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Pencak silat combat: dominant technique in national student competition based on gender and weight

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Abstract: This research analyses the technical actions of student Pencak silat athletes in national competitions. A total of 180 student-athletes (114 male, 66 female) were observed using notation system analysis in 90 game video recordings (57 male, 33 female). Punches (PT), round-kicks (RK), front-kicks (FK), sidekicks (SK), back-kicks (BK), slams (SL), cuts (CUT), and sweeps (SW) are recorded compared by gender and the results. The most used technique was RK (9.89 ± 4.68), followed by PT (7.12 ± 4.090), FK (4.30 ± 2.37), SK (3.31 ± 1.73), SL (2.09 ± 1.04), CUT (1.60 ± 1.53), SW

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(0.97 ± 0.83), and BK (0.15 ± 0.11). Female athletes were more likely to use CUT actions (1.60 ± 1.53) than male athletes ($p < 0.05$). Most technical measures had poor efficacy, and there were changes in PT, RK, FK, SK, BK, SL, CUT, and SW with moderate effect sizes (ES 0.1–0.8), resulting in a success: failure ratio technical action (1: 1.6). These findings suggest optimizing training techniques for accuracy, coordination, and technical skills because correct target contact will result in points.

Keywords: technical action; Pencak silat; combat category; student-athlete.

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1 Introduction

Pencak silat is a self-defence sport that has been officially competed for both at national and international levels (Subekti et al., 2020). Pencak silat competed in a multi-event competition for the first time at the highest event for the Asian continent, namely the 2018 Asian Games held in Indonesia. The existence of an internationalisation agenda for

sports that began in 1980 helped form an international Pencak silat organisation, namely PERSILAT (Inter-Nation Pencak Silat Association). One of the goals of internationalisation is to promote Pencak silat martial arts outside of its home region, namely Southeast Asia. This movement reaped significant results. In 2009, PERSILAT members increased to 39 countries from Asia, Australia, North America, and Europe. (Kartomi, 2011). To this date, Pencak silat through the organisation (PERSILAT) has been actively holding competitions regularly every year from regional to international levels (Soo et al., 2018). Apart from being one of the official martial arts sports competed at the international level, Indonesia as one of the countries that have a lot of potential athletes should be proud, apart from being officially competed at the 2018 Asian Games, the martial arts tradition from Indonesia has now been designated as 'Intangible Cultural Heritage' by UNESCO, at the 14th session; Intergovernmental Committee for the Safeguarding of the Intangible Cultural Heritage, which took place in the City of Bogota, Colombia in 2019 (Rohmana, 2019).

Pencak silat as a sport, has 2 competition categories, namely the art category and the combat category. The art category consists of three types of competition numbers; (singles, doubles, and squads), the three of them focus on standardised choreographic patterns and movements as well as the improvisation of movements designed by athletes themselves (specifically for doubles). The combat category is a full-body contact fight classified based on body weight, carried out on a mat measuring 8 metres in diameter (International Pencak Silat Federation, 2013). The Pencak silat combat category with full-body contact fighting characteristics requires an athlete to have good technical and physical qualities to support performance in matches. From the technical aspect, Pencak silat has a variety of techniques and moves, but not all techniques can be performed in official Pencak silat matches for the reasons of athlete safety. Judging from the scoring system, the martial arts competition in the competition category is given by a jury based on the type of technique displayed by the two athletes in competing. One (1) score for punch technique (PT), two (2) score for kick technique, and three (3) for drop type technique that is considered valid by the referee, while a technique that is preceded by parry will get a score (1+) of advanced techniques that hit a legitimate target (International Pencak Silat Federation, 2013). The technical actions that can be used in a match include punches and kicks (roundhouse, front, side, and back), and techniques for dropping the opponent consist of (slams, cuts, and sweeps). The implementation of the Pencak silat match is divided into three (3) rounds with the duration of each round being two (2) minutes and a pause of 45–60 seconds between rounds. The fighter must display a variety of techniques to carry out attacks on opponents, with targets that have been determined during the first, second, and third rounds. The accumulation of the total technical scores from the three rounds is one of the main factors determining an athlete's victory. Thus, the technical aspect becomes a very important component for athletes to generate value and win competitions at the same time.

