10th International Conference on
BUSINESS, ECONOMICS AND SOCIAL SCIENCES

Venue: The Jayakarta Lombok Resort, Lombok, Indonesia
24th to 25th April 2018

Receipt No. 127 Date 24-4-18

Received with thank from MANSUR

Address .....

NINE HUNDRED ONLY the sum of US $

..... on account of Registration Fee for the 10th ICBESS-2018

organized during 24th to 25th April 2018 at Lombok, Indonesia.

US $ 900/-

by Cash/M.O./Cheque/D.D.

No. _____

Date _____

Vijay Kumar Jha
Conference Organizer (ICBESS-2018)
Academic Research Foundations (India)
New Delhi

Vijay Kumar Jha
(Conference Organizer)
10th ICBESS-2018,
The Jayakarta Lombok Resort, Lombok, Indonesia
C/o Academic Research Foundations
New Delhi (India)

Man In India, 98 (1) : 195-206

THE EFFECT OF COMPLEX TRAINING MANIPULATION ON VO2 MAX

Mansur

Background: The physical condition is an important component and the basis for the development of techniques, tactics, strategies and mental development. Application of appropriate training methods will greatly affect the development biomotor and reduce the risk of injury. **Purpose:** (1) Effect of Pyramid Complex Training (PCT) on VO_2 max, (2) Effect of Square Complex Training (SCT) Exercises on VO_2 max, and (3) Differences in Effect of Pyramid Complex Training (PCT) and Square Complex Training (SCT) to VO_2 max. **Methodology:** This study used quasi experiment design with two group pretest posttest design. The population of this study is a new student of Sport Training Program (PKO) 2013 which is 21 non Athlete. Based on the ranking of the T score pretest the subject is divided into 2 groups, PCT group (11 people) and SCT Group (10 people). **Result:** The research findings showed that: (1) there was no significant influence of Pyramid Complex Training (PCT) manipulation on VO_2 max, with a significance value of 0.055> 0,05; (2) no significant effect of Square manipulation Complex Training (SCT) to VO_2 max, with a significance value of 0.240> 0.05; (3) there was no significant difference between Pyramid Complex Training (PCT) training and Square Complex Training (SCT) to VO_2 max. **Conclusion:** Complex Training Manipulation Training (Pyramid Complex Training (PCT) and Square Complex Training (SCT)) are less effective to improve VO_2 max.

Keywords: Pyramid complex training, Square complex training, VO_2 max

I. INTRODUCTION

The physical capacity of the athlete is an important element in the success of sporting achievements. It involves a large number of different capacities, with aerobic capacity being the main component (Rankoviæ, et al., 2010). New regulations and fierce competition require the exceptional aerobic capacity of every athlete. Sports competition is a test of ability and physical athlete capacity test. Aerobic capacity is an integral indicator of the functional capacity of all systems involved in the supply, transport and energetic transformation of oxygen (cardiopulmonary capacity, functional capacity of muscle to produce ATP in the presence of oxygen). The functional impairment of each link in the chain to some extent may affect the decrease in the physical capacity of the athlete (Ranković, *et al.,* 2010).

Aerobic endurance (VO2 max) is a very important foundation and is considered the best indicator of individual cardiorespiratory capacity, determined by the availability of oxygen, involving the transport components of oxygen pathways including ventilation, cardiac output, conductance of oxygen diffusion of the lungs, conductance of muscle oxygen diffusion, and hemoglobin concentrations (Osteras, Hoff, and Helgerud., 2005). According to Dalleck, and Dalleck., (2008), VO2 max is the highest level of oxygen can be taken and consumed by the body during

* Universitas Negeri Yogyakarta, *E-mail: mansur@uny.ac.id*

intense exercise. Traditionally, the magnitude of one's cardiorespiratory fitness has been accepted as a characteristic of athlete endurance and the overall health symbol. Increased VO2 max has long been considered an important attribute needed for success in endurance related events. Mierke, (2006) states that the higher the max VO2 an athlete, the greater the contribution of aerobic systems to producing energy. This means that having a greater endurance will be able to complete high intensity physical exercise repeatly.

Physical and conditioning training becomes a very important part in the life of athletes, especially the sports that maintain the performance. Aerobic endurance becomes the foundation in the development of anaerobic endurance. Foundation is the basic structure that must be met for development at a high level. If the structure is weak, it will affect the development of the next stage. High aerobic endurance (VO2 max) will determine the peak performance of athletes in the future. VO2 max is an essential component that is essential for the development of other components, such as agility, power, speed and anaerobic resistance. Weak aerobic endurance will be a barrier to the development of anaerobic resistance. While the dominant energy system in competitive sport is largely anaerobic, including forward, backward, sideways motion at high speed (agility), power-jumping, repetitive power endurance and maintained in a relatively long time (anaerobic endurance). The development of more interesting training methods poses challenges to the sports coaches so as to stimulate the development of aerobic endurance to a minimum level of need and more importantly the development of power, agility, speed and anaerobic durability.

II. STUDY REFERENCE

VO2 Max

Endurance is associated with the ability to perform large, dynamic, medium to high intensity for long periods of time. Relating to that endurance depends on the cardiovascular, respiration and muscle system. Bompa, T.O. (2009) states that there are four factors that make up the athlete's resistance ie 1) the spirit (willpower), 2) aerobic capacity, 3) anaerobic capacity and 4) speed reserve. Endurance becomes an important biomotor component and is key in achieving competitive sporting achievements.

Endurance is the length of time displaying performance at a certain intensity. Komi., (2003) defines the ability to fight fatigue. In this case the factors that limit the performance of endurance are fatigue. Besides, the power of tahanjuga influenced by the speed, muscle deployment, skills and psychological aspects.

Aerobic Endurance

The term "maximal oxygen uptake" was first created by Hill and Herbst in 1920. They postulate that there is an upper limit for the absorption of oxygen and that

there are differences between individuals in VO2 max. Also, they theorize that high max VO2 is required for success in long-distance running and that VO2 max is limited by the ability of the cardiorespiratory system to transport oxygen to the muscles (Bassett and Howley, 2000).

Aerobic capacity is another term of cardiac endurance (cardiorespiratory endurance) or cardiovascular fitness or aerobic fitness, ie the functional ability of the heart's lungs to supply oxygen for long-term muscle activity (Wilmore, et al., 2008). Sharkey (2003: 351) defines aerobic fitness as the maximum ability of cardiorespiratory function to inhale, circulate and utilize oxygen. Based on these definitions can be summarized that aerobic fitness is the ability of heart lung function to inhale or take some oxygen, circulate and utilize it for the process energy formation. Someone who has good aerobic fitness, will not quickly experience fatigue after doing a series of work, which means able to do the exercise with a higher intensity. Besides, it also accelerates the recovery of exercise and match. According to Wilmore, *et al.* (2008) among the fitness components, the heart-lung resistance is a very important component, because the endurance of the lungs is needed for the smooth functioning of the oxygen transport system and nutrients in the body to meet energy needs.

Traditionally, VO2 max has been seen as a key component of success in long duration exercises (Bassett & Howley2000). However, more recently researchers have proposed that the lactate threshold is the best and most consistent predictor of aerobic endurance performance. Research studies have repeatedly found a high correlation between aerobic endurance such as running, cycling, fast road race and teady-state maximals workload with lactate threshold (Chandler, and Brown., 2008). At rest and steady-state exercise, there is a balance between lactate production and the removal of blood lactate (Brooks: 2000). The lactate threshold refers to the intensity of the exercise that there is a sudden increase in blood lactate levels if the intensity increases.

Some experts argue that the intensity of exercise that greatly increases VO2 max is 75-85% maximum pulse rate. Bassett, and Howley, (2000) say that the relatively high intensity of exercise (above 85% maximal pulse rate) will positively affect the shift of the anaerobic deflection point to the aerobic. Lance, *et al.* (2005), stated that aerobic endurance exercise negatively affects the production of lactate and is positive for the ability to remove lactate. Decrease in lactate production after endurance exercise may contribute to an increase in mitochondrial size, number of mitochondria, and mitochondrial enzymes. The combined result of the adaptation of the exercise is to improve the ability to generate energy through mitochondrial respiration, thereby decreasing the amount of lactate production in the given workload. Chmura and Nazar, (2010) argue that aerobic endurance exercise not only improves exercise tolerance due to its effect on metabolism, but also facilitates psychomotor performance during strenuous exercise. From a practical point of

view it is important that athletes who are able to maintain high-level psychomotor skills beyond the onset of blood lactate acid (OBLA) are at the domin of the intensity of strenuous exercise. It means that physical exercise improves performance resilience along with shifting the threshold of psychomotor fatigue toward the intensity of work to a higher level.

The law of practice says that Intensity is inversely proportional to volume, meaning that the athlete will not be able to maintain a long duration when the intensity is relatively higher. Conversely, at the intensity of exercise is athlete able to maintain the duration of exercise is relatively longer. Some experts also say that the intensity of exercise is relatively high (aerobic) more influence on stroke volume (stroke volume). Moderate duration intensity exercise is more influential in increasing blood volume, capillary density, number and size of mitochondria in muscle cells.

Cardiac function and the ability to deliver oxygen throughout the body can be enhanced by resistance training. The increased size of the heart, thicker and stronger causes the heart to be more efficient. Based on some of these definitions can be interpreted that aerobic fitness is the ability of heart lung function to inhale or take some oxygen, circulate or transport and utilize it for the process of energy formation. Someone who has good aerobic fitness, will not experience fatigue soon after doing a series of work, for example when climbing up and down stairs from the ground floor to the third floor will not be exaggerated panting. The quality of aerobic endurance is expressed by VO2 max, indicating the maximum amount of oxygen consumed. Stephen, (2005) states that VO2 max is the maximum oxygen volume the body consumes during intensive training at sea level with units (ml / kg / min). Consumption of linear oxygen with energy expenditure so that the measurement can be done indirectly (indirectly measuring). Bompa, (2000) states that achievement of durability is strongly influenced genetically. This is reinforced by the assumption that the proportion of slow muscle fibers and fast muscle fibers greatly determines the potency of the endurance.

Increasing the max VO2is an important step in maximizing the power performance in each event takes place more or more minutes. The higher the VO2max an athlete, the greater the contribution of the aerobic system to energy production. This means that a greater power of decay will be able to complete high intensity physical exercise over and over (Powers, and Howley, 2004).

