

PROCEEDING

OF

THE 3rd INTERNATIONAL SEMINAR ON SPORT AND PHYSICAL EDUCATION

"Striving For World Sport Achievements Through Sport and Physical Education"

Faculty of Sport Science, Yogyakarta State University

Yogyakarta, May 24, 2011



In Cooperation :



Yogyakarta State University



ISORI DIY



Ministry of Youth and Sports
Republic of Indonesia

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PENCAK SILAT ENDURANCE TRAINING (In Dept Overview On Pencak Silat Athlete)

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ABSTRACT

I will begin this paper by discussing the term of Pencak Silat, Pesilat, and Tanding category that used specific in this kind of martial arts. Pesilat is a term for the person or the athlete, while kategori tanding refer to the Pencak Silat fighting categorization. The competition in Pencak Silat divided into four, namely Tanding category, Tunggal category, Ganda category and Regu category. Pencak Silat competition for Tanding category was done in three parts, every part needs two minutes so the time accumulation in one competition would be 10 minutes 15 minutes or less. The accumulation of the fighting in average will be 14-20 repetitions in one part of competition. It is needed the ability of aerobic and anaerobic endurance for Pesilat Tanding category are able to make more faster and everlasting motion.

Based on the using of predominant energy, endurance which used in Pencak Silat for competing category is anaerobic endurance. Though, aerobic endurance still needed for the Pesilat Tanding category as the basic training in anaerobic energy system so it can recovery quickly and can make the highly intensity movement without exhaustion. To train the aerobic endurance can be done in several ways: (1) slow continuous running, (2) fast continuous running, (3) jogging, (4) interval training, and (5) speed play/fartlek. Moreover, anaerobic endurance can be done as follows: 1) acceleration sprint, (2) hollow sprint, (3) interval training, and (4) sprint training. It will better to make some modification on the training to avoiding feeling bored on Pesilat.

Keywords: Pencak Silat, Endurance, Training,

INTRODUCTION

In each appearance of athletics, all athletes want to reach optimal achievement. Because of that, it is needed mature plan in the effort to reach the goal. By mature plan, it is expected to assist coach and also athlete in making and determining target of practice program which is applied during exercise.

In applying a physical exercise program must be considered as a primary factor and primal which is needed in practice to reach optimal achievement. Main goal of practice is to to improve functional potency of athlete and develop ability of bio-motor to the highest standard. Bio-motor defined as the ability of human motion which is influenced by condition of inside organ systems, among others: system of neuromuscular, respiration, digestive, circulation of blood, energy, bone, and joint (Sukadiyanto, 2005). According to Bompa (1994) fundamental component of sportsman bio-motor cover the strength, endurance, speed, coordination, and flexibility. The other components represent the combination some components so that make another term, such as: agility and power. Power is combination or the result of speed and strength, while agility represents alliance of coordination and speed.

Pencak Silat Tanding category is a body-contact sport so that possibility injure in competition relatively high. For that, Pesilat must have ability of good physical so can perform optimal during competition. Quality of physical for example is determined by muscle fitness and energy fitness. According to Sharkey (1986), energy fitness is components of energy source result the motion which consist of capacities of areobic and of anaerobic. As for

muscles fitness is the overall components of bio-motor covering strength, endurance, speed, power, flexibility, balance, and agility (Sukadiyanto, 2005).

According to Awan Hariono (2006), component of bio-motor truly needed in Pencak Silat, such as: endurance, strength, speed, coordination, and flexibility. But, it doesn't mean that the other bio-motor components aren't needed in Pencak Silat. Bio-motor components like power, stamina, agility and balance represent combination of some bio-motor components. It means that if bio-motor component trained it will produce power, stamina, balance, and agility automatically. For example: (1) In training speed, it will automatically train power bio-motor component, (2) Form of speed practice with short distance and always different direction will make agility component, (3) In training strength, bio-motor component is also trained automatically, and (4) Agility component represents combination speed element, flexibility, and coordination. Thereby, every practice which entangling speed component, coordination, and flexibility will automatically form the agility.

Pencak Silat Competition for Tanding category is done in three parts, with interval time between part is 1 minute. Every part in Pencak Silat competition needs 2 minute clean. It means when referee discontinue competition, that time doesn't include in competition time. Besides that, calculation for Pesilat which fall because valid attack doesn't include in calculation time of competition (Persilat, 2001). Thereby, competition time is the total of effective time during competition, which is started by command "start" until "finish" so that the accumulation time in one competition can reach 10 minute up to 15 minute.