The dominant technique that is often performed in competitions to score scores is closely related to the physiological ability and the effectiveness of an athlete's movement (Mardiato and Perdana, 2021). Given this, in the preparation of training programs, especially technical skills for young athletes, it is necessary to consider the characteristics of tactical techniques that are effectively used in competitions (Bompa and Buzzichelli, 2019; Capranica et al., 2010). The needs and demands of athletes' movement activities can be observed through field competition analysis, to find out relevant technical or tactical actions used in combat situations (Hughes et al., 2019). In the context of sports

coaching science, accurate information about the actions and movement activities that occur during the competition, such as; (Technique-tactics-time motion) is a problem that needs attention as a coach's consideration in compiling a measurable training program, to produce optimal performance (Amtmann, 2010; Lees, 2002; Tack, 2013). The need for studying activity and motion in a competition can provide useful information to improve the quality of athletes' technical, tactical, functional, and psychological development. (Smith, 2003).

Several martial arts sports have developed through a research approach that examines the characteristics of the activity or technical action, tactical action, time-motion analysis, and psychological athletes in combat in the arena. Martial arts have the characteristics of intermittent activity with dynamic movement patterns and high intensity so that in a fight an athlete is required to master complex technical skills and appropriate tactical abilities according to the conditions of the fight (Silva et al., 2011). analysed taekwondo battles in youth Olympic competitions that focused on analysing the technical-tactical aspects that occurred during the fighting phase (Tornello et al., 2014). The results of these studies indicate that technical actions during the fighting phase must be carried out appropriately to obtain value, and the effectiveness of the techniques performed will assist athletes in improving their defensive abilities and launching counterattacks on opponents. measures the activity of dominant movements that occur in official battles from the national to international Judo levels (Marcon et al., 2011; Miarka et al., 2012), anthropometric and physiological needs analysis of Muay Thai (Cappai et al., 2012; Silva et al., 2011), technical, tactical and physical requirements of karate (Laird and McLeod, 2009), boxing functional performance profile (Davis et al., 2013), time motion analysis. Analysis of combat carried out to measure the characteristics of physical action, techniques, and tactics in competitions, especially in martial arts, can be used as a reference for coaches to plan special sports training programs according to the demands of the actual match (Haddad et al., 2011; Kurniawan and Pudjianto, 2017). The training program that is structured should be able to simulate the characteristics of events by the demands of the real match. Special training models that reproduce the demands of competition can increase the physical action of the athlete and give the effect the athlete will be accustomed to technical movement frequency and motion time ratio in the competition (Ouergui et al., 2015; Subekti et al., 2021). Technical actions taken in competitions are always associated with physiological abilities and the effectiveness of movement to obtain value. An athlete must rely on his technical abilities in implementing an attack and defense pattern.

The lack of development through a research approach on the needs of activities and performance in real combat in Pencak silat is a factor in hampering the internationalisation process of Pencak silat. The prospect of Pencak silat towards the Olympiade is still being pursued. The highest achievement of Pencak silat in the international arena is the competition for Pencak silat at the multievent Asian Games event in 2018 for the first time. Researchers were only able to find two studies that discussed the demands of activities in Pencak silat competitions. First, a study conducted by Aziz et al (2002), investigated the physical performance in Pencak silat competitions at the level of elite athletes. They were the first to describe the physiological demands and physical profiles required in the real competition situation of the number-fighting Pencak silat. The study focuses on highlighting the characteristics of the physiological needs of athletes, while other indicators of technical action and performance such as (tactics) that are predominantly performed on match number Pencak silat athletes have

not been studied. Second, consider the complexity of movements involving tactical elements such as; attack, defend, and counterattack (Soo et al., 2018) and conduct further investigations to determine the performance characteristics of the fighting results in Pencak silat match numbers at the level of elite athletes, which are associated with performance indicators and match results. This study has described the technical aspects, but the absence of an explanation of the characteristics of technical performance in detail in martial arts matches based on gender (male and female) makes the development of more detailed research needed, given that the number of Pencak silat matches is differentiated by gender (Subekti et al., 2020)