Anaerobic Endurance

The term threshold batamba was introduced in 1960 based on the concept that in high intensity exercise, it causes low oxygen content in muscle (Chandler, and Brown., 2008). At this point, to continue the exercise, the required energy supply shifts from the aerobic energy system (respiration mitochondria) to the anaerobic energy system (glycolysis and phosphagen systems).

The definition of anaerobic threshold is related to exercises involving large muscle masses, therefore the concept of anaerobic thresholds only applies to whole bodies when most muscle mass is large. To understand the concept of anaerobic thresholds, it is important to understand the metabolic system that provides energy during exercise (Svedahl, and MacIntosh., 2003). Technically, if "anaerobic metabolism" is defined as charging ATP without the use of oxygen, anaerobic level phosphorylation substrate will be considered. These include reactions related to creatine kinase, glycolysis, and the Krebs cycle. Because oxygen absorption measurements allow accounting for some of these steps, the presence of glycolytic activity is not necessarily evidence that exercise has exceeded the limits of aerobic (Svedahl, and MacIntosh., 2003).

Complex Training

Complex training is a relatively new method of training and is the concern of practitioners and sports scientists. Complex training training methods are methods devoted to developing power. It is also called a combination method or a combined method of weight training and pliometric training. More specifically, complex training is a physical exercise method that combines weight training and pliometric training, the combination of both types of exercises is biomechanically similar.

Practitioners generally use either of these two methods of weight training or pliometric training. Weight training is a physical training method designed to develop athletic performance. Weight training programs can be designed to meet the needs of specific physical training, based on the nature of the training of the sport so as to enable control over the progress of the physical exercise program through volume manipulation, intensity, frequency, and duration of exercise.

Muscles have a natural tendency to rebound when stretched quickly (eg rubber band). Theoretically, the faster the eccentric contraction, the more likely the stretch reflex is activated. For a truly pliometric activity, there must be a movement beginning with the action of eccentric muscles. Pliometric training can promote changes in the neuromuscular system that allow people to have better muscle contraction control.

In principle, complex training is a training method that combines high intensity load training methods and pliometric training methods. With regard to the study of complex training training, it includes two methods of training, there are:

Pyramid *Complex Training* (PCT)

PCT is a modified training method developed from the training of complex training. In principle, PCT is no different from complex training training. Since complex training is a combination of weight training and pliometric exercises performed at the same session, PCT also follows that rule. Modification and development of PCT focuses on aspects of pliometric training. The pliometric training involves a

series of one leg lateral jump, rope-hurdle side jump, side-box combination jump, twist jump (± 450) and twist knee tuck jump (± 900).

Exercise	*Reps*	*Rest/Set*
Half Squats	1 × 8RM	
	3 minutes	
One leg lateral jump	1× 6	30 seconds
Rope-hurdle side jump	1× 8	30 seconds
Side-front box jump	1× 9	30 seconds
Twist jump (45^0)	1×11	30 seconds
Twist knee tuck jump(90^0)	1× 12	30 seconds
	3 minutes rest	
Half Squats	1 × 6RM	
3 minutes rest		
One leg lateral jump	1× 6	30 seconds
Rope-hurdle side jump	1× 8	30 seconds
Side-front box jump	1× 9	30 seconds
Twist jump (45^0)	1× 11	30 seconds
Twist knee tuck jump(90^0)	1× 12	30 seconds
	3 minutes rest	
Half Squats	1 × 4RM	
	3 minutes rest	
One leg lateral jump	1× 6	30 seconds
Rope-hurdle side jump	1× 8	30 seconds
Side-front box jump	1× 9	30 seconds
Twist jump (45^0)	1× 11	30 seconds
Twist knee tuck jump(90^0)	*1× 12*	*30 seconds*

Square Complex training (SCT)

In principle, SCT is no different from the usual training training, while combining the load and pliometric exercises that are carried out in the same session. Modification and development of SCT focuses on aspects of pliometric training as well. The pliometric training involves a series of one leg front jump, side jump, front box jump, hurdle side jump, and knee tuck jump. All obstacles are placed across the right and left of the subject.

Exercise	*Reps*	*Rest/Set*
Half Squats	1 × 8RM	
	3 minutes	
One leg front jump	1× 10	30 seconds
Side jump	1× 10	30 seconds
Front box jump	1× 10	30 seconds
Hurdle side jump	1× 10	30 seconds
Kknee tuck jump(90^0)	1× 10	30 seconds

	3 minutes rest	
Half Squats	1 × 6RM	
3 minutes rest		
One leg front jump	1× 10	30 seconds
Side jump	1× 10	30 seconds
Front box jump	1× 10	30 seconds
Hurdle side jump	1× 10	30 seconds
Kknee tuck jump(90^0)	1× 10	30 seconds
	3 minutes rest	
Half Squats	1 × 4RM	
3 minutes rest		
One leg front jump	1× 10	30 seconds
Side jump	1× 10	30 seconds
Front box jump	1× 10	30 seconds
Hurdle side jump	1× 10	30 seconds
Kknee tuck jump(90^0)	*1× 10*	*30 seconds*

III. RESEARCH METHOD

3.1. Scope and Types of Research

The present study was a quasi experimental research design with two groups pretest posttest design. This research has two variables, that is independent variable and dependent variable. The independent variable in this research is Pyramid Complex Training (PCT) and Square Complex Training (SCT) training, while the dependent variable is VO2 Max.

3.2. Population and Sample Research

The study population was the new students of Sport Coaching Education Study Program (PKO) of 2013. Based on the ranking of the pre-test T score, the subjects were divided into two groups, that is PCT (Pyramid Complex Training) group and SCT (Square Complex Training) group. The PCT group was treated by combination of 8 RM, 6 RM, 4 RM weight training and plyometrics with pyramid system (6 contacts lateral single leg jump, 8 contacts side jump, 10 contacts box's jump, 12 contacts twist front jump and 14 contacts twist tuck jump), The SCT group was treated by combination of 8 RM, 6 RM, 4 RM weight training and plyometrics with square system (10 contacts single leg jump, 10 contacts side jump, 10 contacts front box's jump, 10 contacts hardle front jump and 10 contacts tuck jump). The training was conducted in three training sessions per week for 7 weeks.

3.3. Data Collection and Data Analysis Technique

The type of research data is quantitative data obtained from VO2 max test. The data were analysed by using t-test, which was previously carried out by normality and homogeneity tests.

IV. RESEARCH RESULTS AND DISCUSSION

Before stepping into the t-test, there is a requirement that must be fulfilled by the researcher is the data analyzed must be normal distribution, therefore it is necessary to test normality and homogeneity test.

Normality Test

TABLE 1: NORMALITY TEST RESULT

Group	*P*	*Sig.*	
PCT			
Pretest VO2 max	0,945	0,05	Normal
Posttest VO2 max	0,997	0,05	Normal
SCT			
Pretest VO2 max	0,999	0,05	Normal
Posttest VO2 max	0,860	0,05	Normal

Based on table 1, the data result showed that all data has a value of p (sig.) > 0.05, then all of data has normal distribute.

Homogenity Test

TABLE 2: HOMEGENITY TEST RESULT

Group	*Sig.*	
PCT		
Pretest-Posttest VO2 max	.378	Homogen
SCT		
Pretest-Posttest VO2 max	.603	Homogen

Based on table 2, the data result showed that all data has a value of p (sig.) > 0.05, so the data are homogeneous.

Testing of research hypothesis is done based on result of data analysis and interpretation t test analysis. The sequence of results of hypothesis testing is adjusted with the hypothesis, as follows:

TABLE 3: RESULT OF PAIRED T TEST FOR PCT AND SCT GROUP

Item	*Mean Difference*	*p*
PCT	2,654	0,055
SCT	1,89	0,240

Based on table 3, the data result showed a statistically not significant effectiveness PCT (p= 0,055) to improve VO2 max, and not significant effectiveness also showed on SCT group (p=0,240). That means both of PCT and SCT not significant effectiveness improve VO2 max.

In addition, statistically no significant difference was found between the PCT (M=2,654) and SCT (M=1,89), P value= 0,210 for the VO2 max. Data analysis result of difference between PCT and SCT on table 4.

TABLE 4: RESULT OF INDEPENDENT T TEST FOR VIDEO AND SCRIPT IMAGERY

Item	*Mean*	*p*
PCT	2,654	0,210
SCT	1,89	

DISCUSSION

The results showed that PCT and SCT manipulation had no significant effect on the increase of VO2 max (P> ½ α = 0,025). The average increase in PCT manipulation (2.65) is greater than that of SCT (1.89). The cardiopulmonary adaptation to chronic strength exercises is minimal and varied depending on the specific protocols used. A similar opinion was given by Chandler, and Brown. (2008) that cardiovascular adaptation is due to minimal load training and depends on the manipulation of weight training. Still according to Chander and Brown, (2008) adaptations are more on the morphological aspects such as the time and diameter of the left ventricle, and the thickness of the left ventricular wall and the thickness of the septum.

The maximum aerobic capacity of the top athlete is achieved between 17-22 years, after which the linear decreases with age. Training at age above 22 years can not expect significant improvement in VO2 max. After age 22 the possibility of VO2 max increase is only 10% (Rankoviæ, et al., 2010). The investigation of maximal oxygen uptake (VO2 max) provides relevant data on player health, planning and follow-up of training effects, also useful for athlete selection. For this reason, an increase in the VO2 max value reflects the athlete's physical performance indicators indispensable to reach the upper limit of sports achievement.

