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Efforts to increase Perisai Diri athletes' agility, speed, balance and flexibility components through shuttle run, zigzag run, and formation of 8 training method

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Abstract*:* The biomotor component is an important factor for an athlete, especially athletes from the Perisai Diri martial arts school, to achieve achievements in a competition. Agility, Speed, Flexibility and Balance are four biomotor components that are very dominantly used in the training process and are often used by martial art athletes in competitions. The aim of this research was to find out shuttle run, zigzag run, and formation of 8 training method influence agility, speed, flexibility, and balance in pencak silat athletes. This research is quantitative research, with a quasi-experimental design of three balanced treatments. The sample in this research was 45 athetes from the 80 total athletes in population that selected by purposive sampling, devided in 3 groups, each group consisting of 15 athletes. Agility, speed, balance, and flexibility obtained with a valid and reliable instrument. The data analysis used in this research is the Wilcoxon test and the Kruskal Wallis test. To measure improvement using different means. The standard significance of sat is p=0.05 (5%). The results of the research prove that there is a significant comparison between shuttle running, zigzag running, zigzag running with a combination of 8 numbers, for agility and speed ($p<0.05$), shuttle running is useful for improving balance and speed, zig-zag running is useful for improve dexterity and zigzag combines 8 figures which are useful for increasing flexibility. It can be concluded that there were significant differences between alternating training, zigzag running, and figure 8 formation running, especially in agility and speed. The back and forth running training method is useful for increasing balance and speed, the zigzag running training method is useful for increasing agility, and the figure 8 formation running method is useful for increasing flexibility.

Keywords: agility, speed, flexibilty, balance, pencak silat athlete.

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INTRODUCTION

The traditional martial arts of silat is one of the arts of Indonesia's cultural wealth which was preserved by the ancestors from ancient times to modern times and has spread to all layers of the world (Ivanto & Tuasikal, 2018). This is marked by various events that are contested both at the local, national and even international levels (Akbar & Hariyanto, 2022). Indonesia as the creator of this martial art, often gets various achievements from the various events it participates in (Alfira et al., 2022; Nezhad & Besharat, 2010).

Talking about achievement is closely related to the pattern of coaching and biomotor aspects in an individual, because these aspects are not trained and carried out properly, they will have a non-positive impact on the achievements that will be obtained (Zulyaden et al., 2022). His is evidenced by the results of Indonesian pencak silat achievements at the international pencak silat championships in Malayasia, where at first Indonesia was able to get 80-90% gold medals or 9-11 gold medals, but the Indonesian team suffered a setback, namely only being able to present 6 gold medals or 50% just. this

becomes an evaluation for administrators and even trainers to solve the problem. Because it is left alone, it will affect achievement in martial arts, thus creating a decline in performance in the future. Therefore, coaching athletes must pay extra attention to improve these achievements, because the better the pattern of attention and pattern of training will have a big impact on the achievement of Indonesian pencak silat athletes.

Correct coaching of athletes, definitely increases the performance of an athlete in a mature and consistent manner (Putri & Khamidi, 2021; Yu et al., 2022). Coaching an individual to become a professional athlete is one of the things that is highly coveted by a coach and an athlete, therefore coaching athletes must be done properly (Winarni et al., 2021). In all sports in the world, coaching for athletes applies the same thing, training for pencak silat athletes includes physical training and mental development for fighters, it's just that the methods used are different, for example in Europe they often use methods that are already technology-based and modern, while Asian countries still using traditional methods in the formation of biomotor components (Susanto et al., 2021). Physical coaching and development in supporting achievement is emphasized on the biomotor component abilities of an athlete, therefore things that must be paid special attention to are endurance, muscle strength, speed, muscle explosive power, agility, flexibility, balance, running is closely related to speed and walking. Fast, jumping is related to passing obstacles that train the muscle strength of a martial artist (Wali et al., 2022). The integration of the abilities possessed by a fighter will affect the achievement of the achievement targets desired by the team and the athlete concerned (Thiago A.G. et al., 2021). The achievement target for a fighter includes various elements of the body as a whole and good basic technical skills such as dodging/blocking, punches, kicks, dropping techniques and locking techniques in facing opponents in the arena of competition (Kuswanti et al., 2019; Tresnawati et al., 2022). In Pencak Silat, the physical condition of agility is very important, besides being supported by other elements of physical condition.