Investigation through analysis procedures Technique action is a method used in the study of motion biomechanics as part of sports performance analysis (Lees, 2002). In addition, the identification of technical measures has the objective of descriptive analyses that can be used as a guide to improving the ability of athletes' technical actions. In the context of fighting sports (martial arts), technical action information is needed, especially as a consideration for coaches and scientists in developing training programs for technical skills development. Considering the importance of technical action as an indicator of achievement for an athlete and the lack of literature on the analysis of performance characteristics and action in Pencak silat competitions, especially in competition numbers, the research idea was raised with the aim;

1 conduct analysis of technical action ratios (success and error) in the official martial arts match of the match number

2 test the comparison of technical action based on gender and body weight during the match.

The findings of this study are expected to be a positive contribution and accurate information for coaches and scientists about the classification of technical actions in Pencak silat matches, and of course, can be used as a guide in the preparation of training programs based on gender (male and female) and differences in body weight.

2 Material and methods

2.1 Experimental approach to the problem

As is the case with accomplished martial arts sports in general, Pencak silat combat has the characteristics of open movement activities and full-body contact. Athletes in fighting are required to take technical skill actions to obtain value for a predetermined duration of time and round of matches. The technical interaction that occurs between the two fighters is a form of action-reaction attack and anticipation of the movements of the opponents competing in the battle phase, the analytical instrument in this study uses a technical action analysis system. (Table 1) based on the terminology of the Pencak silat competition regulations https://ipsf-persilat.org/ (International Pencak Silat Federation, 2013). The three categories of techniques in a Pencak silat fighting competition consist of

a PTs = punch techniques

b kick techniques (roundhouse, front, side, back)

c takedown (slam, cutouts, sweeps).

Table 1 System of action analysis of the technique of Pencak silat combat matches

Technique category	*Technique indicator*	*Description*
Punch	Punches	An attack technique using an arm with a hard-clenched fist
Kick	Round	The attack technique circularly uses the leg resembling the letter a kick on the target with the instep
	Front	The attack technique uses the leg straight forward with the target hit on the sole
	Side	The attack technique uses the legs sideways with the legs resembling the letter
	Back	The attack technique uses the legs by rotating with the impact on the toe
Takedowns	Slam	The technique of dropping the opponent is preceded by a catch (foot/hand)
	Cutouts	The technique of dropping the opponent is preceded by the process of attacking the lower part of the opponent (leg) with a cutting motion
	Sweeps	The technique of dropping the opponent is preceded by the process of attacking the opponent's bottom (leg) with a sweeping motion (front/back)

Source: International Pencak Silat Federation (2013)

Action analysis of video-based techniques of Pencak silat matches in the competition category recorded during the Student Sports Week competition. Video matches are selected through the selection stage, considering the quality and accuracy of the image that can be justified. Incomplete matches due to incident or disqualification are not included in the analysis process. A total of 180 athletes were analysed (n = 180) consisting of men: 64 matches in the lightweight category; (45–60 kg), and 50 games weight category weight class; (61–80 kg). while for women: 45 matches in the lightweight category; (45–60 kg) and 21 matches weight category weight class; (61–70 kg).

Analysis of the action of martial arts fighting techniques refers to the technical assessment criteria: point 1 (stroke), point 2 kicks (sickle, front, side, and back), and point 3 falls (throws, clippings, and strokes). In particular, the technical criteria that are recorded as research data are technical movements launched at the opponent's limb or legitimate target without being hindered by a block or not being able to be anticipated by the opponent. Observations of technical actions were carried out (success and failure) at each round of competition (1, 2, and 3), classified based on the sex of the athlete (male-female) and the success-failure rate of each technical indicator carried out during the competition.

