



Physical Condition and Concentration on Pencak Silat Athletes

Della Salsaputri*, Kuston Sultoni, Jajat, Yati Ruhayati, Oktoviana Nur Ajid

Sport Science Study Program, Faculty of Sport and Health Education, Universitas Pendidikan Indonesia

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Abstract

Introduction: Physical condition and concentration are key factors influencing the performance of pencak silat athletes in both fighter and artistic categories. However, the relationship between these two aspects has rarely been explored specifically in this sport.

Objectives: This study aimed to compare physical condition and concentration levels between athletes in the fighter and artistic categories, and to examine the relationship between the. **Method:** A cross-sectional design was used involving 36 athletes (18 fighter and 18 artistic). Physical condition was assessed through power, speed, agility, and endurance tests, while concentration was measured using the Grid Concentration Test (GCT). Data were analyzed using independent samples t-tests and Pearson correlation. **Result:** The results showed that fighter athletes had significantly higher power, speed, and endurance ($p < 0.05$), whereas artistic athletes had significantly better agility ($p < 0.05$). No significant differences in concentration levels were found between the two groups ($p > 0.05$). Additionally, there was no significant correlation between physical condition and concentration in either group ($p > 0.05$). **Conclusion:** These findings suggest that physical and cognitive aspects may develop independently. Therefore, training programs should incorporate both components to enhance overall athlete performance.

*Correspondence E-mail: kustonsultoni@upi.edu

INTRODUCTION

Concentration is a component of cognitive function that is essential for athletes (Tache et al., 2017). According to (Jannah, 2017), concentration refers to an athlete's ability to focus attention and thoughts for the purpose of achieving optimal results during both competitions and training. Concentration is a critical factor for athletes. When an athlete loses focus during a match, they may be deceived by their opponent and forget the techniques they are supposed to perform. This can negatively affect the athlete's performance outcome in the competition.

Concentration during a match significantly assists pencak silat athletes in executing techniques such as kicks, punches, and takedowns. In pencak silat competitions, kicking is the dominant technique used in the sparring category to score points. Therefore, athletes require high levels of concentration to execute kicks with maximum accuracy during a match (Sadiko et al., 2023)

A decrease or disruption in an athlete's concentration during training, and especially during competitions, can lead to various serious problems and suboptimal results (Haidir et al., 2021). Insufficient concentration may lead to technical and strategic errors in both training and competitive contexts (Indahwati & Ristanto, 2016). Concentration is essential for almost all athletes in their respective sports, especially martial arts (Kadir et al., 2023)

In addition to having good concentration, pencak silat athletes must also possess good physical condition. According to (Rohman & Effendi, 2019), physical condition is one of the important factors in enhancing sports performance. Components of physical condition such as strength, endurance, speed, agility, flexibility, explosive power, accuracy, reaction, and balance significantly contribute to the performance of pencak silat athletes. Therefore, physical conditioning training requires serious attention and must be carefully and systematically planned to improve physical fitness levels and the functional capacity of the body's systems.

(Ray et al., 2020) stated that physical fitness is a fundamental prerequisite for improving and developing an athlete's performance potential. The goal of developing physical fitness is to improve an athlete's bodily functions and biomotor abilities to a high standard (Azmi & Kusnanik, 2018). Good physical fitness is a fundamental foundation for athletes to achieve peak performance. In pencak silat, physical fitness elements can also be developed based on the specific demands of technical and tactical movements (Mirfen & Umar, 2018)

In pencak silat, across both the fighting and artistic categories, concentration and physical condition possess inseparable urgency and significantly influence athlete performance. High concentration allows athletes to focus on a series of complex movements and diverse techniques such as punches, kicks, sweeps, scissors, blocks, and evasions, as well as to make quick and precise decisions during an intense three-minute duration (Muttaqin, 2018). Without optimal concentration, movements can become inaccurate, timing can be

missed, and responses to opponents (in the fighting category) or transitions between movements (in the artistic category) can slow down.

The ability to maintain concentration, however, is highly dependent on prime physical condition. A fit physique ensures that the central nervous system operates efficiently, keeping attention span and decision-making abilities sharp throughout training and competition (Kao et al., 2023). Physical fatigue can rapidly erode concentration, leading to decreased accuracy, slower reaction times, and diminished mental resilience. Thus, optimal physical condition not only supports technical execution but also serves as a vital foundation for sustained concentration and strategic decision-making, which are crucial for achieving peak performance in pencak silat. As highlighted by (Haikal, 2017) achievement in pencak silat results from the synergy of physical, technical, tactical, and mental aspects, all of which are interconnected and influence athlete performance.