Some experts argue that the intensity of exercise that greatly improves VO2 max is 75-85% maximum pulse rate. Holly (2001: 452), argues that exercises to improve heart lung resistance is recommended intensity 75-85% maximal pulse rate and duration of exercise 20-60 minutes of persesi. American College of Sport Medicine (2006) recommends frequencies 3 - 5 times per week, intensity 60% - 90% HRmax or 50% - 85% VO2 max, duration 15-60 minutes, depending on the intensity used. Exercise with the intensity of 75% HRR will increase the heart rate until it reaches Cardiovascular endurance zone or aerobic exercise treshold, which in turn will increase the activity of cardiorespiration system such as increased blood circulation, stroke volume, heart rate frequency and cardiac output. Continuous, tiered and sustained exercise over a period of time will lead to positive adaptation of the heart muscle so that the work of the cardiorespiratory system is more efficient. This is in line with Djoko P's dissertation (2009) that low intensity

weight training circuits respond to a higher heart rate increase making it more significant in increasing VO2 max than in jogging exercises for people with overweight. Bassett, and Howley, (2000) say that the relatively high intensity of exercise (above 85% maximal pulse rate) will positively affect the shift of the anaerobic deflection point to the aerobic. Other researchers have suggested that the onset of blood lactate acid (OBLA) 4mM is the best predictor of endurance performance. To know how the response of PCT and SCT training methods can be seen in Figure 1 as follows;

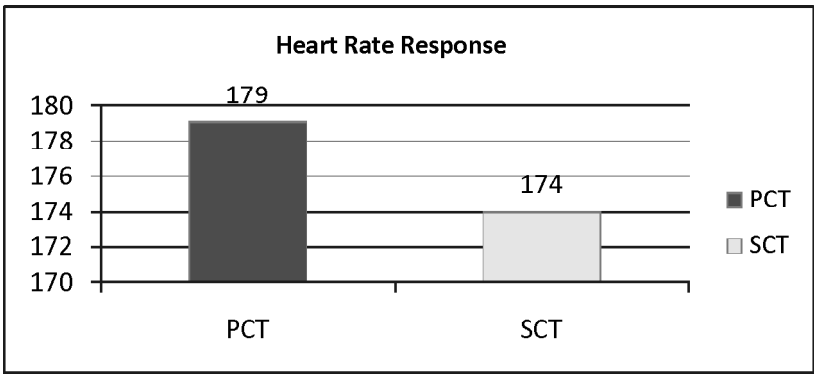


Figure 1: Heart Rate Response Postpartum Training

In this study, the PCT training method had a higher DJ response (179 times per minute) than the SCT training method (174) (Figure 5.7). Based on the theoretical and experimental studies the above experts indicated that the PCT training method further increased the VO2 max from the SCT training (Figure 5.5), albeit statistically insignificant with the error rate ½ $\alpha = 0.025$. According to Shephard (2008), Factors that affect maximal oxygen consumption (VO2 max) in healthy adults are age, gender, heredity, body composition, training conditions and exercise methods. One of the training methods that can be proposed to maintain and increase VO2 max is to manipulate the intensity and volume of exercise approaching the OBLA limit of 4 mMol. From the intensity side (Figure 5.6) shows that both exercise intensity variables can stimulate the cardiorespiration system to the OBLA limit of 4 mMol (75-85% maximal heart rate).

Shephard (2008) summarizes cross-sectional studies showing that aerobic ability declines steadily in men, with mean values in the region of 45 ml / kg / min at age 20 and about 25 ml / kg / min at 60 years. In inactive women, Shephard also noted that aerobic ability began to decline at 35 years of age from about 38 ml / kg / min and about 25 ml / kg / min at 60 years of age. Consecutive approaching 44% and 34% loss of aerobic endurance in both men and women. The decrease in VO2 max with age varies greatly, possibly due to decreased maximal heart rate, stroke

volume (blood pumped per pulse), free fat mass, and oxygen extraction on cells (arteriovenous oxygen difference). The maximum aerobic capacity of the top athlete is achieved between 17-22 years, after which the linear decreases with age. Training at age above 22 years can not expect significant improvement in VO2 max. After age 22 the possibility of VO2 max increase is only 10% (Ranković, *et al.,* 2010). The subject age in this study is 18-22 years old, in theory the age is within the gold age limit for the development of VO2 max.

As already known that resting heart rate for trained athletes is lower than those of untrained athletes. In theory a poorly trained athlete is more easily increased than a trained athlete. In this case the SCT group (Figure 5.8) should have a better effect than the PCT group.

V. CONCLUSION

Based on the reseach result and discussion there are several conclusion:

1. There was no significant influence of Pyramid Complex Training (PCT) manipulation on VO_2 max, with a significance value of 0.055> 0,05
2. No significant effect of Square manipulation Complex Training (SCT) to VO_2 max, with a significance value of 0.240> 0.05
3. There was no significant difference between Pyramid Complex Training (PCT) training and Square Complex Training (SCT) to VO_2 max

References

Bassett, D.R., Jr., and Howley, E.T., (2000). Limiting factors for maximum oxygen uptake and determinants of endurance performance. *Medicine and Science in Sport and Exercise,*32(1),70-84.

Bompa, T.O., (2000). *Total Training for Young Champions.* United States of America: Human Kinetics.

Bompa TO, and Haff GG., (2009). *Periodization: Theory and Methodology of Training*. Champaign, IL: Human Kinetics Publishers.

Brooks, G.A., (2000). Intra- and extra-cellular lactate shuttles. *Medicine and Science in Sport and Exercise*, 32 (4), 790-799.

Chandler, T.J., and Brown, L.E,. (2008). *Conditioning for Strength and Human Performance*. Philadelphia, Lippincott Williams & Wilkins.

Chmura J., and Nazar, K.., (2010). Parallel changes in the onset of blood lactate accumulation (OBLA) and threshold of psychomotor performance deterioration during incremental exercise after training in athletes. *International Journal of Psychophysiology* 75 (2010) 287–29.

Dalleck, L.C., and Dalleck, A.M., (2008). The ACSM Exercise Intensity Guidelines for Cardiorespiratory Fitness: Why The Misuse? *JEPonline* 2008;11(4):1-11.

Komi., P.V., (2003). *Strength and Power in Sport*. 2 nd. Ed. (Eds). The Encyclopaedia of Sports Medicine an IOC Medical Commission Publucation in Collaboration With the International Federation of Sport Medicine.

Lance, C., *et al.* (2005). Optimize Endurance Training. Idea Personal Trainer. Jan. 2003. *http:// www.unm,edu/~ikravitz/pages/article.html.*

Mierke, K., (2006). Training for Triathlon Running. Head coach of Fitness Concepts. Director of Training for Joe Friel's.Ultrafit and author of Training for Time Trials.

Osteras. H., Hoff, J., and Helgerud, J., (2005). Effects of Hight-Intensity Endurance Training on Maximal Oxygen Consumption in Healthty Elderly People. *The Journal of Applied Gerontology.* Vol.24. No.5. November 2005. 377-387.

Powers, S. and Howley, E. (2004). *Exercise physiology*. 5th edition. McGraw Hill, New York.

Ranković, G., Mutavdžić, V., Toskić, D., Preljević, A., Kocić, M., Gorana Nedin-Ranković, G.N., Damjanović, N., (2010). Aerobic Capacity as An Indicator in Different Kinds of Sports. *Bosnian Journal of Basic Medical Sciences*. 2010; 10 (1): 44-48.

Svedahl, K., and MacIntosh, B.R., (2003). Anaerobic Threshold: The Concept and Methods of Measurement. Can. J. *Appl. Physiol***.** 28(2): 299-323. Canadian Society for Exercise Physiology.

Wilmore, J.H., Costill, D.L., and Kenny, W.L., (2008). *Physiology of Sport and Exercise: 4ed*. United States of America. Human Kinetics.

Man In India, 98 (1) : 71-77

STUDENTS FOOTBALL ATHLETES COACHING AND TRAINING MODEL PROGRAM (An Evaluative Study in Student Training and Education Program)

Komarudin[1], Sugiharto[2], Hari Setijono[3] and Setya Rahayu[2]

This study aims to develop and test the feasibility of a soccer training model for youth athlete based on the Long-Term Athlete Development (LTAD). The soccer training model is declared eligible by a coaching material expert, a soccer training expert and a soccer coach for youth athlete. The research and development that is carried out refers to Borg and Gall (1983) development procedure simplified only to the limit of expert validation test and product revision. Data retrieval is done with expert validation, i.e. expert coaching material, soccer training expert and soccer coach for youth athlete. Data analysis is done by converting quantitative data to qualitative data using Likert scale guidance. The results showed that the model of soccer training developed is feasible, based on the validation of expert materials of coaching seen from several aspects. Aspects of training content quality content with 72% eligibility level. Aspects of training content content with 94% eligibility level. Feasibility aspects of the training with 66% feasibility level. Aspects of sport coaching concept with 60% eligibility level. While the feasibility assessment of soccer training experts based on the basic concept aspects of training with 72% eligibility level. Aspects of development stage of the training with 82% eligibility level. Quality aspects of training materials with 68% eligibility. Assessment of soccer coach for youth athlete eligibility based on training aspect with level of 69% eligibility. Aspects of training design with 65% eligibility level. Material aspect with 69% eligibility level. Overall assessment of training eligibility is 68% with "Good" category.

Keywords: Soccer Training Model, Youth Athlete, LTAD

INTRODUCTION

Soccer is the most popular sport and attracts the attention of the world community today. The sheer amount of information about soccer presented by electronic media and print media is one of the most obvious indications of the claim that soccer is the most popular sport. The journey to become a professional and reliable soccerer is very long and tortuous, it takes intensive training to continue in accordance with the appropriate methods, systems and training model of soccer practice.

The current soccer training model is a major concern because the function of the training model is very important in the coaching process. According to Chondel (2013) the efforts undertaken by Germany by reforming the training model of early age coaching is manifested into a guidebook. The result is that Germany can successfully bring up new names like Mario Goetze (20), Lewis Holtby (20), Julian Draxler (19), Ilkay Gundogan (21), and others who are all under the age of 22.

[1] Faculty of Sport Sciences, Universitas Negeri Yogyakarta, Indonesia, *E-mail: komarudin@uny.ac.id*
[2] Postgraduate Program, Universitas Negeri Semarang, Indonesia

With the training model that must be applied when doing the training consciously or unconsciously such actions indicate the existence of uniform pattern of education and games from an early age.

During this time throughout Indonesia soccer coaching have not or do not apply the standard training model to be applied in the training in soccer respectively. Training has been dependent on the initiatives and experience of existing trainers. These trainers work hard on how to apply science or soccer experience to their foster children in their own way. The training has not been fully able to develop the talent of the players and sometimes there is something wrong in applying the practice method for the students.

Articles written by Sinaga (2012), playing exercises for ages 8-12 can improve the results of dribbling practice. While in the article written by Rinaldi (2012), Siregar (2013) and Zulhairil (2013), concluded that using variations of exercise can improve the results of passing and shooting practice because by giving variations of exercise will not easily arise saturated and bored because at the age the child is still very unstable, easy to feel bored and bored so that the application of appropriate methods and training materials is very big influence in the process of soccer coaching.