2.2 Technical actions

The technical actions that were observed were all types of technical executions carried out during the match, both in the concept of defense and attack aimed at gaining points. Assessment criteria technical actions based on the rules of the competition category of martial arts, including

a PT

b kick technique, are classified based on the kick that may be taken in the match; roundhouse kick (RK), front kick (FK), side kick (SK), and back kick (BK)

c techniques for dropping opponents are classified into 3 types, namely: slam (SL), cutouts (CUT), and sweep (SW).

All technical actions performed by athletes (success and failure) in competing were recorded based on the athlete's gender category (male and female) and weight class category (light and heavy). Table 2 of the technical parameters observed in this study.

Table 2 The parameters for the assessment of the match technique of the combat Pencak silat

Technique's variable	*Males*		*Females*	
	Succeed	*Failed*	*Succeed*	*Failed*
Punch	All types of hits that enter the opponent's target area (points)	All types of strokes that do not enter the opponent's target area (no point)	All types of hits that enter the opponent's target area (points)	All types of strokes that do not enter the opponent's target area (no point)
Round	Type of circular kick (sickle) enters the opponent's target area (point)	The type of circular kick (sickle) does not enter the target area of the opponent (no point)	Type of circular kick (sickle) enters the opponent's target area (point)	The type of circular kick (sickle) does not enter the target area of the opponent (no point)
Front	The type of front kick enters the opponent's target area (point)	The type of front kick does not enter the opponent's target area (no point)	The type of front kick enters the opponent's target area (point)	The type of front kick does not enter the opponent's target area (no point)
Side	The type of sidekick enters the opponent's target area (point)	The type of sidekick does not enter the opponent's target area (no point)	The type of sidekick enters the opponent's target area (point)	The type of sidekick does not enter the opponent's target area (no point)

Source: International Pencak Silat Federation (2013)

Table 2 The parameters for the assessment of the match technique of the combat Pencak silat (continued)

Technique's variable	*Males*		*Females*	
	Succeed	*Failed*	*Succeed*	*Failed*
Back	The type of back kick enters the opponent's target area (point)	The type of backkick does not enter the opponent's target area (no point)	The type of back kick enters the opponent's target area (point)	The type of backkick does not enter the opponent's target area (no point)
Slam	This type of technique drops the opponent through the catch process and is validated by the referee/judge	This type of technique drops the opponent through a catch process that fails or is not validated by the referee/judge	This type of technique drops the opponent through the catch process and is validated by the referee/judge	This type of technique drops the opponent through a catch process that fails or is not validated by the referee/judge
Cutout	This type of technique drops the opponent with a leg cut and is validated by the referee/judge	This type of technique of dropping an opponent with a leg cut that failed or was not validated by the referee/judge	This type of technique drops the opponent with a leg cut and is validated by the referee/ |judge	This type of technique of dropping an opponent with a leg cut that failed or was not validated by the referee/ judge
Sweep	This type of technique drops the opponent with a sweep of the foot and is validated by the referee/judge	A technique of dropping an opponent with a foot sweep that failed or was not validated by the referee/judge	This type of technique drops the opponent with a sweep of the foot and is validated by the referee/judge	A technique of dropping an opponent with a foot sweep that failed or was not validated by the referee/ judge

Source: International Pencak Silat Federation (2013)

2.3 Participants

The University's Bureau of Research and Community Service has approved the implementation of this research by ethical standards in sports science research. 180 athletes who competed in the 2019 Student Sports Week in Jakarta, consisting of (114 males, and 66 females, aged 17–25 years) participated in this study, divided into 90 video recordings of matches (57 men's matches and 33 women's competitions). Participants are Pencak silat athletes at the student level as representatives of the teams of each university. All athletes have gone through the selection process for their respective university core teams and receive special mid-long-term training.