Therefore, maintaining good concentration and physical condition is an absolute prerequisite for every pesilat to support their performance during training and competition. A previous study conducted by (Fatahilah & Firlando, 2020), using a quantitative descriptive approach involving 15 athletes from five different sports in Lubuklinggau, showed that most athletes had low to moderately low levels of concentration. These findings indicate an issue with athletes' mental preparedness. However, the study did not specifically examine the relationship between physical condition and concentration in the context of pencak silat, nor did it differentiate between the sparring and artistic categories within the sport.

Based on this background, the present study aims to examine the differences in physical condition and concentration levels between pencak silat athletes in the sparring (fighter) and artistic categories. The findings of this study are expected to contribute to coaches' efforts in evaluating and developing training programs that not only focus on physical aspects but also emphasize the improvement of athletes' concentration to achieve optimal performance (Kadir et al., 2023).

METHOD

Design and Participants

This study employed a quantitative, cross-sectional design to examine differences and correlations between physical condition and concentration among pencak silat athletes in the fighter and artistic categories. A cross-sectional approach was selected to evaluate these variables at a single point in time without any experimental intervention.

Participants were selected through purposive sampling from the Bandung City Pencak Silat Team. The final sample consisted of 36 athletes: 18 in the fighter category and 18 in the artistic category (including 7 individuals, 2 double, and 9 team performers). The average age of participants was 21 years, with a mean height of 162 cm and mean body weight of 56.6 kg.

Inclusion and Exclusion Criteria

Inclusion criteria included: (a) registered active members of the Bandung City Pencak Silat Team; (b) aged between 18 and 25 years; (c) having participated in regional-level competitions or higher within the past 12 months; and (d) being physically and mentally fit to engage in the tests. Exclusion criteria comprised: (a) athletes with current injuries or undergoing rehabilitation; (b) failure to complete all phases of testing; and (c) refusal to provide informed consent.

Prior to data collection, ethical approval and permission were obtained from the team's head coach. Athletes were briefed about the research objectives and procedures and were asked to sign an informed consent form. After completing a demographic questionnaire, participants proceeded to the testing phase.

Instruments

Two categories of instruments were used:

Concentration Test

Concentration was measured using the Grid Concentration Test (GCT), which consists of a 10 × 10 grid containing randomly ordered numbers from 00 to 99. Participants were instructed to identify and connect the numbers sequentially from 00 in ascending order within one minute. The score was determined by the highest number reached in correct sequence (Maksum, 2011)

Physical Condition Tests.

Four components of physical fitness were assessed:

Agility: Measured using the T-Test Agility (Madole et al., 2000) where participants followed a specified cone pattern. Time was recorded with a stopwatch, and the best of two trials was used.

Endurance (VO₂max): Estimated using the Multistage Fitness Test (Bleep Test) as proposed by (Léger & Lambert, 1982). Athletes ran back and forth over a 20-meter course in accordance with increasing audio signals. VO₂max was determined from the last completed level.

Speed: Assessed using the 20-Meter Sprint Test (Insan et al., 2022). Athletes performed two sprints, and the fastest time was recorded.

Whole Body Reaction Time: Measured using a visual reaction device (Takei Co., Ltd., Tokyo, Japan), which has a validated reliability score of 0.86 (Miyatake, 2012). Athletes responded to a light stimulus while standing on the device; the best result from two trials was recorded.

Data Analysis

Data were analyzed using SPSS version 25. The Shapiro–Wilk test was used to assess normality, and Levene's test evaluated homogeneity of variance. Due to the presence of non-normally distributed data, Spearman's rank-order correlation was employed to examine

relationships between physical condition and concentration. Independent samples t-tests were used to compare differences between athlete categories, with statistical significance set at $p < .05$.

RESULT AND DISCUSSION

Result

This study involved 36 pencak silat athletes, consisting of 18 athletes in the sparring category and 18 athletes in the artistic category. The results of the independent samples t-test revealed significant differences in agility ($p = 0.0026$) and $VO_2\text{max}$ ($p = 0.0045$) between the two categories. No significant differences were found in speed ($p = 0.115$), reaction time ($p = 0.137$), or concentration grid scores ($p = 0.107$).