With the right soccer coaching training model is expected to improve the quality of training, directed and appropriate age, so as to deliver students to develop talent and reach its peak potential and achievement. Training or nurturing early childhood is much different than training senior players, training early childhood is much more difficult because it teaches the basic foundations of playing the right soccer, not only that a trainer should be able to pay attention to the child's development in terms of physical, psychological, growth and Motor ability. If the application of train there is a mistake it will result in damage both in terms of physical, pyromological and growth so that it can affect the future of the child.

Therefore an early childhood trainer must master the theoretical and training methodology in which there are many sport performance achievement theories that support for practice-training activities. The theory of exercise or sportsmanship in the training process is anatomy, health, psychology, physiology, biomechanics, tests and measurements, stratics, history, sociology, nutrition, education, and motor learning, these are all supporting knowledge in the process of practicing according to (Bompa 2009), therefore a standardized reference is needed in order to be a guide for trainings and trainers, in order to achieve the desired goals and objectives in promoting national soccer, in addition to the importance of a plan and a standard reference is (1) Can determine clearly achieved direction, (2) Can achieve high efficiency and effectiveness, (3) Facilitate in identifying obstacles in reaching goal, (4) As a control tool whether the goal has been achieved or not.

In addition, the training plan is absolutely necessary in the training of sports education to develop a youth soccer, Seeing the above problems the authors have a limit "Planning is the specialty of the goals to be achieved, as well as the ways pursued to achieve these goals. This limitation implies (1) The planner involves the process of setting goals about the desired future state, (2) Selecting and determining the way to be taken from all possible alternatives, (3) Attempts to achieve that goal. Therefore, this should be the basis of the Indonesian sports scientists to design a sports training model to improve the sports system in Indonesia. Based on the above description, the researcher intends to conduct research on "Soccer training model in youth athlete based on the long term athlete development", this is the basis that this research will be useful for the progress of Indonesian soccer, because there has been no research on it, so the focus of this research is to develop a occer training model in youth athlete that adopts the training model of the United States with the title of US book Soccer Training model and supported by long-term athlete coaching theory of Long-Term Athlete Development by Istvan Balyi.

METHOD

In this study the authors use research and development (R & D) research methods or research and development methods. Research and Development is a research method used to produce a particular product, and test the effectiveness of the product, the resulting product can be diverse. According to Sugiyono (2011: 297), Research and Development research methods which hereinafter abbreviated to R & D are research methods used to produce specific products, and test the effectiveness of those products. Sukmadinata (2012: 164) said the developed product is not always in the form of software or software, such as computer program for data processing, classroom learning or educational model, learning, training, evaluation and management, but also in the form of hardware or hardware such as books, modules, learning media aids in the classroom.

In this study, the product that will be developed is a soccer training model design based on sports coaching education. According to Sujadi (2003) Research and Development or Research and Development (R & D) is a process or steps to develop a new product, or improve the existing product, which can be justified. As mentioned above, the research and development method examines the effectiveness of a new product and has gone through refinement steps. But due to limited research time, researchers limit the research only to developing existing products. Here researchers are developing a soccer training training model from the United States with the U.S. training model title. Soccer Training model composed by Dr. Javier Perez and Claudio Reyna, the training model is developed in accordance with the potential and cultural culture of the Indonesian nation.

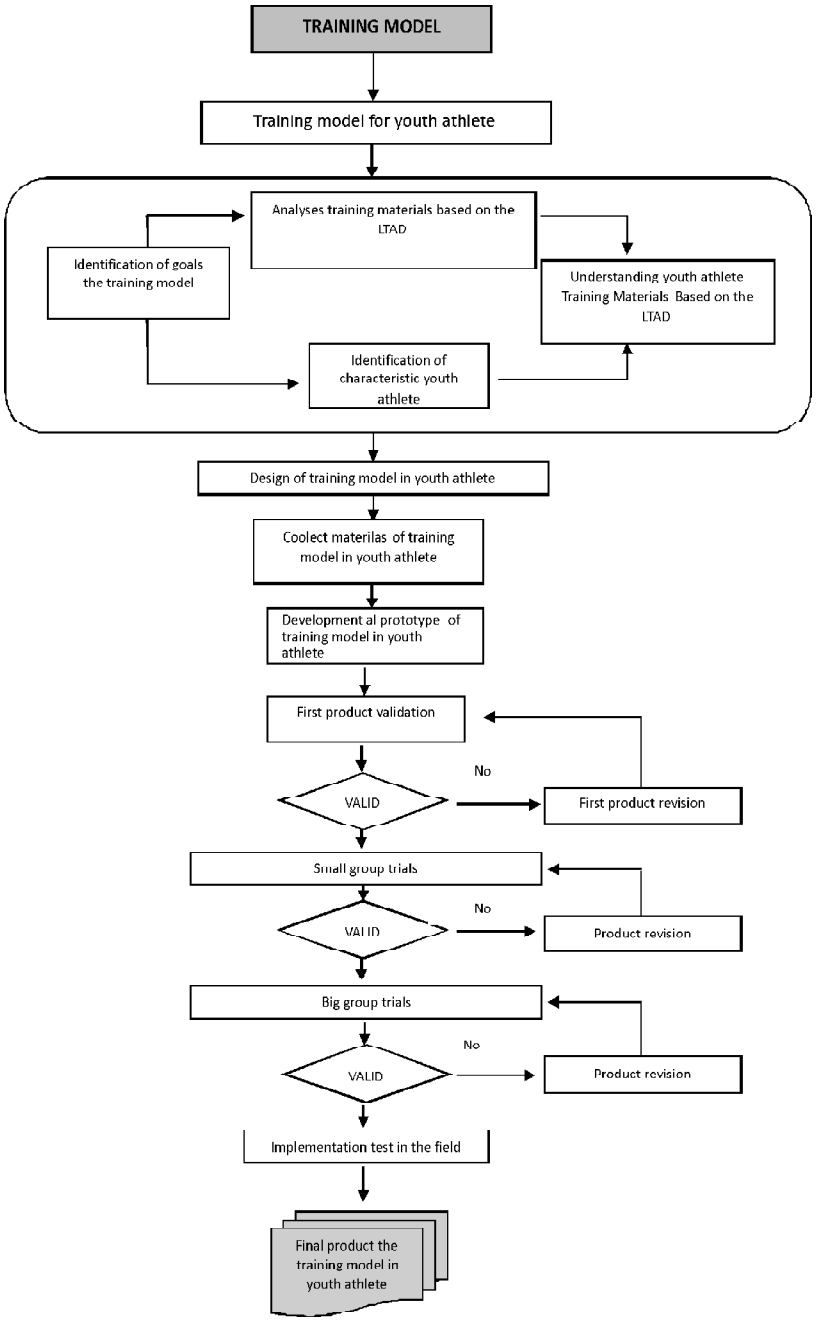


Chart 1: Development procedure training model in youth athlete based on the LTAD

RESULTS AND DISCUSSION

The product in this research and development is in the form of the soccer training model in youth athlete based on the Long Term Athlete Development (LTAD). The development of soccer training model based on LTAD can be used by trainers or educators in the process of coaching and training at a soccer training, through training and upgrading of trainers and educators to be able to apply drills and training materials in the formation and training of juvenile athletes which corresponds to the growth and development of learners, in order to get results according to the wishes and ideals of quality human development and the development of national sports.

The research and development carried out refers to Borg and Gall's simplified development procedure only at the limits of expert validation tests and product revisions. The first step, to collect information and observation. Information gathering is done by conducting preliminary study in the field to see the problems faced in soccer coaching and training, in soccer trainings in conducting coaching and training for adolescent athletes in accordance with the procedures in the world of modern sport coaching, reading the various literature that support in youth soccer coaching and studying the soccer training model to develop training programs tailored to the needs of learners according to the age group and the development of learners in the training.

Observation is done by looking at the problems experienced in the field by the coach both the coaching staff at the soccer training. The second step, which is to determine the training model materials and design that will be developed to support the process of coaching and training in soccer training model based on LTAD. Here is a picture of a major component of the soccer training model in youth athlete based on the LTAD.

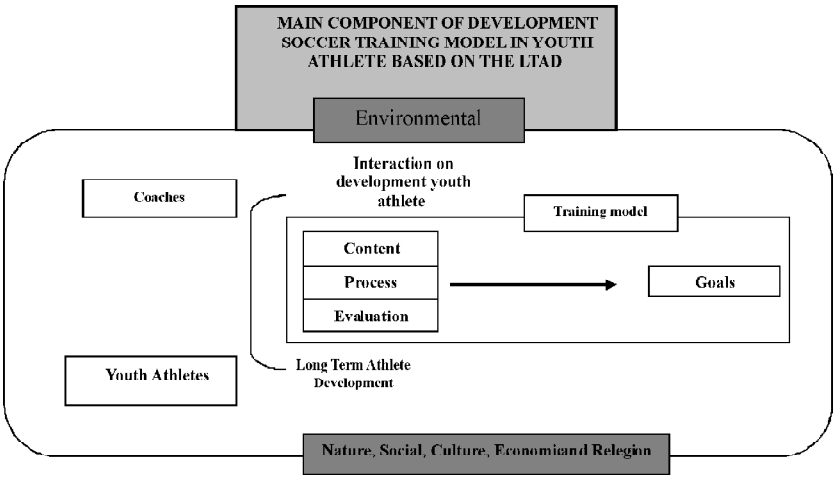


Chart 2: Main component of soccer training model in youth athlete based on the LTAD