2.4 Procedures

There are 90 video records of fighting that took place in the Pencak Silat match held during the student sports week. During the fighting period, an experienced sports video operator simultaneously records two athletes competing. Analysis of the action video of the technique of Pencak silat matches using the Software Program (Dartfish Software Connect Plus 6.0; Dartfish, Fribourg, Swiss) with intervals; of 0.016 seconds (Tornello et al., 2014). To avoid mistakes, video match observation is carried out by 2 experienced observers for every match video. Each observer made 2 repetitions at a distance of 7 days from the first observation (Casolino et al., 2012). This was done to determine the objectivity of the assessment/recording from the results of observations of one of the video matches conducted by two experienced observers. Through statistical inter-rater analysis, there is no difference between observers (k = 0.81), this proves that the observation of the match video by two experienced observers can be used as an effective instrument to analyse the action of the Pencak silat match technique.

2.5 Statistical analysis

All research data were subjected to statistical analysis using SPSS software. Data are presented as mean ± SD frequency of engineering measures (percentage). The level of statistical significance was set at the alpha level $p \leq 0.05$. The Kolmogorov test is applied to evaluate data with normal distribution or not. Analysis of repeated measures of variance in subjects using the test (ANOVA) to identify differences in parameter measures of technique; The punches (PT), kicks (RK, FK, SK, BK), and takedown (SL, CUT, SW) that were taken during the match were associated with gender (male and female) and the success and failure rate. Levene's test for homogeneity of variance and Mauchly's test for roundness were applied to control for statistical assumptions. When multiple comparisons were made, the comparison of the least significant difference that Fisher protected post hoc with Bonferroni correction was used. To provide meaningful analysis for significant comparisons, the Cohen effect size (ES) (15) between groups was also calculated. ES < 0.2 is considered weak, from 0.3 to 0.6 as small, < 1.2 as moderate, and > 1.2 as large.

3 Results

Descriptions of technical action data from 45 national student Pencak silat competitions that were observed are presented in Table 3. It can be seen from the table that most significant comparison was in RK between male and female (D = 0.8). Meanwhile, for overall subjects, the frequency of technical action showed the RK 9.89 ± 4.68 was most often performed during the fight in the Pencak silat arena, followed by PT (7.12 ± 4.090), FK (4.30). ± 2.37), SK (3.31 ± 1.73), SL (2.09 ± 1.04), CUT (1.60 ± 1.53), and SW (0.97 ± 0.83), while BK (0.15 ± 0.11) was least technique being performed during a fight. The difference ($p < 0.05$) that appeared only in the CUT technique (1.60 ± 1.53) was related to gender, where female athletes performed the CUT technique more frequently than male athletes. Comparison between the results of the technical actions performed (succeed and failure), Table 4 shows a difference ($p < 0.001$, ES < 1.2), where all the failed techniques were higher than the successful techniques. The post hoc analysis

maintained moderate differences in PT, RK, FK, SK, BK, SL, CUT, and SW between succeed and failure with values (ES ranging from 0.1 to 0.8). The mean ratio of technical measures between (succeed and failed) (1: 1.6).

Table 3 Description of technical action data

Technical indicator	*Male*	*Female*	*Total*
PT	7.36 ± 3.99	6.73 ± 4.44	7.12 ± 4.09
RK	9.81 ± 4.69	10.01 ± 4.92	9.89 ± 4.68
FK	4.22 ± 2.51	4.42 ± 2.27	4.30 ± 2.37
SK	3.20 ± 1.74	3.50 ± 1.79	3.31 ± 1.73
BK	0.16 ± 0.12	0.12 ± 0.09	0.15 ± 0.11
SL	2.29 ± 1.06	1.78 ± 0.96	2.09 ± 1.04
CUT	1.98 ± 1.67	1.00 ± 1.06	1.60 ± 1.53
SW	0.96 ± 0.89	1.00 ± 0.78	0.97 ± 0.83

Source: data processing

Table 4 Comparison of technical result (succeed-failed) between gender on every motion