The background of this research is based on the reality that researchers found in the field based on direct interviews with two head trainers at the Perisai Diri student activity unit (UKM) who said that the biomotor components related to agility, speed, flexibility, and balance are still lacking, so they influence movements performed by an athlete. Because the components of agility, speed, flexibility, and balance are very necessary for a martial artist to carry out various movements, both attacking and defending. For example, agility is one of the factors that plays an important role for an athlete in carrying out a movement quickly and precisely, this is confirmed by research results Primasoni et al., (2022) which says that agility can be a benchmark for distinguishing a person's level of movement skills. Because it determines success in launching an attack, avoiding a blow and even the ability to avoid an attack from an opponent, a fighter can even counterattack against an opponent by paying attention to body points that provide value to the athlete (Antonietto et al., 2022; Gutiérrez-Santiago et al., 2020). The gaps in this research were based on the researcher's observations which found that the martial artists' abilities were still very low in relation to agility, speed, flexibility, and balance. Then the researchers conducted in-depth interviews with two main trainers, who provided information to the athletes that it was true that there were deficiencies in these components. The gaps in this research come from previous researchers Ansharudin et al., (2022) said that the agility component cannot be separated from speed. The relevant research in this research is Syahputra et al., (2022) who conducted research on the biomotor components of East Java PPLP pencak silat athletes including the components of agility, leg muscle power, endurance, speed, strength, and flexibility. The sport of pencak silat really requires excellent physical skills which include efforts to build attacks, create appropriate defense methods and even win matches in a match (Sulistyowati et al., 2022). The techniques that are often used by a silat fighter and can even be said to be the main components in a silat match, are kicking, hitting, parrying, dodging, jumping, slamming, and knocking down an opponent (Lubis et al., 2022; Sudiana et al., 2023). To become a strong fighter requires excellent physical condition which includes heart and lung fitness, muscle strength, endurance, flexibility and agility in addition to good coordination and skills and can also use weights, this is in line with research results (Nasrulloh & Wicaksono, 2020) which says that using weights as a tool to increase the strength of muscle function, in order to achieve goals such as improving physical condition, preventing injury, or for health purposes. The aim of this research is to find out whether the training methods used in this research influence agility, speed, flexibility, and balance in pencak silat athletes in student activity units.

METHODS

This quantitative research was conducted using a quasi-experimental three-treatment counterbalanced design (see Table 1). The sampling technique in this study used a purposive sampling method using several criteria (have been training for at least 1 year, joined and registered as a member of Perisai Diri, 3rd semester student, never took part in an official match). Based on the criteria, the total number of silat fighters was 80 people. The sample selected by this researcher was 45 fighters who met the criteria, while 35 fighters did not meet the criteria, then 45 fighters, each group consisting of 15 fighters. It is certain that the instruments used in this research are valid because the researchers did not create new instruments but used existing instruments. Automatically the instrument is suitable for use in research. While the supporting components are body weight measured by scales, height by anthropometric tape measure. Measurements were made before and after treatment. Pesilat receives treatment for 6 weeks with treatment time 3 times per week. Data analysis technique with Wilcoxon test and Kruskal Wallis test. The results of the treatment and the relationship between the effects are known by testing the differences between groups. To find out the increase or progress with the mean different. The significance limit of the statistical test results is p=0.05 (5%), if the value of p>0.05 = not significant and if the value of p<0.05 = significant.