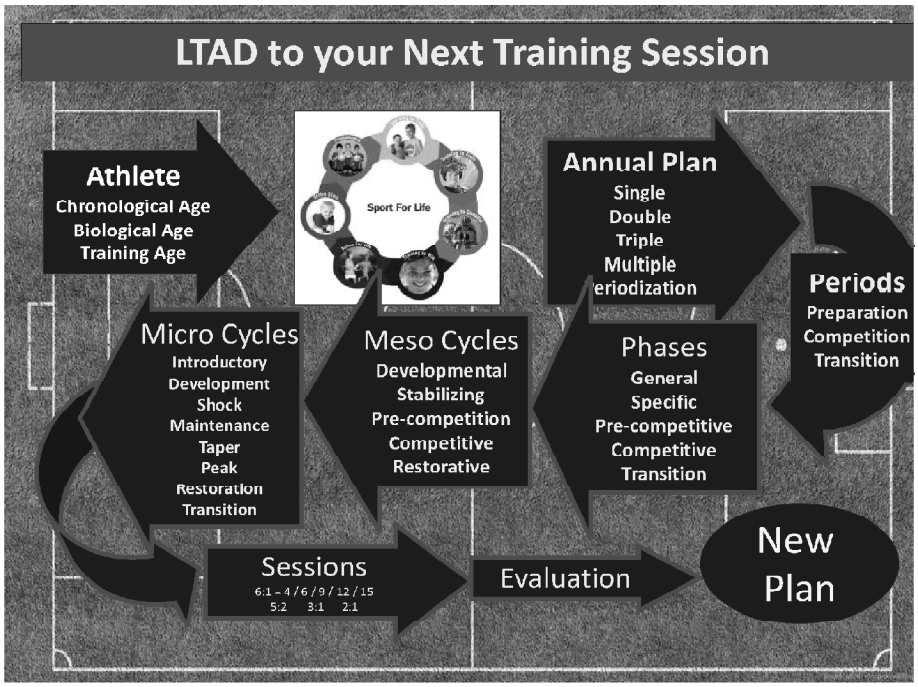


Chart 3: Planning flow of soccer training model in youth athlete based on the LTAD

CONCLUSION AND SUGGESTION

The results showed that the model of soccer training developed is feasible, based on the validation of expert materials of coaching seen from several aspects. Aspects of training content quality content with 72% eligibility level. Aspects of training content with 94% eligibility level. Feasibility aspects of the training with 66% feasibility level. Aspects of sport coaching concept with 60% eligibility level. While the feasibility assessment of soccer training experts based on the basic concept aspects of training with 72% eligibility level. Aspects of development stage of the training with 82% eligibility level. Quality aspects of training materials with 68% eligibility. Assessment of soccer coach for youth athlete eligibility based on training aspect with level of 69% eligibility. Aspects of training design with 65% eligibility level. Material aspect with 69% eligibility level. Overall assessment of training eligibility is 68% with "Good" category.

References

Bompa O. Thudor., (2009). *Periodization Theory and Methodology of Training*. Human Kinetics.

Bompa O. Thudor., (2015). *Periodization Training for Sports.* Human Kinetics.

Bompa O. Thudor., (2015). *Conditioning Young Athletes.* Human Kinetics.

Claudio Reyna & Javier Perez., (2011). *U.S. Curriculum*. Amereka: U.S. SOCCER FEDERATION.

Didik Assalam, Sulaiman, Taufiq Hidayah, (2015). Journal of Physical Education and Sports, *Evaluasi Program Pembinaan Prestasi Cabang Olahraga Pencak Silat Pusat Pendidikan Dan Latihan Olahraga Pelajar (PPLP) Provinsi Kalimantan Timur.* Diperoleh dari *http://journal.unnes.ac.id/sju/index.php/jere* (diunduh 16 November 2016).

Football International Federation Association, (2007). *Health and Fitness For The Female Football Player.* F-MARC Football For Health.

Haris Satria M., Tandiyo Rahayu, Soegiyanto KS, (2012). Journal of Physical Education and Sports, *Evaluasi Program Pembinaan Olahraga Sepakbola Di Sekayu Youth Soccer Academy (Sysa) Kabupaten Musi Banyuasin Sumatera Selatan*, *http://journal.unnes.ac.id/sju/index.php/jpes*, (diunduh 16 November 2016).

Istvan Balyi., (2013). *Long-Term Athlete Development*. Human Kinetics.

Mudha Prasetya Budi, (2013). Journal of Physical Education, Sport, Health and Recreations Manajemen, *Pembinaan Atlet Pusat Pendidikan Dan Latihan Pelajar (PPLP) Cabang Atletik Jawa Tengah Di Salatiga Tahun 2013.* Diperoleh dari, *http://journal.unnes.ac.id/sju/index.php/peshr*, (diunduh 16 November 2016).

Nana Syaodi Sukmadinata., (2011). *Metode Penelitian Pendidikan*. Bandung: PT Remaja Rosdakarya.

Rainer Martens., (2012). *SucceSS ful coaching*. Human Kinetics.

Setjono, Hari. (2005). Disertasi, *Evaluasi Proses Pembelajaran dan Pelatihan Sekolah Menengah Khusus Olahragawan*. Surabaya: Pascasarjana UNESA.

Sugiyono., (2011). *Metode penelitian kuanittatif, kualitatif dan R & D*. Bandung: ALFABETA.

Triyasari, Arin Rini; K.S, Soegiyanto; Soekardi, Soekardi, (2016). *Evaluasi Pembinaan Olahraga Senam Artistik Di Klub Senam Kabupaten Pati Dan Kabupaten Rembang*. *Journal of Physical Education and Sports*, [S.l.], v. 5, n. 1, p. 42-47, oct. 2016, Diperoleh dari *http://journal.unnes.ac.id/sju/index.php/jpes/article/view/13269*, (diunduh 16 November 2016).

ISSN : 0972-9380

International Journal of ECONOMIC RESEARCH

Volume 15 Number 2 2018

IJER

Serials Publications Pvt. Ltd

INTERNATIONAL JOURNAL OF **ECONOMIC RESEARCH**

Back Issues : Information about the availability and prices of back issues may be obtained from the publishers.

Inquiries : Address all permission requests and subscription correspondence to **SERIALS PUBLICATIONS (P) LTD.**, 4830/24, Ansari Road, Darya Ganj, New Delhi-110002 (India). Phone : 91-11-23245225, 23259207, 23272135

e-mail : serials@mail.com *or* serialspublications.india@gmail.com • www.serialsjournals.com

International Journal of Economic Research (IJER) is a refereed scientific periodical published by Serials Publishers, Delhi, India, featuring the latest research findings in economics and business. It provides a forum to both academics and decision makers to advance theory and application in the fields of economics and business. IJER publishes original research in accounting, economics, finance, management and quantitative methods, which has an international orientation.

SERIALS PUBLICATIONS (P) LTD.
4830/24, Prahlad Street, Ansari Road, Darya Ganj, New Delhi-110002 (India)
Tel.: 91-11-23245225, 23259207, 23272135
E-mail : serials@mail.com • serialspublications.india@gmail.com

INTERNATIONAL JOURNAL OF
ECONOMIC RESEARCH

VOLUME 15 NUMBER 2 2018

CONTENTS

International Journal of Economic Research
Volume 15, Number 2, 2018, ISSN : 0972-9380
available at http: www.serialsjournals.com

OPPORTUNITY OF INDUSTRIAL DEVELOPMENT AND BUSINESS OF LEARNING MEDIA "COLORING BOOK AND PUZZLE" PENCAK SILAT

[1]Siswantoyo, [2]Ali Satia Graha and [3]Subagyo

[1,2,3] Sport Science Faculty, Yogyakarta State University, Indonesia, E-mail: siswantoyo@uny.ac.id

Abstract: This research aims to produce puzzle Coloring Book learning media Pencak Silat to introducing basic technique pencak silat for early age and can be used as a teaching media for teachers or trainers as well as students in learning independence. Besides, coloring book and puzzle is an opportunity for the development of sports entrepreneurship. This research method is Research and Development with method approach of borg and gall. The subjects of the study were elementary school students. Data analysis with quantitative descriptive approach. Result of research and development was overall media of puzzle and Coloring Book of martial arts with material: step, defence, punch, elbow, kicks is categorized feasible use in learning pencak silat for early age with level of feasibility 81% and in terms of media feasibility equal to 72.5%. Based on field trials, the feasibility of puzzle media and pencak silat Coloring Book for students include: Material facet of 77% and facet of puzzle design and Book76%. Overall the puzzle media Pencak Silat is worthy of use in the introduction of basic pencak silat techniques for early age. Coloring book and puzzle is very needed students in elementary school. In Indonesia there are many elementary school students, so the opportunity for the development of sports entrepreneurs is very large potential.

Keywords: Coloring Book and Puzzle, Pencak Silat, sport preunership.

INTRODUCTION

In accordance with the existence of pencak silat is one of the cultural results of Malay clumps. The development of martial arts today can be proved by the increasingly crowded event, from elementary school, adolescent, adult even to multi-event sport in Asia and invitation of world championship. In multi-international multi-event, the general champion of pencak silat branch has been held by other countries, so it is enough to prove the progress has been progressing well in Asia and Europe.

The basic techniques in pencak silat include: (1) the defenses are: elastic shield, shadow, and *tangkisan*, (2) attack that is: punch, kick, fall, and lock, (3) bottom technique that is: bottom sweep, down, and clipping (Agung Nugroho, 2004: 5). In order to perform the technique properly and properly required good biomotor skills. For that, the process of pencak silat coaching should start from an early age. Pencak silat learning process itself is still classical, so less effective when applied in early childhood. Classical learning also tends to be boring when applied to an early age. Here teachers or trainers must be creative and have a learning strategy in the delivery of martial arts materials to learners. The learning process occurs the process of delivering messages of teachers or trainers on learners. Here the role of instructional media is needed for the success of learning pencak silat. Method of mangajar or train early child should be fun and interesting to be followed by learners so no one when using concept learn and play in process of learning. Anggani Sudono (2000: 1) argues that if the understanding of play is understood and highly controlled, then that ability will have a positive impact on our way in helping children's learning process. Mayke

Sugianto (1995: 5) also points out that, from Frobel's experience as a teacher he realizes that play activities enjoyed by children and toys most favored by children can be used to attract attention and develop children's capacity and knowledge. In addition, in order to implement school based management (school based management) and active learning, so it is necessary to think of fun and interesting learning model for early age. Fun learning contains elements of play in learning activities. Learning model is intended to provide individual comfort for learners, so it is necessary a fun medium and can be motivated learners to help the process of delivering the message.

This development research intends to design the learning media to facilitate the introduction of basic techniques of pencak silat for early age. Learning media developed in the form of learning media puzzle and coloring book, which of course this object is not foreign anymore for teachers or trainers and learners. According to Patmonodewo, (in Misbach, Muzamil, 2010) the word puzzle and coloring book comes from English which means puzzle or unloading pairs, puzzle media and coloring book is a simple medium that is played by unloading pairs. Meanwhile, according to Big Indonesian Dictionary (2003: 352), puzzle and coloring book is a puzzle.