Attack which performed in Pencak Silat for Tanding category is told having efficiency and effectiveness movement when it can be done swiftly and making expected score. Attack technique can obtain score if enter the target area by using power and do not block by defense and or capture of opponent. Multiple attack must arrange consecutively and interdependent by various way to the target as much as possible four attack types (Persilat, 2001). As the accumulation average fight 14 - 20 times during one part competition (Awan Hariono, 2006). For that, Pesilat must have ability to maintain the quality of movement during competition so can perform optimally.

To make movement quickly, repeatedly and in long period is needed ability endurance of aerobic and anaerobic from Pesilat. According to Awan Hariono (2006) in Pencak Silat Tanding category needs 73,75% system of energy ATP-CP, 16,25% system of energy LA-O₂, and 10% from oxygen (O₂). Based on the using predominant energy system, so the endurance which used in Pencak Silat Tanding category is anaerobic though aerobic endurance is still needed for Pesilat Tanding category as the base to train system of anaerobic energy so it can recovery swiftly and can move with high intensity without experiencing of fatigue. Besides that, aerobic exercise will assist to strengthen ligament, tendon, and muscle fibers so it can reduce possibility injure during practice or competition.

ENERGY SYSTEM OF PENCAK SILAT TANDING CATEGORY

Elementary principles of Pencak Silat Tanding category are making attack by using blow technique and swift kick and hard kick at certain target so the opponent cannot refrain and reciprocation and also do good up-fall-out technique or down-fall-out which is ratified by jury and referee. According to Persilat (2001) Pencak Silat Tanding category is competition which presenting two fighters from the different group and each other dealing with by using defense element and attack, that is deflect, evade and attack at the certain target and also drop the opponent.

So, to make defense and attack technique, a Pesilat must master techniques in Pencak Silat well and right. For that, it is needed by domination of technique in Pencak Silat through the long period time practice process and done regularly, in program, and measure. Thereby, to master movement technique in Pencak Silat is needed good bio-motor component. Bio-motor component is needed in Pencak Silat, such as strength, speed, power, flexibility, agility, and coordination.

Competition Pencak Silat for Tanding category is done in three part, with interval time between part during 1 minute. Every part in competition Pencak Silat needs 2 minute clean. During competition, accumulation average fight 14 - 20 times in one part (Awan Hariono, 2006). From observation, average time in working to fighting in Pencak Silat competition is needed around 3-5 second. While multiple attack must be arranged regularly and respectively by many ways to the target as much as 4 various offensiveness (Persilat, 2001). It means that when in last attack (each Pesilat make 4 attack types) foot can be arrested by opponent and don't make fallout, so accumulation time during the process is maximal 10 second.

Based on the description above, the system of energy which needed is a-lactic anaerobic system (ATP-CP), because working time only needs maximal 10 second. This is consistent with the system of a-lactic anaerobic system. The features of a-lactic anaerobic system are: (1) maximal working intensity, (2) time working for about 10 second, (3) rhythm explosive working (sudden quickly), and the activity produces ADP and energy (Soekarman, 1991).

To determine component type of bio-motor needed, it is important to know characteristic of athletic branch will be trained based on competition time, kinds of motion, and rhythm movement during competition. According to Awan Hariono (2006), accumulation time during competition can be counted as follows: (1) time which used in three parts is 480 second, (2) in doing attack for every part is needed average time 126 second, (3) recovery in every part is about 234 second, (4) interval between each parts is 120 second. So, the percentage of time during competition is 26,25% for fighting (t. work), 48,75% for recovery between fight, and 25% for interval between part. For that, the total of rest time actively or passively is 73,75%, while total effective time for fighting during competition is 26,25%.

Based on total percentage time during competition, dominant energy which used in Pencak Silat Tanding category is 73,75% aerobic and 26,25% is anaerobic. But if seen from the using of energy in fighting (in working), so the dominant energy is anaerobic system. For that, in Pencak Silat needs 73,75% energy system ATP-CP, 16,25%, energy system LA-O₂, and 10% from oxygen (O₂). Because of that, in fighting is used average 3 second, so the energy which used in fighting more dominant use alaktik anaerobic energy system (ATP-CP). But that way, in Pencak Silat needed good aerobic ability although only 10%. Thereby, the endurance ability which is needed in Pencak Silat Tanding category is anaerobic endurance.

ENDURANCE UNDERSTANDING

Endurance exercise has the influence to quality system of cardiovascular, exhalation, and blood circulation system so the process accomplishment of energy during activity can done well. Thereby, endurance component is very needed in athletic branch of Pencak Silat. Because of Pesilat having good endurance component, beside it can work longer and do not easy to feel tiredness also can recovery by their self.