Tabel 1. Research Design

X1 > X2	(back-and-forth practice group)
X3 > X4	(zig-zag training group)
X5 > X6	(8th and Z formation running training group)

RESULT AND DISCUSSION

A total of 45 athletes met the criteria and were willing to be subjects in this study. All subjects in this study were then carried out by simple randomization to divide the subjects into 3 training groups, namely back-and-forth running, zig-zag (z) running and number 8 formation running. totaled 15 people, and the number 8 formation running group totaled 15 people. Data on biomotor variables were obtained from measurements of flexibility, balance, agility and speed. Each subject was treated for 6 weeks, 3 times a week, starting with a pre-test and post-test after 6 weeks of treatment. Before being given treatment, the groups formed in this study were tested for differences first. The results of the difference test between the exercise groups were as follows: from the same basic ability (equivalent) for flexibility, at a balance of X2 = 10.476, with p = 0.005 where P <0.05 which means there is a significant difference between the three running training groups, on agility it was obtained 8.276 , with p=0.016 where P<0.05 which means there is a significant difference between the three running training groups, in speed it is 26.865, with p=0.001 where P<0.05 which means there is a significant difference between the three running training groups. From the above groups depart from unequal conditions for balance, agility and speed, but what is used as a basis for determining the pretest is the initial ability of the subject at that time, and what then becomes the reference for the final result is the percentage increase in the mean or mean difference achieved. Data analysis regarding the biomotor components after being given treatment can be seen in Table 2.

From the Kruskal Wallis test conducted, the X2 count was obtained as follows: In flexibility X2=0.583, with T=0.654 where P>0.05 which means there was no significant difference between the three running training groups. This means that the three groups depart from the same basic ability (equivalent) for flexibility, at a balance of X2=9.369 with p=0.005 where P<0.05 which means there is a significant difference between the three running training groups, at speed obtained 25.754 with p=0.001 where P <0.05 which means there is a significant difference between the three running training groups. From the above groups depart from unequal conditions for balance, agility and speed, but what is used as the basis for determining the pretest is the initial ability possessed by the subject before being given treatment in each method that has been prepared, so that the final result is the percentage increase in the mean or the mean difference achieved in this study. From the data in this study, the data analysis regarding the biomotor components of the subjects, in this case the pencak silat athletes, was measured after the subjects in this study were given treatment in the form of three test items that had been determined by the researcher.

Tabel 2. Differences in Pre-test Results

Group		Flexibility	Balance	Agility	Speed
Run back and forth	N	15	15	15	15
	Mean	4.51	1.49	1.87	1.36
	SD	0.50	0.63	1.12	0.59
Zigzag run	*N*	15	15	15	15
	Mean	4.51	3.05	2.69	2.49
	SD	0.50	1.50	0.87	0.53
Run in a figure 8 formation	*N*	15	15	15	15
	Mean	4.30	2.23	2.16	1.79
	SD	0.48	1.10	1.13	1.88
Statistics count	*X2*	0.583	9.369	7.986	25.754
	T	0.654	0.005	0.014	0.001
	*T**	P>0.05	P<0.05	P<0.05	P<0.05
Information		Not significant	Significant	Significant	Significant

Inter group exercise test

Table 3 shows the Wilcoxon test conducted, Z = -0.16 was obtained in the alternating running group, with P = 0.271 where p> 0.05 which means there was no significant difference in the alternating running group before and after treatment. From the Wilcoxon test conducted, Z = -0.18 was obtained in the zig-zag running group, with P = 0.319 where p> 0.05 which means there was no significant difference in the zig-zag running group before and after treatment. From the Wilcoxon test conducted, it was found that Z = -1.40 in the zigzag running combination number 8 group, with P = 0.213 where p <0.05 which means there was a significant difference in the zigzag running group with number 8 before and after treatment.