Puzzle and coloring book here developed with the concept so that children can learn while playing in the process of learning pencak silat so it is expected Puzzle and coloring book can be used as an alternative media in learning basic techniques pencak silat. By using Puzzle and coloring book, it is expected that teachers or trainers can make the learners to have independent character so that it creates meaningful and memorable activities for students. Nana Syaodih Sukmadinata (2006: 166) stated that, learning that emphasizes student activity motivates more motivation learning, high-order thinking, creativity, and independence.

Based on the description described above can formulate the problem how to develop the learning media Coloring Book and Puzzle in introducing the basic techniques of pencak silat for early childhood. This research aims to develop Coloring Book and Puzzle learning media in introducing basic pencak silat techniques for early childhood. With the product specification that will be produced through this development research has the following specifications include Product development results in the form of coloring book with size 28x21 cm, consists of 19 techniques pencak silat base, which is given full color color and next to it in black and white, made of material playwood, which made a variety of design pieces, so that will stimulate the creativity of children. If the research is completed it will make it easier for learners to learn to understand and practice the basic techniques of pencak silat effectively and independently, facilitating the teacher or trainer in giving material about the basic techniques of pencak silat in addition to the classical or monotonous way.

METHOD OF THE RESEARCH

This type of research is Research and Development Borg and Gall, using a ten step procedure in conducting development research. Research and development method is a research method used to produce a particular product, and test the effectiveness of the product (Sugiyono, 2011: 297). Research and development is an attempt to develop an effective product in the form of learning materials, media, learning strategies for use in schools, not to test the theory. According to Borg and (in Sri Anitah, 1983: 27) research and development is a process used to develop or validate the products used in education and teaching. The products produced in the development research include training materials for teachers or trainers, learning materials for learners, learning media to facilitate learning, processing systems and so forth.

The development of media programs is an effort to prepare and plan carefully in developing, producing and validating a media program. Media learning Coloring Book and Puzzle Pencak Silat. Learning media Coloring book is a media development by displaying various techniques packed in a book with one side there is a silk image fullcolor and the side of the black and white image that there is only the edge of the course, then students will color the image of the martial arts techniques. Puzzle learning media and coloring book Pencak Silat in research and development is a simple two-dimensional media that presents images of basic engineering materials in pencak

silat, designed so that learners are interested and happy with the concept of learning while playing, so as to increase motivation and interest of participants in learning or training. The result of this development product will be learning media in the form of Puzzle and coloring book. The basic material of pencak sillat material found in research and development of learning media of Puzzle and coloring book of Pencak Silat is the whole about basic technique material of pencak silat for early age. Validation of instruments for material experts and media experts.

RESULT OF DEVELOPMENT AND DISCUSSION

The preliminary research was conducted by observation, interview to the respondent (pencak silat trainer of SD-SMP Budi Mulia Dua Yogyakarta), looking for books as reference, looking for relevant result as reference of researcher, taking photographs from learner to put together in product to be developed . From the preliminary research, found some things as follows: 1). The trainer expresses the characteristics of learners who prefer the learning model with the game. 2). Trainer states need to be developed learning media so that learners can do motion effectively and efficiently and can spur creativity of learners. 3). The trainer states that the learner is more enthusiastic at the time of learning by giving the game in it. 4). The trainer stated that it is necessary to develop instructional media that can clarify the learning materials and can accelerate the learning process.

The development of instructional media and the practice of puzzle and coloring book is validated by the experts in their field, namely the expert of learning media and Pencak Silat material experts. Data on the Results of Media Assessment "Puzzle and coloring book Pencak Silat" by Media Expert declared feasible 76%, and from Eligible Material experts (75%). In the second stage of validation percentage obtained increased from 67% to 78% of the maximum score. Thus it can be stated that according to media experts, in the validation stage of both learning media puzzle and coloring book and pencil silat coloring book developed from the content feasibility aspect get the "eligible" category.

Product Results After Revision

Picture. Puzzle display and coloring book After Final Revision

The effectiveness test result on the puzzle media and coloring book of pencak silat shows the judgment about the material aspect of 77% which is categorized as feasible and for the facet of card design equal to 76% which is categorized as feasible. The total assessment of feasibility test of puzzle media and coloring book of pencak silat according to the respondents of 6-9 year old students by 77% is categorized as feasible.

DISCUSSION

In the early development of puzzle and coloring book is designed and produced into an early product in the form of puzzle and coloring book pencak silat to introduce basic pencak silat technique for elementary school students of 6-9 years old. Development process through research and development procedures. Through some planning, production and evaluation. Then the product is developed with the help of photoschape, photoshop CS6, and corel draw, after the initial product is produced then need to be evaluated to the experts through validation and need to be tested to the students. The evaluation stage is performed on material experts and media experts. While the research phase is done by small group trials and field trials.

The material expert validation process generates data that can be used for revision of the original product. In the process of validation of this material expert the researcher uses two stages of phase I and phase II. The first stage validation data is used as the basis for revising the second product. Upon completion of the second revision the product is ready for trial. Upon completion of the validation of the material expert, validation is immediately validated to the media expert. From media experts obtained data, suggestions and feedback to improve puzzle and coloring book pencak silat being developed. In the process of media validation of the researcher through two stages of phase I and phase II. The first stage I media validation data was used as the basis for revising the second product. After completion the second revision is validated again until the product is ready for testing. The trials were conducted in two stages, ie small group trial stage, and field trials. After the final revision, the final product is ready to be used by the students for learning media in learning basic pencak silat technique and learning independently and assisting the teacher or trainer in giving information to the students especially learning the game of pencak silat.

The quality of the puzzle and coloring book of pencak silat belonging to the "Eligible" criteria of the statement can be proved from the results of the "Eligible" assessment analysis of both the expert material and the media expert, and field trials. Students are happy with this product because they are interested to learn and hope this product can be disseminated to other students. Puzzle games and coloring book on this learning media to attract participants' motivation to learn basic technique of pencak silat.

There are some things that students think are the advantages of this product. Among them is the appearance of martial art drawing techniques with cartoon design make puzzle and coloring book pencak silat become interesting and liked by students, also pieces of each puzzle and coloring book different basic techniques to make students more enthusiastic try puzzle and coloring book stacking game. Student interest in pencak silat learning media is a symptom that can improve the learning process. This product also allows students to be motivated to learn actively and independently because this product is easy to use.

In addition to the advantages of this product, while the weaknesses in this product, including the level of student creativity in the game is not good, it should be for the type of puzzle game and coloring book students must be creative in finding suitable pieces and sequential so easy in preparing the puzzle and coloring book. With these weaknesses, further attention and development efforts can be made to obtain better product results. This fact will open up opportunities for continuous subsequent revamping. Test results can be described in the following discussion: 1. Testing to the material expert; The result of the questionnaire test to the material expert shows the relevance level to the material of 81% which means that the material contained in the media of puzzle and coloring book of pencak silat is suitable for use in the field study. 2. Testing to media experts; The result of questionnaire test done to media expert showed 72.5% media feasibility level, meaning that the media of puzzle and coloring book of pencak silat is feasible to be used

in pencak silat learning with the revision included on the facet of puzzle and coloring book.

3. Testing to learners; a). Small group trial The result of questionnaire of early age students about the media of puzzle and coloring book of pencak silat shows that for judgment about 74% material aspect which is categorized quite feasible and the design aspect of puzzle and coloring book is 70% which is categorized quite feasible. The total assessment of feasibility study of learning media of puzzle and coloring book of pencak silat according to the respondents of learners aged 6-9 years by 72% is categorized quite feasible which can be interpreted that the media is quite feasible to be tested to next stage. b). Field trials The result of the questionnaire test of students concerning the media of puzzle and coloring book of pencak silat shows the judgment about the material aspect of 77% which is categorized as feasible and for the design aspect of the puzzle and coloring book equal to 76% which is categorized as feasible. Total assessment of media feasibility test of puzzle and coloring book of pencak silat according to the respondents of learners aged 6-9 years by 77% categorized worthy. Analysis of Pros and Cons of Media; After going through a product trial (small group and field) it can be described the advantages and disadvantages of learning media.

1) Excess media:
   a) Can be more motivating pesrta learners so that the exercise becomes the spirit, b). Sharpen the creativity of children to be able to arrange the puzzle and coloring book. c). It is very interesting for children to practice while playing. d). More ease the trainer's duty in training. e). Children become more active in the training process.
2) Media shortage:
   a) Disadvantages in this media are motionless images that sometimes make learners still have to wonder to ask for coach guidance.
   b) The cartoon design used in the puzzle and coloring book of pencak silat makes the basic engineering detail shown less than optimal. c). The procurement of puzzles and coloring book pencak silat is still relatively expensive in terms of media production. Analysis of Learning media prespectives introduction of basic pencak silat techniques for early age before using puzzle learning media and coloring book pencak silat still classic tends to be boring for early childhood during learning. Learning media puzzle and coloring book pencak silat in design with the concept of learning while playing so hopefully learners do not feel boredom and can increase the motivation pesrta students in learning pencak silat.

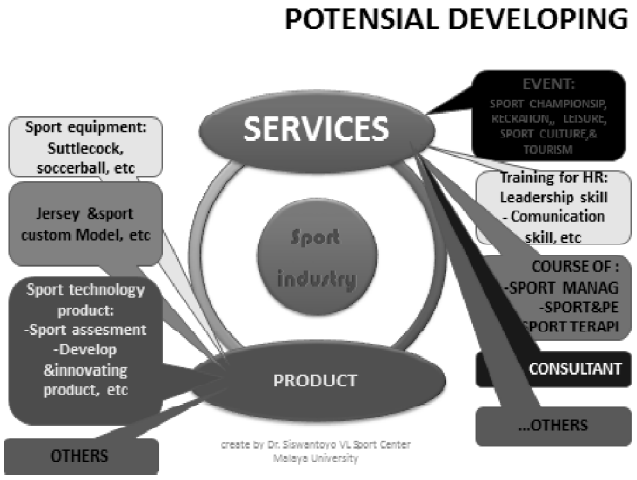
From the analysis of learning media puzzle and coloring book pencak silat during product trial can be described as follows:

1. Students or learners:
   a. Learners are more motivated and do not experience boredom through the game of learning media puzzle and coloring book pencak silat, pencak silat basic material is more easily understood and learners more spirit to demonstrate the basic technique movements pencak silat.
   b. Learners are more active and creative in using puzzle and coloring book pencak silat with a form of game that is very interesting for them.
2. Trainer or teacher:
   a. Trainers or teachers are more time efficient in training, the media is designed so that learners can learn pencak silat independently at home.
   b. Trainers or teachers more easily manage the students, with this medium the trainer or teacher is easier to manage the exercises with the characteristics of children who are active and likes to play.