Table 1. Results of the comparison test between Sparring and Artistic Categories

Variabel	Uji Statistik	p-value
Speed	t-test	0.115
Agility	Mann-Whitney U test	0.0026
Reaction	t-test	0.137
$VO_2\text{max}$	t-test	0.0045
Concentration Grid	t-test	0.107

In the physical condition of fighting category, the correlation analysis revealed a significant negative relationship between $VO_2\text{max}$ and agility ($\rho = -0.607$, $p = 0.008$), as well as significant positive relationships between agility and reaction time ($\rho = 0.722$, $p = 0.001$), agility and speed ($\rho = 0.741$, $p < 0.001$), and reaction time and speed ($\rho = 0.637$, $p = 0.004$). No significant correlations were found between physical condition variables and concentration.

Table 2. Spearman Correlation Coefficients among Fighter Athletes

Variabel	N	Mean	Std.Deviation	1	2	3	4	5
$VO_2\text{max}$	18	50.84	6.109	–				
Agility	18	10.76	0.808	–.61**	–			
Reaction	18	0.25	0.033	–.43	.72**	–		
Speed	18	3.52	0.309	–.45	.74**	.64**	–	
Concentration	18	11.11	2.676	0.04	–.41	–.19	–.04	–

In the physical condition artistic category, a significant negative correlation was found between $VO_2\text{max}$ and agility ($\rho = -0.721$, $p = 0.001$), as well as between $VO_2\text{max}$ and reaction time ($\rho = -0.488$, $p = 0.040$). Significant positive correlations were also observed between agility and reaction time ($\rho = 0.570$, $p = 0.014$), and between agility and speed ($\rho = 0.615$, $p = 0.007$). No significant relationship was found between physical condition and concentration.

Table 3. Spearman Correlation Coefficients among Art Category Athletes

Variabel	N	Mean	Std.Deviation	1	2	3	4	5
VO2max	18	45.34	4.550	–				
Agility	18	11.82	1.263	–.721**	–			
Reaction	18	0.26	0.026	–.488*	.570**	–		
Speed	18	3.68	0.289	–.441	.615**	0.445	–	
Concentration	18	9.39	3.5	0.056	–.175	0.189	–.066	–

DISCUSSION

Physical Condition and Its Relationship with Athletic Performance

Physical condition is a crucial element in supporting optimal athletic performance, including in the sport of pencak silat. Several previous studies have emphasized that athletic performance is greatly influenced by biomotor abilities such as endurance (VO₂max), speed, agility, strength, flexibility, and reaction time (Mirfen & Umar, 2018). In the context of pencak silat, which demands a combination of explosiveness, precision, and endurance, each component of physical condition plays a strategic role in supporting athletic achievement.

This study found a significant negative correlation between VO₂max and agility ($\rho = -0.721$, $p = 0.001$). This result indicates that athletes with higher aerobic capacity tend to have lower agility. This finding is consistent with the study by (Azmi & Kusnanik, 2018), which revealed that an increase in VO₂max may potentially reduce explosive performance due to muscle adaptations resulting from repetitive aerobic training. This adaptation leads to increased muscle work efficiency in the long term but does not necessarily support the rapid and explosive movements that are key in the artistic category of pencak silat.

Furthermore, the positive correlations between agility and speed ($\rho = 0.615$, $p = 0.007$) and reaction time ($\rho = 0.570$, $p = 0.014$) confirm that agility is not only about the ability to change direction but is also closely related to the ability to respond quickly to stimuli and accelerate. (Madole et al., 2000) It states that the agility component is an integration of neuromuscular coordination, reaction time, and muscle speed, all of which are important determinants in the successful execution of complex movements in martial arts. This finding is further supported by (Léger & Lambert, 1982), who emphasized that the synergy between agility and speed provides an advantage in tactical decision-making on the field.

Another interesting finding is the significant negative correlation between VO₂max and reaction time ($\rho = -0.488$, $p = 0.040$), which can be interpreted as athletes with better aerobic endurance having faster cognitive capacity and motor reflexes. A study by (Insan et al., 2022) supports this result by stating that increased aerobic capacity can enhance blood flow to the brain, thereby accelerating information.

Physical Condition and Concentration

Concentration is an essential cognitive element in the sport of pencak silat. In both sparring and artistic categories, athletes are required to maintain a high level of focus on rhythm, visual and auditory stimuli, and the precise timing of technical execution.

In pencak silat, concentration is required to respond quickly to an opponent's attacks, remember and execute a sequence of techniques (especially in the artistic category), and make strategic decisions in a short time.