Tabel 3. Differences in Pre-Post Test Results on The Flexibility Component

Group		N	Mean	SD	F	T	T*
Run back and forth	Pre-test	15	4.51	1	-0.16	0.271	P>0. 05
	Post-test	15	3.43	0.23			
Zigzag run	Pre-test	15	4.51	1.10	-0.18	0.319	P>0. 05
	Post-test	15	2.01	0.50			
Run in a figure 8 formation	Pre-test	15	4.30	1.48	-1.40	0.213	P<0.05
	Post-test	15	2.00	0.40			

Table 4 shows the Wilcoxon test conducted, it was found that F = -0.13 in the alternating running group, with T = 0.005 where p <0.05 which means there was a significant difference in the alternating running group before and after treatment. From the Wilcoxon test conducted, it was obtained T = -0.19 in the zig-zag running group, with P = 0.319 where p> 0.05 which means there was no significant difference in the zig-zag running group before and after treatment. From the Wilcoxon test conducted, it was found that F = -2.124 in the zig-zag running group with the number 8 combination, with T = -0.91 where p <0.05 which means there was a significant difference in the group running with the number 8 formation before and after treatment.

Tabel 4. Differences in Pre-Post Test Results on The Balance Component

Group		N	Mean	SD	F	T	T*
Run back and forth	Pre-test	15	1.49	1.63	-0.13	0.005	P<0.05
	Post-test	15	3.00	0.55			
Zigzag run	Pre-test	15	3.05	1.50	-0.19	0.319	P>0. 05
	Post-test	15	1.34	0.30			
Run in a figure 8 formation	Pre-test	15	2.23	1.10	-0.91	0.213	P<0.05
	Post-test	15	1.51	0.79			

Tabel 5. Differences in Pre-Post Test Results on The Agility Component

Group		N	Mean	SD	F	T	T*
	Pre-test	15	1.49	1.63	-0.13	0.005	P<0.05
Run back and forth	Post-test	15	3.00	0.55			
Zigzag run	Pre-test	15	3.05	1.50	-0.19	0.319	P>0. 05
	Post-test	15	1.34	0.30			
Run in a figure 8	Pre-test	15	2.23	1.10	-0.91	0.213	P<0.05
formation	Post-test	15	1.51	0.79			

Tabel 6. Differences in Pre-test and Post-test Results of the Speed Component

Group		N	Mean	SD	F	T	T*
	Pre-test	15	1.36	2.20	-0.43	0.017	P<0.05
Run back and forth	Post-test	15	0.40	0.59			
Zigzag run	Pre-test	15	2.49	1.67	-0.19	0.15	P>0. 05
	Post-test	15	1	0.53			
Run in a figure 8	Pre-test	15	1.79	2.47	-0.91	0.019	P<0.05
formation	Post-test	15	1.19	1.88			

Table 5 shows Wilcoxon test conducted, it was found that F = --0.43 in the alternating running group, with T = 0.014 where p <0.05 which means there was a significant difference in the alternating running group before and after treatment. From the Wilcoxon test performed, it was found that F= -0.19 in the zig-zag running group, with F = 0.219 where p <0.05 which means there is a significant difference in the zig-zag running group before and after treatment. From the Wilcoxon test conducted, it was found that F = -1.027 in the group zig-zag running combination number 8, with T = 0.017 where p> 0.05 which means there was no significant difference in the zig-zag running group combining number 8 before and after treatment. From the Wilcoxon test conducted, it was obtained F = -0.43 in the alternating running group, with T = 0.017 where p> 0.05 which means there was no significant difference in the alternating running group before and after treatment. From the Wilcoxon test conducted, it was found that F = --0.19 in the zig-zag running group, with T = 0.15 where p>0.05 which means there was no significant difference in the zig-zag running group before and after treatment. From the Wilcoxon test conducted, it was found that F = -0.91 in the zig-zag running group with a combination of number 8, with T = 0.019 where p> 0.05 (see table 6) which means there was no significant difference in the group running with the number 8 formation before and after treatment.