Technical indicator	*Male*		*Female*		*p*	*ES*
	Success	*Failed*	*Success*	*Failed*		
PT	3.10 ± 1.07	10.74 ± 2.64	3.57 ± 1.63	9.89 ± 4.11	< 0.001	0.6
RK	5.62 ± 1.08	14.00 ± 2.43	5.89 ± 2.08	14.13 ± 2.78	< 0.001	0.8
FK	2.44 ± 1.12	6.00 ± 2.24	2.37 ± 0.37	6.47 ± 0.99	< 0.001	0.6
SK	2.02 ± 0.80	4.37 ± 1.63	2.24 ± 0.94	4.76 ± 1.53	< 0.001	0.5
BK	0.13 ± 0.11	0.20 ± 0.14	0.06 ± 0.06	0.17 ± 0.10	< 0.001	0.1
SL	1.97 ± 0.67	2.61 ± 1.32	1.45 ± 0.46	2.12 ± 1.26	< 0.001	0.1
CUT	0.53 ± 0.18	3.43 ± 1.09	0.27 ± 0.15	1.72 ± 1.10	< 0.001	0.6
SW	0.35 ± 0.12	1.57 ± 0.92	0.30 ± 0.17	1.70 ± 0.35	< 0.001	0.6

Source: data processing

4 Discussion

This research focuses on identifying the attack techniques employed in Pencak Silat matches. Moreover, it delves into the outcomes of these attacks by assessing the succeed-failure ratio of each manoeuvre executed by athletes during the game. The study also investigates how the type of attack and its succeed-failure ratio correlate with the gender of the athlete, encompassing both male and female participants. The key findings of this study are as follows:

a the RK emerges as the most prevalent and dominant technique employed during combat

b notably, a disparity in the employment of the cutting technique (CUT) is observed, with female athletes exhibiting a higher frequency of use compared to their male counterparts

c a critical observation from the analysis is that the succeed rate of technical actions performed is lower than the failure rate.

On average, the succeed-failure ratio stands at 1:1.6. This implies that out of every 16 attempted attacks, only 10 are successful, leading to the addition of match points.

Drawing from existing literature in the realm of martial arts research, alongside the consideration of time-motion dynamics, there emerges a significant importance in assessing the frequency of common tactical attacking techniques. This assessment serves as a foundational benchmark for understanding the demands placed upon athletes during diverse battle scenarios (Amtmann and Berry, 2003; Barbas et al., 2011; Calmet et al., 2010; Chaabène et al., 2014; Miarka et al., 2015; Nilsson et al., 2002). Much like several other martial arts disciplines, combat-oriented martial arts involve a preliminary sequence of steps before engaging in an attack against an opponent. These steps serve to approach the adversary or fine-tune the attacking distance. Critical to this is the consideration of the opponent's positioning, which acts as a guiding indicator when selecting an effective attacking maneuver. The succeed of an attack hinges on its precision, making it challenging for the opponent to predict. Consequently, the greater the accuracy of attacks and their element of surprise, the higher the likelihood of influencing the match's outcome (Del Vecchio et al., 2011).

For athletes to excel in this context, a solid foundation of technical skills is imperative. Every technical action they undertake must be underpinned by exacting precision, considering both the efficiency of the movement itself and the strategic positioning of the opponent. Realising these competencies necessitates targeted training in specific technical skills and substantial exposure to competitive environments. These factors collectively contribute to enhancing the technical performance of young athletes.

Conducting thorough investigations into the distinct attributes and frequencies of dominant techniques utilised in competitive scenarios, particularly when considering gender-based disparities and the outcomes of attacking maneuvers, becomes an essential step in establishing a foundational reference for training programs. In Pencak Silat combat, categorisation extends beyond just weight, encompassing gender differences as well. Consequently, it becomes crucial to identify effective and efficient techniques tailored to each gender group's characteristics. In addition to the physical aspects, psychological factors also exert notable influence on decision-making abilities within the competitive arena. The responses exhibited are significantly impacted by variables such as stress levels, self-control capabilities, and the swiftness of coordinated reactions (Cortis et al., 2009). Furthermore, an athlete's performance hinges on a range of factors including agility, reaction speed, dynamic balance, and precision. These elements assume heightened importance in combat sports where the orchestrated execution of skillful actions must be repeatedly and adeptly adapted to the changing positioning of the opponent (Sadowski, 2005).