Even a momentary lapse in focus can result in a technical error, loss of points, or even injury. In the sparring category, athletes must be able to anticipate their opponent's movements, evaluate the match situation, and spontaneously execute offensive or defensive techniques. Meanwhile, in the artistic category, athletes are required to deliver a series of movements with precise rhythm, consistency, and expression within a limited time (Sadiko et al., 2023)

However, this study did not find a significant relationship between physical condition and concentration, although previous literature suggests a possible indirect relationship. This result may be explained by the complexity of cognitive variables, which are influenced not only by physiological factors but also by psychological, social, and environmental aspects. For example, (Fatahilah & Firlando, 2020) found that athletes' concentration is significantly influenced by psychological stress, competitive experience, and mental training strategies. These factors may be more dominant in determining athletes' ability to focus, especially in sports that require a high degree of coordination between motor and cognitive aspects, such as pencak silat. Therefore, mental training such as visualization, relaxation techniques, and mindfulness are highly relevant in this context (Goldman & Rao, 2012)

This difference may be attributed to several factors. First, other mental factors, such as intrinsic motivation, stress management, or psychological support, which were not measured in this study, may be more dominant in determining athletes' concentration. Second, the measurement method used (GCT) may not fully reflect the type of concentration required during pencak silat matches, which is dynamic and reactive. Athletes need to instantly integrate visual, auditory, and kinesthetic information to respond to attacks or find gaps in defense (Mann et al., 2007)

Furthermore, the physical conditions measured, such as agility and speed, may not directly correlate with concentration in this specific sport context. This suggests that the relationship between the two variables may be more complex and mediated by other, as yet unidentified, factors. Therefore, the measurement method used likely does not comprehensively capture the type of concentration relevant to dynamic performance in competition.

Overall, these findings imply that while physical condition and concentration are equally important, they may not have a simple cause-and-effect relationship. Improving the

performance of pencak silat athletes should involve training programs that focus not only on systematic physical improvement, as suggested by (Rohman & Effendi, 2019), but also on psychological interventions specifically designed to enhance concentration. Thus, coaches can design more holistic and comprehensive programs, in line with the recommendations of (Haidir et al., 2021), to address issues that may interfere with athletes' concentration.

Nevertheless, it cannot be ignored that good physical fitness—especially in terms of brain circulation and oxygenation—should theoretically support brain function, including focus and working memory. However, the results of this study show that physical exercise alone is insufficient to improve cognitive function without structured and sustained mental intervention. Therefore, both remain important components that must be trained in a parallel and integrated manner. A training program that focuses solely on the physical aspect will not prepare athletes for the psychological and cognitive pressures of competition. Therefore, a holistic training approach is needed.

Coaches are encouraged to incorporate cognitive exercises such as visual reaction, quick decision-making, and emotional control into physical training sessions. Exercises such as "dual-task training" (performing motor movements while completing cognitive tasks) or strategy games can provide a means of developing dual performance: physical and mental simultaneously.

Implications and Recommendations

Based on these findings, several important recommendations can be proposed. First, coaches are advised to design training programs that balance the development of endurance (VO_{2max}) and explosive components such as agility and speed. This is crucial so that athletes not only possess high aerobic capacity but also the ability to perform effective explosive movements within a short time (Haikal, 2017).

Second, agility-based training should be strengthened because this component has been shown to correlate positively with speed and reaction time. Programs such as ladder drills, cone drills, or reactive agility training can be incorporated into daily training routines (Sheppard & Young, 2006).

Third, to enhance concentration, the integration of cognitive training such as mindfulness meditation, mental visualization, breathing exercises, and neurofeedback-based focus training should be considered (Goldman & Rao, 2012). These strategies have been proven to support stress management and improve attentional capacity during competition.

Finally, further studies are recommended using a longitudinal approach with a larger sample size and additional measurements such as stress levels, self-confidence, and coping strategies. This would allow for a more comprehensive understanding of the relationship between physical condition and cognitive function in the context of athletic performance.

CONCLUSION

This study identified correlations among physical fitness components such as VO_2max , agility, reaction time, and speed in pencak silat athletes, but found no significant relationship between overall physical condition and concentration levels. These findings suggest that while increased aerobic capacity may influence agility and reaction time, concentration might be more significantly impacted by psychological factors or mental training. Therefore, the implications of this research emphasize the need for a holistic training approach in pencak silat that not only focuses on physical development but also integrates concentration enhancement through psychological strategies and mental training. Further research with longitudinal designs and larger sample sizes is necessary to explore this relationship in more depth.

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