Tabel 7. Differences in Post-test Results

Group		Flexibility	Balance	Agility	Speed
	N	15	15	15	15
Run back and forth	Mean	4.43	1.00	1.40	1.10
	SD	0.231	0.401	0.108	0.11
Zigzag run	N	15	15	15	15
	Mean	3.79	2.30	2.45	2.11
	SD	0.151	0.120	0.061	0.191
Run in a figure 8	N	15	15	15	15
formation	Mean	4.89	2.00	1.18	1.79
	SD	0.012	0.109	1.004	1.051
	X2	0.816	18.916	15.251	25.754
Statistics count	T	0.413	0.003	0.012	0.001
	T*	P>0.05	P>0.05	P<0.05	P<0.05
Information		Not significant	Not significant	significant	significant

The Kruskal Wallis test carried out, the X2 count was obtained as follows: In flexibility X2 = 0.816, with T = 0.413 where P> 0.05, which means there was no significant difference between the three running training groups. This means that the three did not experience a significant difference while being

given running training, at a balance of X2 = 18.916, with T = 0.003 where P> 0.05 which means there was no significant difference between the three running training groups, at agility = 10.940, with p = 0.004 where P <0.05 which means there is a significant difference between the three running training groups, at speed = 28.051, with p = 0.001 where P <0.05 (see table 7) which means there is a significant difference between the three running training groups.

Percentage of Increase in Biomotor Components

Different results were obtained in each group of alternating running, zig-zag running and formation 8 running. The components of flexibility, balance, agility and speed experienced differences between and between groups. For this reason, it can also be seen from the mean different changes in each treatment group. Table 8 shows that the highest percentage increase in flexibility was found in the number 8 formation running group, with a percentage of 9.01%, for balance the highest percentage was in alternating running, with a percentage of 16.49%, in agility the highest percentage was in zigzag running zag, with a percentage of 31.17%, the highest percentage of speed is in the back and forth run, with a percentage of 6.19%.

Tabel 8. Percentage of Increase in Biomotor Components

Group	Biomotor Components	Early Period	End Times	Mean Different	Percentage Ascension (%)
Run back and forth	Flexibility	4.50	4.30	-0.12	-4.96
	Balance	1.81	2.20	1.11	61.50
	Agility	1.89	2.19	0.27	14.21
	Speed	1.29	1.50	0.11	6.19
Zigzag run	Flexibility	4.50	4.59	0.12	3.01
	Balance	3.04	3.50	0.4	16.49
	Agility	2.60	3.61	0.87	31.17
	Speed	3.20	2.90	0.23	5.8
Run in a figure 8 formation	Flexibility	4.20	4.40	0.2	9.01
	Balance	2.51	3.20	0.76	32.27
	Agility	3.10	3.23	0.23	5.25
	Speed	2.70	2.70	0.11	4.51

The hypothesis in this research is that the four biomotor components, if trained using the method used in this research, will have a good impact on the abilities of pencak silat martial arts athletes. So, researchers conduct experiments using this training method and hypotheses or temporary answers will be answered through this research. Agility is an indicator of an athlete's physical condition to be able to perform well in a match (Gulia & Dhauta, 2019; Panasiuk et al., 2022). The agility component can help an athlete change direction and body position quickly and precisely when carrying out a movement without losing balance (Panasiuk et al., 2021). Agility is the main factor for every athlete, especially pencak silat, to carry out evasive techniques when their opponent attacks (Bazarov, 2022). Because the speed factor will influence the attacks carried out by a fighter, because agility is not good, the athlete in question will be hit repeatedly and will result in points for the opposing athlete (Liu & Jia, 2023). This is confirmed by the research results Muthiarani & Lismadiana, (2021) found that shadow training methods using sequential step techniques and cross step techniques had the same effect in increasing foot movement agility. The agility component training program is an unavoidable part of overall physical fitness, and agility is the most important part that must be trained continuously to obtain a good level of ability (Čaprić et al., 2022; Yılmaz, 2022). Because a good level of agility greatly influences an athlete's high speed and accuracy in carrying out various attacks on the opponent (Chomani et al., 2021). Agility not only play a role in maintaining stable physical fitness, but agility is very important for an athlete in avoiding attacks from opponents in a match.