The combat situation for the martial arts sport of Pencak silat is limited to the time of each round of 2 minutes, with a total of 3 rounds, so athletes must be able to determine the type of technical action that is appropriate and relatively easy to do (Casolino et al, 2012). Even though in the context of choosing the type of technique to be displayed there is a contributing factor to the instruction from the companion coach, the decision is on the athlete to carry out the final execution according to the observation of the opponent. We found that in our investigation, attacks using the legs of the legs were more dominant than those of the other limbs. The RK is a common technique and is similar to other

martial arts kicking techniques. Relative types of kicks can be done easily and require a maximum speed factor, unlike other types of kicks, which are required to combine speed and strength, ultimately producing power and the effect of making the opponent bounce.

In terms of gender differences, this study shows that there are no significant differences in technical actions in student-level Pencak silat competitions. Student-level female athletes only do ground attacks more often with the cutting technique. This cutting technique is one of the techniques that most Pencak silat athletes are interested in. Apart from being easy to do, this technique can be an alternative to securing the points earned because according to the rules, the opponent cannot reciprocate. Until now, there have been no studies that specifically discuss this technique, but according to the observations of researchers, the cutting technique has a higher advantage than the disadvantage factor, besides being effective it can produce high scores, after the end of the movement the opponent is not allowed to attack or must stop the attack (International Pencak Silat Federation, 2013).

The level of success in technical action is an aspect of the judges' assessment of each match. All forms of technical action that hit a valid target will get points, while those outside the target will not. If no incident or TKO occurs, the final score is the accumulated number of points in rounds 1, 2, and 3 (International Pencak Silat Federation, 2013). We found that at student-level matches, the ratio of the failure rate in carrying out technical actions was higher than the success rate. This shows that accuracy, coordination, and agility still need to be improved. For this reason, coaches must apply training models for accuracy, accuracy, and effectiveness of movement so that in competitive situations the execution of techniques carried out is more effective, right on target, and saves energy.

5 Conclusions

Considering the results and discussion, in the context of developing young athletes, planning a skills training program is one of the important factors that must be followed up by coaches. The basic skills of athletes related to technical actions are very important, given that the elements of assessment in Pencak silat pay attention to what type of technique is used (punches = 1), (kick = 2), and (drops = 3). The findings of this study indicate that there is no difference in the frequency of technical actions during student-level competition between male and female athletes. The interesting thing is the frequency of the clipping technique, where female athletes do it more often than male athletes. The crescent kick technique is the highest and dominant action performed by athletes, while the BK technique is the lowest, where the structure of the BK movement has a very high level of difficulty. Facts in the battle arena, not all of the technical actions that were carried out succeeded in hitting the target and getting points. The ratio of failed techniques is higher than successful techniques (1.6: 1).

These results can be used as a source of information that needs to be considered by coaches in preparing technical training programs, especially for young athletes. Technical training programs need to focus on developing basic motor skills before building on more complex technical-tactical skills. The application of the technical training model needs to consider the dominant technical factors needed in gender-adjusted matches so that training targets will be easier to determine. Training development focuses on precise accuracy according to technical demands and physical components supporting the

performance of Pencak silat matches. However, this study only focused on technical factors, not involving other factors related to the characteristics of Pencak silat fights, such as; time movement intensity characteristics, and physiological and psychological responses. For this reason, further studies are needed to complement these findings to investigate more deeply the other factors that demand athlete performance in Pencak silat competitions.

6 Practical application

Due to the high failure rate of technical actions in student-level Pencak silat competitions, we advise coaches to focus more on training young athletes on exercises based on dexterity, coordination, dynamic balance, and accuracy of motion. The development of the training model to be applied needs to consider the dominant technical characteristics of each gender group so that selecting the type of technical action during combat is more effective, efficient, and able to be maintained up to the specified time limit. The training process must go through the correct stages, not instantaneously, so that the final result of technical skills is perfect and permanent.

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