Utilization of learning media puzzle and coloring book pencak silat in the introduction of basic techniques of early age pencak silat still experience obstacles. Images that have not moved sometimes make students still ask the coach to be guided. In the future learning media puzzle and coloring book pencak silat is expected to be more refined.

Analysis of Industry Opportunities and Sports Business

Puzzles can be made with the material from acrylic, wood or plastic plates, colored and given drawings of martial arts techniques, which can be quickly disassembled. While the coloring book is a book that contains pictures of martial arts techniques with full color images to imitate and black and white images to mimic coloring like full color images. Opportunities for industry are producing varied puzzles with various techniques of martial arts. Besides, coloring book is an opportunity to produce, socialize, and make coloring event. Based on the potential opportunities of industrial development and sports business can be seen in the picture below.



When analyzed the need and demand obtained the assumption that the need for such products is very large, because in Indonesia in 2016, the number of schools in Indonesia reached 297,368 units. Primary School is the level of education with the highest number of schools, reaching 147 thousand units. As for playgroup schools are also more numerous. Based on data from Sapulidi Research Center (SRC) as per January 2016, the number of playgroup schools institutions throughout Indonesia reaches 190,238 institutions. Consisting of kindergartens 80,140 institutions, Playing Groups 78,056 institutions, Childcare Park 3,473 institutions, and Similar Early Childhood Units 28,569 institutions. The data is an opportunity to develop a highly prospective industry and learning media business. Thus if this product can be spread in each school 100 packets, it must provide products in the number of thousands of packages. This will educate the public in the field of edu-preunership.

CONCLUSION

The learning media of puzzle and coloring book of pencak silat which has been developed in this research deserves to be used as media of increasing knowledge about basic technique of pencak silat for early childhood (6-9 years). In addition, the results of the assessment of learning media puzzle and coloring book martial arts as a whole, learning media puzzle and coloring book pencak silat with the material of step, defence, punch, elbow, kicks is categorized quite feasible for use in learning pencak silat for early age with a feasibility level of 81%, and from the media aspect categorized as feasible with a feasibility level of 72.5%. Overall learning media puzzle and coloring book pencak silat is feasible to be used in the introduction of martial arts for an early age after going through several stages of testing. This development research has been achieved for use by teachers or trainers in teaching basic pencak silat techniques to learners. In Indonesia, the education of early childhood and primary school is very much, even reaching hundreds of thousands of children. Coloring book and puzzle is needed for playgroup, kindergarten and elementary school students to improve the cognitive abilities and psychomotor children in a very large number, so this is an opportunity to develop sports industry and sport preneurship.

BIBLIOGRAPHY

Arsyad, Ashar. (2002). Instructional Media. Jakarta: Raja Grafindo.

Bompa, Tudor. O. (1990). Theory and Methodology of Training. Toronto: Mozaic Press.

Djoko Pekik Irianto. (2002). "Basic Coaching". Yogyakarta. FIK.UNY.

Endang Rini Sukamti. (2007). "Diktat Development of Motorik Yogyakarta. FIK. UNY.

Farittodi Barri Arrohhim. (2008). Development of Learning Media Seals "Si Cerdas" (Silat Ceria and Agile) In Introducing Basic Pencak Silat Techniques For Early Childhood. Essay. FIK UNY.

Harmoko. (1990). Modern Bolabasket Coach Guides. Jakarta: Perbasi.

Http://paud.unnes.ac.id/v3/download/MARKET AJAR_MEDIA.pdf. (accessed on 14th January 2014 at 20.00).

Irawan Andri (2012). My Coced Clinic Module. Jakarta: My Futsal

Kosasih, Danny. (2008). Fundamental Bolabasket First Step to Win. Semarang: CV. Elwas Offset.

Mawarsih, Agnes. (2013). Taekwondo Intelligent Teaching and Training Media In Introducing Basic Techniques of Taekwondo For Early Childhood. Thesis (Unpublished). Yogyakarta: Faculty of Sport Sciences UNY.

Marilia, Arifanti. (2012). Basic Skill Leveling Skills Playing Student's Bolabasket Using Aahperd Basketball Test and STO Test Following Extracurriculars at SMK Negeri 1 Bantul. Thesis (Unpublished). Yogyakarta: Faculty of Sport Sciences UNY.

Mochammad Moeslim. (2000). Guidelines for Teaching Sports Education in Primary Schools. Jakarta: Depdikbud.

Nana Sudjana and Ahmad Rifai. (1992). Media Teaching. Bandung: Sinar Baru Bandung.

Nana Syaodih Sukmadinata. (2006). Educational Research Methods. Bandung: Sinar Baru Bandung.

Sanafiah Faizal. (1981). Basic and Technique of Composing Questionnaire. Surabaya: P3T IKIP. Rajawali Press.

Sarwiko, Dwi. (2007). Development of Multimedia Based Learning Media MX. Journal of Science and Technology. P. 1-12.

Siswantoyo, *et al.* (2012). Smart Card Smart Card Media Development For The Early Child. Yogyakarta: FIK UNY.

Sugianto. (2011). Characteristics of Elementary Children. Retrieved on December 24, 2013, at 15:00 hrs.

Sugiyono. (2010). Research Methods of Education.Bandung: Alfabeta.

____. (2011). Qualitative Quantitative Research Methods and R & D. Bandung: Alfabeta.

Sukadiyanto. (2010). Introduction to Theory and Methodology of Physical Training. Yogyakarta: FIK UNY.

Sumiyarsono, Dedy. (2002). Bolabasket Skill. Yogyakarta: FIK UNY.

Trianto. (2010). Integrated Learning Model. Jakarta: Earth Literacy.

Wayan, I., Santyasa. (2007). The Conceptual Platform of Learning Media. Research. UPG.

ISSN : 0972-9380

International Journal of ECONOMIC RESEARCH

Volume 15 Number 2 2018

IJER

Serials Publications Pvt. Ltd

INTERNATIONAL JOURNAL OF **ECONOMIC RESEARCH**

Back Issues : Information about the availability and prices of back issues may be obtained from the publishers.

Inquiries : Address all permission requests and subscription correspondence to **SERIALS PUBLICATIONS (P) LTD.**, 4830/24, Ansari Road, Darya Ganj, New Delhi-110002 (India). Phone : 91-11-23245225, 23259207, 23272135

e-mail : serials@mail.com *or* serialspublications.india@gmail.com • www.serialsjournals.com

International Journal of Economic Research (IJER) is a refereed scientific periodical published by Serials Publishers, Delhi, India, featuring the latest research findings in economics and business. It provides a forum to both academics and decision makers to advance theory and application in the fields of economics and business. IJER publishes original research in accounting, economics, finance, management and quantitative methods, which has an international orientation.

SERIALS PUBLICATIONS (P) LTD.
4830/24, Prahlad Street, Ansari Road, Darya Ganj, New Delhi-110002 (India)
Tel.: 91-11-23245225, 23259207, 23272135
E-mail : serials@mail.com • serialspublications.india@gmail.com

INTERNATIONAL JOURNAL OF
ECONOMIC RESEARCH

VOLUME 15 NUMBER 2 2018

CONTENTS

International Journal of Economic Research
Volume 15, Number 2, 2018, ISSN : 0972-9380
available at http: www.serialsjournals.com

DEVELOPMENT POCKET BOOK THERAPY AND REHABILITATION INJURY: BUSINESS OPPORTUNITIES ON SPORT ASPECT SERVICES

Bambang Priyonoadi, Ali Satia Graha, Siswantoyo and Ahmad Fauzi

Sport science faculty, Yogyakarta State University Indonesia, E-mail: bambang_pa@uny.ac.id

Abstract: Injuries are often experienced by everyone due to physical activity such as sports, work and more. Therapists and rehabilitation numbers are still not comparable with the population. First aid needs to be done. Understanding of injury needs to be known to everyone. Until now still needed a guide like a handbag injury handbook. On the other hand, not many people are interested in doing business services for therapeutic and rehabilitation services. This study aims to develop a pocket book handling sports injuries. And look at the business opportunity perspective of therapeutic services and rehabilitation of sports injuries. This research is included in the research and development. Data were collected by questionnaire, and data analysis was performed with quantitative descriptive with percentage. The results showed that the development of pocket book therapy and foot joint injury rehabilitation results obtained that the product is feasible and meet the rules that apply. On the other hand from the observation and study results it is found that therapeutic and rehabilitation services are prospective business opportunities to be developed. It can be concluded that therapy and rehabilitation are included in potential business opportunities.

Keywords: pocket book, therapy, rehabilitation, business, services, sports

PRELIMINARY

Sports in the modern era is now very advanced and developed with the application of science and technology. Sports can devide for physical fitness, achievement and recreation. Sports based on the Constitution of the Republic of Indonesia number 3 of 2005 about sports systems that sport is all aspects related with sports that require regulation, education, training, coaching, development and oversight. Then the sport can improve human resources healthy and healthy Indonesia. Regular and directed exercise and programmed will improve the condition of the prime body as revealed by Giri Wiarto, (2013: 163) said that Sports is a systematic musculoskeletal system activities and structured with the frequency, intensity, type and time has been determined. Irregular, directed, and programmed sports will cause prolonged injury.

Sports injuries result from errors of both external violence, internal violence, and overuse, as expressed by Mukhamad Ikhwan Zein (2016: 7) that sports injuries can calculated based on the cause. Another opinion from Andun Sudijandoko (2000: 7) reveals that, sports injuries are a pain caused by exercise, which can cause disability, injury, and damage to muscles or joints and other parts of the body. occurs when and anywhere, and all sports are at risk of injury without exception. Sports Injuries can affect all parts of the body, especially areas that have motion functions or become the foundation during the move, which is characterized by symptoms of pain, swelling, bruising, abrasions, and broken on the bone. (Ali Satia Graha, 2005: 2). Types of sports injuries that are often experienced by the perpetrators of many sports, one of the most common is an ankle injury.