The comparative data in the research is clearly visible in the research results before and after experiments were carried out on all samples in this research using the training method in this research. The initial test results are very different from the final test results. The four biomotor components that were the focus of this research had very significant comparative values before the subjects were given treatment. The agility component is closely related to flexibility and balance (Zhao et al., 2022). The components of flexibility and balance will support the agility component of an athlete in carrying out

movements, because flexibility is an athlete's ability to move parts of his body in one space of motion with an unlimited range of motion, of course the athlete is not easily injured in dominant body parts such as joints. , muscles and bones (Rodineau, 2020). The biomotor component of flexibility makes it easier for an athlete to use their best energy and abilities in launching an attack on an opponent to gain points (Turnagöl et al., 2022). This also applies to the balance component, balance is an action carried out by an athlete to maintain the body when carrying out a movement (Mocanu et al., 2022). Therefore, agility, balance and flexibility are one of the keys that will produce other components such as speed, coordination and stable endurance for a professional athlete (Lee et al., 2022). Therefore, an athlete's efforts to improve these components must be carried out through the training process using appropriate methods, especially the most important and dominant components in the martial art (Fikri et al., 2022).

Through the training methods used in this research, it was proven to improve the biomotor abilities of four pencak silat athletes at UKM Perisai Diri. This justification is supported by the results of data analysis in table number 6 which describes in detail the four fighter biomotors after experimenting using the training methods used in this research. The justification for this research was supported by the research results which are presented in table 7 in this research. Thus, agility training methods include running back and forth, zig zag running, figure eight running, squat pushing, jumping exercises, running up and down stairs which were used in this research. but can also be trained on other components such as speed, flexibility, endurance, balance, and coordination. However, this research only covers flexibility, balance, agility, and speed. In this study there were significant differences in the components of agility and speed in the three groups, there were no differences in the components of flexibility and balance. With numbers X2 agility = 10,940 ($p<0,05$), X2 speed = 28,051 ($p<0,05$), whereas X2 flexibility = 3,951 ($p>0,05$), X2 balance = 5,065 ($p>0,05$). In the differences between groups, there were significant differences in the training group running formation number 8 for flexibility, the group running back and forth and zigzag running in combination with number 8 for balance, and the group running back and forth and zigzag. zag running group for the agility component. In calculating the mean percentage increase, the highest percentage increase in flexibility was found in the number 8 formation running group, with a percentage of 9,09%. Meanwhile, the highest percentage of balance is found in running back and forth with a percentage 74,51%. Meanwhile, the highest percentage of agility is found in zigzag running with a percentage of 33,21%. Meanwhile, the highest percentage of speed is found in back and forth running with a percentage of 8,84%.

The consideration of this research was carried out by researchers because the fighters in the student activity unit need this training method to be applied in every training session. Another consideration from this research was that training methods are really needed for silat fighters to improve the abilities of various biomotor components, especially the dominant biomotor components which are often used in pencak silat martial arts, in this case the Shield Self style. This research was carried out because previous researchers had not found this research in student activity unit. Then for prospects and research, researchers really hope that this training method could be applied universally in all sports that use biomotor components such as speed, endurance, agility, coordination, explosive power and so on. The researchers hope that researchers in the future can use more complete training methods to improve various basic components of martial arts athletes. The researcher realizes that research is not perfect, so the researcher really hopes that this research can be continued by other researchers.

CONCLUSSION

From statistical calculations, it was concluded that there were significant differences between alternating training, zig-zag running and figure 8 formation running, especially in agility and speed ($p<0.05$). The back and forth running training method is useful for increasing balance and speed, the zig-zag running training method is useful for increasing agility, and the figure 8 formation running method is useful for increasing flexibility. All methods are very useful for professional athletes in training and improving the quality of various biomotor elements. The suggestion from the researchers is that trainers must provide training methods that are more than one training method and do not focus on just one biomotor component, but can do more than one biomotor component which is really needed by athletes.

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