Triplett, N. T., & National Strength and Conditioning Association. (2026). *Essentials of strength training and conditioning* (5th ed.). Human Kinetics.

Hernandez-Martinez, J., et al. (2025). Effects of Olympic combat sports on physical fitness in non-athlete students: A systematic review with meta-analysis. *Frontiers in Physiology, 16*, 1620621.

Hoffmann, J. J., Reed, J. P., Leiting, K., Chiang, C. Y., & Stone, M. H. (2014). Repeated sprints, high-intensity interval training, small-sided games: Theory and application to field sports. International Journal of Sports Physiology and Performance, 9(2), 352–357. https://doi.org/10.1123/IJSPP.2013-0189

Léger, L. A., Mercier, D., Gadoury, C., & Lambert, J. (1988). The multistage 20 metre shuttle run test for aerobic fitness. Journal of Sports Sciences, 6(2), 93–101. https://doi.org/10.1080/02640418808729800

McHugh, M. P., & Cosgrave, C. H. (2010). To stretch or not to stretch: The role of stretching in injury prevention and performance. Scandinavian Journal of Medicine & Science in Sports, 20(2), 169–181. https://doi.org/10.1111/j.1600-0838.2009.01058.x

Nimphius, S., Callaghan, S. J., Bezodis, N. E., & Lockie, R. G. (2016). Change of direction deficit: A more isolated measure of change of direction performance than total 505 time. Journal of Strength and Conditioning Research, 30(11), 3024–3032. https://doi.org/10.1519/JSC.0000000000001471

Patah, I. A., Jumareng, H., Setiawan, E., Aryani, M., & Gani, R. A. (2021). The importance of physical fitness for pencak silat athletes: Home-based weight training Tabata and circuit can it work? *Journal Sport Area, 6*(1), 86–97.

Ramsbottom, R., Brewer, J., & Williams, C. (1988). A progressive shuttle run test to estimate maximal oxygen uptake. British Journal of Sports Medicine, 22(4), 141–144. https://doi.org/10.1136/bjsm.22.4.141

Ruddock, A., James, L., French, D., Rogerson, D., Driller, M., & West, D. J. (2021). High-intensity conditioning for combat athletes: Practical recommendations. *Applied Sciences, 11*(22), 10658.

Salsaputri, D., et al. (2025). Physical condition and concentration on pencak silat athletes. *Journal of Sport Science and Fitness*

Sheppard, J. M., & Young, W. B. (2006). Agility literature review: Classifications, training and testing. Journal of Sports Sciences, 24(9), 919–932. https://doi.org/10.1080/02640410500457109

Suchomel, T. J., Nimphius, S., & Stone, M. H. (2016). The importance of muscular strength in athletic performance. Sports Medicine, 46(10), 1419-1449. https://doi.org/10.1007/s40279-016-0486-0

Subekti, N., et al. (2019). Measurement of anaerobic capacity based on fatigue index in pencak silat athletes (combat category). In Proceedings of ISETH (pp. 1–6).

Wu, C. H., et al. (2024). Mental fatigue and sports performance of athletes: Theoretical explanation, influencing factors, and intervention methods. *Behavioral Sciences, 14*(12), 1125.

Yue, F., Wang, Y., Yang, H., & Zhang, X. (2025). Effects of high-intensity interval training on aerobic and anaerobic capacity in Olympic combat sports: A systematic review and meta-analysis. *Frontiers in Physiology, 16*, 1576676.