Endurance is ability of body equipment to fight against fatigue during activity take place. According to Sukadiyanto (2005), the advantage for sportsman who owning good endurance, such as: (1) Adding ability to do activity continuously with high intensity in a long time, (2) Adding ability to make recovery time shorter, and (3) Adding ability to accept heavier and vary burden. Thereby, the advantage for Pesilat who owning good endurance components are: (1) Can determine game pattern and rhythm during competition, (2) Can keep or change game pattern and rhythm as wanted, and (3) Have the energy fight and do not easy to surrender during competition.

KINDS OF ENDURANCE

Evaluation from the variety, endurance can be differentiated into two, they are general endurance and special endurance. General endurance is ability in working by entangling some muscle group or all muscle group, nerve center system, neuromuscular, and cardio-respiration in long time. While special endurance is the endurance which entangled a group of local muscle. General endurance entangles all organ potency in body as the basic of

endurance type, so it is needed by all athletic branches as the basic to develop special endurance. For that, before train special endurance must be started by training the general endurance.

Evaluation from the duration working, endurance is differentiated as: (1) long-range endurance, (2) medium-range endurance and (3) short-range endurance (Sukadiyanto, 2005). The features endurance from its working time shall be as follows: (a) long-range endurance is endurance which needs more than 8 minute time, so the requirement of energy is fulfilled by aerobic system (O_2), (b) middle-range endurance is endurance which needs between 2 until 6 minute time so the requirement of energy is fulfilled by LA- O_2 and O_2 system, and (c) short-range endurance is endurance which needs between 45 second until 2 minute time so the requirement of energy is fulfilled by ATP-CP system.

Based on predominant energy system which used, endurance can be differentiated in to two, they are: (1) aerobic endurance, it is ability of respiration system and heart in answering the demand of oxygen at muscle to burn glycogen in order to become the source of energy; and (2) anaerobic endurance (lactic and a-lactic), it is processed accomplishment of requirement energy in body to burn glycogen in order to make power source out of the existence of outside oxygen aid (Levisohn and of Simon, 1984).

THE METHOD OF ENDURANCE EXERCISE

Energy which needed in Pencak Silat Tanding category is ATP-CP 73,75%, LA- O_2 16,25%, and O_2 10% (Awan Hariono, 2006). So the endurance priorities in Pencak Silat Tanding category are short-range endurance and middle-range endurance. But the long-range endurance is still needed, because the system of aerobic energy is still needed aerobic in Pencak Silat though only 10%. For that, aerobic system is needed to be given as the foundation to train anaerobic system. In line with Sharkey's opinion (1986) to reach top position must be started from development of aerobic ability, sill stimulate anaerobic (anaerobic-threshold), anaerobic exercise, and the top is speed to reach highest achievement.

To determine the method of endurance exercise, it is important to know about exercise principles to develop endurance both aerobic and anaerobic, such as: (1) in early practice have to do warm-up (warming-up) and the end of practice is given the refrigeration (cooling-down), (2) Pesilat must have good fitness (good VO_2 max), (3) maximum Heartbeat have to know previously, (4) To increase ability of aerobic, exercise intensity 60-90% or heartbeat is 140-150/minute, (5) To increase ability of anaerobic, exercise intensity of sub-maximum heartbeat is 180/minute (or more), (6) For children, aerobic exercise may not be abundant, and (7) Minimum endurance exercise program is done in 40 minute up to 1 hour, with follows period frequency: (3 times in a week at transition period until early preparation, twice a week at preparation period, once a week at early period competition, and once in 2 week at competition period).

To make simply in determining exercise type, this is table of some exercise method and percentage of development energy of Bowers and Fox.

Table 1. Some exercise method and percentage of development energy of Bowers and Fox.

EXERCISE METHOD	EXERCISE FORM	% DEVELOPMENT		
		ATP-CP	LA-O ₂	O ₂
Acceleration Sprint	Sprint 40-100 meter. Starting from jogging faster and faster till <i>sprint</i> by longer step	90	5	5
Continuous Faster	Long distance run in quick rhythm	2	8	90
Continuous Slower	Long distance run in slow rhythm	2	5	93
Interval Sprinting	Sprint 40m, do interval by jogging 60m. Total distance is 3.000 m	20	10	70
Hollow Sprint	Sprint by interval of walking and jogging continuously: 50m <i>sprint</i> , 50m walking, 50m jogging, and back to sprint 50m	85	10	5
Interval Training	Interval between run Set I 4 x 200m, t = 0:27 Set II 8 x 100m, t = 0:13 Set III 8 x 100m, t = 0:13	10-30	30-50	20-60
Jogging	Run in slow rhythm till medium rhythm, the distance is 6000m or run in more than 30 minute	-	-	100
Repetition Running	Same with interval training, but t working and t recovery is longer	10	50	40
Speed Play (Fartlek)	Jogging 5-10 minute, walking and jogging 5 minute by interval sprint 50-60 meter.	20	40	40
Sprint Training	Run in maximum speed to pass between 40-50 meter. Repetition 16-20 times. t. recovery and t. interval is complete (ratio 1: 4-5)	90	6	4

Source: Bowers and Fox (1988: 231)

From some exercise methods and percentage of development energy Bowers and Fox, so the developments in applying the method in exercising Pencak Silat Tanding category, some of it are:

a. The Method of Aerobic Endurance Exercise

Exercise method which can be used to increase aerobic endurance, such as: (1) *continuous slower*, (2) *continuous faster*, (3) *jogging*, (4) *interval training*, and (5) (*speed play/fartlek*).

b. The Method of Anaerobic Endurance

Exercise methods which can be used to increase anaerobic endurance are: *acceleration sprint*, *hollow sprint*, *interval training*, and *sprint training*.

1) Acceleration Sprint Method

It is started from jogging faster and faster until sprint by lengthening step. Travel distance is adapted by periodicals of exercise.

2) Hollow Sprint Method

Sprint with interval of walking and *jogging* continuously: 50 m *sprint*, 50 m walking, 50 m *jogging*, just maintain it until limitation target.

3) Interval Training Method

Actually, the interval training is endurance exercise method which can be used to increase aerobic and anaerobic endurance. To differentiate is in setting-up between exercise time and rest time. Interval method of training can be grouped into three, they are: long-interval training, intermediate-interval training, and short-interval training.

a) Long-Interval Training

Though the long-interval training is more dominant to increase aerobic endurance, but it takes effect to the increase of anaerobic endurance. The menu of long-interval training shall be as follows:

- Intensity : 85-90%
- t. work : 2-5 minute
- Recovery : 1:1 'till 1:2
- Interval : 2-8 minute (active)
- Repetition : 3-12

b) Intermediate-Interval Training (Aerobic and Anaerobic)

Duration in this exercise is shorter than long-interval training, but exercise intensity is improved so it can improve aerobic and anaerobic endurance. The menu of intermediate-interval training shall be as follows:

- Intensity : 90-95%
- t. work : 30 second - 2 minute
- Recovery : 1: 2 'till 1: 3
- Interval : 2-6 minute (active)
- Repetition : 3-12

c) Short-Interval Training (Anaerobic): Pre competition until competition

Short-interval training is tend to anaerobic endurance, because the aim of this exercise is specially to increase muscle power. Short-interval training also improves aerobic endurance though relatively small.

The menu of short-interval training shall be as follows:

- Intensity : > 95%
- t. work : 5 – 30 second
- Recovery : 1: 3 'till 1: 5
- Interval : 15 – 150 second
- Repetition : 5 - 20

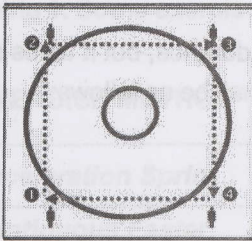
4) Sprint Training

This exercise method is more proper to be applied in the period of pre competition up to competition. The form of sprint training is run in maximum speed, pass through over short (30-50m), and done repeatedly (repetition: 16-20). The menu of training sprint shall be as follows:

- Intensity : 100%
- Distance : 40 meter (variation)
- Volume : 4 set with 4 repetitions (16 repetitions)
- Recovery : complete (1: 4 - 5)
- Interval : complete (1: 4 - 5)
- Frequency : 3x/ week

c. The development of the Anaerobic Endurance Model for Pesilat Tanding Category

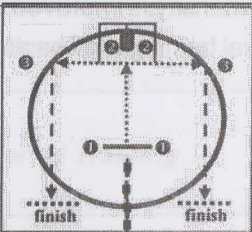
Dominant endurance which needed in Pencak Silat competition is anaerobic endurance, though aerobic is still needed. So, to train the endurance for Pesilat must be adapted in the real condition of competition. These are the examples of endurance exercise which can be done in Pencak Silat arena:



Sequence of Execution:

- From post ① Pesilat makes combination attack to the post ②
- From post ② Pesilat *jogging* to the post ③
- From post ③ Pesilat make combination defense to the post ④
- From post ④ Pesilat jogging back to the post ①
- Do that continuously for 1-2 minute based on the period time.
- The movement can be started from all post

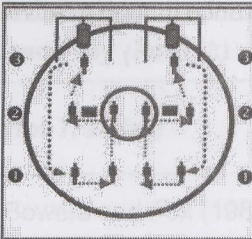
Image 1. Attack combination, defense, and jogging by forming the square



Sequence of Execution:

- From ① (limit line), Pesilat *sprint* to the ② (samsak) and doing attack on samsak (4 kinds of attack)
- Next, Pesilat run sideway to the ③ (anomalous sequence to the right and even sequence to the left or on the contrary)
- Next, from ③ Pesilat does the counter attack to the finish line
- Next, Pesilat entering ①, back sequence waits for the innings
- Do it for 3-4 minute (10-20 repetition) or suited with period time.

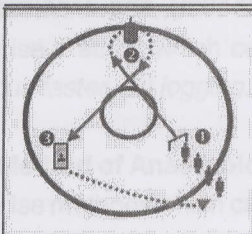
Image 2. Sprint combination, attack, and counter attack



Sequence of Execution:

- Entering the sequences ① moves to ② holding the *punch-box*, Pesilat at ② who hold the *punchbox* doing attack in the *punchbox*, Pesilat entering ② who doing attack moves to ③ attacking on the samsak
- Next, Pesilat entering ③ moves to ① doing *sparing*
- Do it in 4 – 8 parts (every parts 2-3 minute), it accomodated with the competition rules

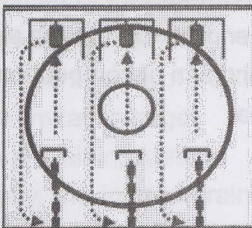
Image 3. Sparing combination, punchbox, and samsak with circuit method



Sequence of Execution:

- Pesilat jumps ① (gate) with both backfeet at the same time and sprint to the ② (samsak)
- After runs around in ② (samsak), Pesilat sprints to the ③ and attacks 4 times on the punchbox
- Next, jogging to the back Pesilat to wait for innings
- Do it for 4-6 sets (10-20 repetition) or it is accommodated with period time

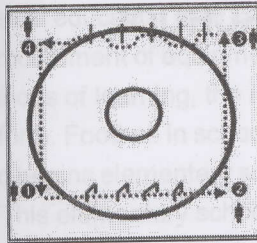
Image 4. Jump combination, sprint, and technique



Sequence of Execution:

- Pesilat jumps the wicket with two feet at the same time, then *sprint* to the samsak and attacks on the samsak.
- Next, Pesilat run to the last back to wait for inning
- Do it for 4-6 sets (10-20 repetition) or its accommodated with period of time

Image 5. Jump combination, sprint, and technique



Sequence of Execution:

- From ① Pesilat jump to the wicket by using two back feet to the ②
- From ② Pesilat do attack combination to the ③
- From ③ Pesilat does zigzag run to the ④
- From ④ Pesilat do defense combination to the ①
- Do repeatedly for 1-2 minute based on period time.
- Movement can be started from all posts

Image 6. Jump combination, defense, zigzag, and defense by forming square

Images above are some examples of model exercise to increase anaerobic endurance for Pesilat Tanding category. Each coach can make more various exercise models without disregarding target and target based on exercise program. Variation exercise is very important to avoid of boredom athlete during exercise process. Thereby, Pesilat can accept every burden which given by coach optimally based on applied program.

CONCLUSION

Ability of aerobic endurance and anaerobic endurance is very needed by Pesilat Tanding category. Besides assisting to strengthen ligament, tendon, and muscle fibers, aerobic endurance is needed as the basic to train system of anaerobic system so it can recovery swiftly and can move in high intensity without experiencing of fatigue. To increase aerobic endurance can be done by as follows: (1) slow continuous running, (2) fast continuous running, (3) jogging, (4) interval training, and (5) speed play/fartlek.

Pencak Silat Tanding category needs 73,75% system of energy ATP-CP, 16,25% system of energy LA-O₂, and 10% from oxygen (O₂). Based on the using of predominant energy system, the endurance which used in Pencak Silat Tanding category is anaerobic endurance. For that, in training component endurance for Pesilat must be adapted with the real condition in competition. To train anaerobic endurance can be done as follows: (1) acceleration sprint, (2) hollow sprint, (3) interval training, and (4) sprint training. Besides that, coach can vary the model of anaerobic endurance exercise which matched with the characteristic of Pencak Silat Tanding category.

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