Ankle joint injuries usually occur because of sprains and ankle joint injury is an injury that is often experienced by the sport but long healing process. Ankle sprains are one of the most common acute injuries experienced by

athletes. The ankle joint is easily injured because it is less able to resist the medial, lateral, pressure and rotational forces (Sri Sumartiningsih, 2012: 54). Ankle injuries are a daunting thing for the sportsman, because everyone will be lazy to exercise and athlete achievement becomes decreased. Initial observations of both college students and practicing athletes resulted in: (1) Many students and athletes during practice and lecture classes suffered bodily injury, (2) Many students and injured athletes were unable to continue sports or exercise activities. (3) Injuries that occur in students who are in practice and athletes who are training one of them is ankle joint injury, (4) Both athletes and many students who do not know help in handling ankle injuries, (5) Reference or book an ankle injury handling guide does not exist as a first aid guide.

Based on this background it is necessary to develop a pocket book guide handling injury and rehabilitation at the ankle joint. How to develop a pocket manual for handling injuries and rehabilitation at ankle joints with ankle injuries? This study aims to produce a book product pocket guide handling injuries and rehabilitation at the wrist joints provide an understanding of the handling of injury and rehabilitation at the ankle joint.

The development of an injection handbook for injury and rehabilitation of the ankle joint will be useful for providing knowledge about the handling of ankle joint injury and rehabilitation, Providing ease in learning to understand and recognize the handling of ankle joint injury and rehabilitation, facilitate sports actors in providing joint injury treatment solutions ankle and rehabilitation.

RESEARCH METHODS

Design The research used in this research is research and development with approach developed by borg and gall. Called research-based development, according to Sugiyono (2012: 407), development research method is a research method used to produce a particular product, and review the effectiveness of the product or in other words to produce a specific product needs analysis needs and to test the effectiveness of the product. The instrument in this development study is to use several data collection instruments, with questionnaires. Technique of data analysis conducted in this research is quantitative analysis technique.

RESULT AND DISCUSSION

Learning media developed in the form of learning media in the form of pocket book. The initial product produced is called "The Handbook of Injury and Rehabilitation Handbooks on Ankle Hands" to provide an understanding of the handling of injuries and rehabilitation of the ankle joints. Learning media products "The Handbook of Injury and Rehabilitation Handbooks on Ankle " is developed with the concept of introducing ways of handling ankle joint injuries to sports actors. Thus, "Handbook of Injury and Rehabilitation Handbooks on Ankle" is expected to be used as an *interesting learning resource and preferred by sports* actors so that it can be an alternative in introducing ways of handling ankle injuries through the media of a pocket book.

The "Handbook of Hand Wrist Injury Handbook and Rehabilitation of Ankle" products developed is a book that contains material on how to handle injuries and rehabilitation at the ankle joint with a picture as well as a simple but clear explanation so that it is expected to be a guide for the sports actors in deal with ankle injuries. This pocket book also comes with case examples in case of ankle joint injury and prevention efforts to minimize the occurrence of ankle joints. Pocket book made with pocket-sized clothes with an attractive appearance that is expected to be used as a medium of learning by the perpetrators of sports.

The development of instructional media "The Handbook of Injury Handling and Rehabilitation of Ankle Hands" is validated by experts in their field, which is a learning media expert and sports injury material expert. This expert review yields several revisions as follows: In the first stage of validation the percentage obtained 85% can thus be stated that according to the material expert, in the first validation stage the pocket book learning media developed from the content feasibility aspects get the category "Eligible".

In the second stage of validation percentage obtained increased from 85% to 95% of the maximum score. And the media expert in validating the first phase of the percentage obtained 73.33% thus can be stated that according to media experts, in the first validation stage

of learning media pocket book developed from design feasibility aspects get the category "worthy". Field test results obtained total score assessment feasibility of media learning pocket book according to student respondents of 85.62% categorized "Eligible".

Based on small group and large group test trials showing results in the "Eligible" category. The results of the data obtained are interpreted according to predetermined categories. The categories used in this development study are divided into sections, ie for values <40% categorized as inappropriate, 41-55% are categorized as unfeasible, 56-75% are categorized as reasonable, and 76-100% are categorized as viable.

According to Ali Satia Graha (2009: 25) Massage therapy sports injury, used for the management of minor injuries in the lower and upper limbs. One of the injuries to the lower limbs is an injury to the ankle joint. Early in the development of this pocket book was designed and produced into an initial product in the form of a pocket book guide handling injuries and rehabilitation at ankle joints for sports actors, especially athletes and coaches. Development process through research and development procedures. Through some planning, production and evaluation. Then the product is developed with the help of photoschape, photoshop CS6, and corel draw, after the initial product is produced then need to be evaluated to the experts through expert validation and need to be tested to the students FIK UNY. The evaluation stage is performed on material experts and media experts. While the research phase is done by small group trials, and large group trials.

The material expert validation process generates data that can be used for revision of the original product. In the process of validation of this material expert the researcher uses two stages of phase I and phase II. The first stage validation data serve as a basis for revising the product to refine until the product is ready for testing. Upon completion of the validation of the material expert, it is immediately validated to the media expert. From the media expert got suggestions and feedback to improve the quality of the contents of the pocket book being developed. In the process of media validation of the researcher through two stages of phase I and phase II. The first stage I media validation data validated the basis for revising the product, after which the first revision was validated again until the product was ready for testing. The trials were conducted in two stages, ie small group trial stage, and large group trials.

The quality of this handbook included in the "Eligible" criteria of the statement can be proven by the analysis of "Eligible" assessment by both the expert material and media expert, as well as in small group trial assessments, and large group trials. This is seen from the provision of points to the questionnaire questions given from points 1 through 4, points that often appear are points 4, then point 3.

Most research subjects are still athletes and are highly enthusiastic and well-received coaches with a handbook on handling injuries and rehabilitation at these ankle joints, requiring that many pocket books be printed and immediately circulated to the public.

With the advantages of this product, the weaknesses in this product, including the reader saturation level in reading because the material is quite a lot, the term anatomy is difficult to understand the reader, more focused on handling injuries, and directly practice it directly than first understand the ways to do it. Some of these weaknesses, hope for attention and further development efforts to obtain better product results. this fact will increasingly open up opportunities for continuous subsequent revamping.

The results of sports questionnaire test of learning media of the book of sakumen showed that for the evaluation in terms of appearance of 82.67% which is categorized as "Eligible", the material aspect of the book is 88,19% which is categorized as "Eligible", legibility aspect of 85% pocket book. Total assessment of feasibility test of pocketbook learning media according to student respondents of 85.62% is categorized as "Eligible".

Analysis of Pros and Cons of Media

Excess media: Can attract the attention of sports actors to recognize the handling of ankle injuries; Can be a practical medium for learning for sports; Easy to carry while traveling; Can add to the understanding of the handling of injuries. Media deficiency: Writings that are

too dense that can cause readers to hesitate to read; Anatomical terms that may be difficult for the reader to understand.

Analysis of the Pocket book Prespective

Prior to the existence of pocketbook learning media, there is no media learning that specifically provides an understanding of the handling of injuries and rehabilitation at the ankle joint. Learning books design literature with the media practical and simplified that facilitate the reader learn the contents of the pocket book material because of its small and can brought traveling anywhere so it is expected that sports actors, especially athletes and coaches can recognize and practice ways of handling injury and rehabilitation of the ankle joint properly. From the results of the analysis of pocket book learning media during product trial can be described as follows:

Sports Actors: a) Sportmakers are more motivated through pocket book learning media, materials handling ankle injuries more easily understood, the desire of sports actors to demonstrate the size of a pocket book into a pocket or pants. b) The sports practitioner can learn to know how easy the ankle injury is done. c) Doers of sports are independent by understanding how to deal with ankle injuries.

Mapping teraphy and rehabilitation from result of the research the results of research related to therapeutic and rehabilitation of sports injuries have begun to be widely practiced by experts. Based on the results of a review conducted by Eunkuk Kim * and Hokyung Choi, (2015), a mapping summary of the following 8 articles on aquatic physical therapy interventions: design, intervention, outcome, assessment, and results was performed.

Table 1
Summary of 8 articles of aquatic physical therapy interventions: design, intervention, outcome, assessment, and results (Eunkuk Kim* and Hokyung Choi, 2015)

Authors	*Design*	*N (% female)*	*Mean age (SD) in years*	*Intervention/ Training*	*Outcome measures*	*Assessment/ Follow-up*	*Results*
Robinson *et al.* [18]	Repeated measures	32 (100)	20.2 (0.3)	Plyometric training in water or on land (3 days a week for 8 weeks)	Sargent vertical jump test Peak torque 40 m sprint Self-report ordinal scale (muscle soreness) Pain sensitivity	Pre-training Mid-training (4 weeks) Post-training (8 weeks)	There were no treatment by time interactions, indicating that there were no performance and pain sensitivity differences between the land- and aquatic-trained groups ($p>0.05$). There was a significant interaction of treatment group by time for perception of muscle soreness ($p=0.01$).
Martel *et al.* [19]	Repeated measures	19 (100)	15(1)/14(1) (aquatic group/ control	Plyometric training in aqua or on land (twice a	Vertical jump Isokinetic peak torque	Baseline After 2 weeks After 4 weeks After 6 weeks	There were significant increases in vertical jump after 4 weeks and 6 weeks in both

contd. table

Authors	*Design*	*N (% female)*	*Mean age (SD) in years*	*Intervention/ Training*	*Outcome measures*	*Assessment/ Follow-up*	*Results*
			group)	week for 6 weeks)			groups ($p<0.05$). Significant improvements in concentric peak torque were observed in the dominant leg of both groups after 6 weeks ($p<0.05$).
Roth *et al.* [20]	Repeated measures	27(62)	21.18(1.24)/ 22.43(1.81) (female/male)	Balance training program in aqua or on land (for 4 weeks)	X and Y range of Single leg stance(SL), Tandem, stance (T), and Single leg foam stance (SLF) Tandem form stance (TF)	Pretest Mid-test (2 weeks) Post-test (4 weeks) Follow-up test (6 weeks)	A significant group* time interaction for the X range was found for SL, SLF, and TF ($p<0.05$). The Y range improved significantly, with posttest value lower than pretest value ($p<0.05$).
Stemm and Jacobson [22]	Pre-test/ Post-test	21 (unknown)	24(2.5)	Plyometric training in aqua or on land (twice a week for 6 weeks)	VERTEC vertical jump test	Pre-test Post-test	Aquatic and land-based groups significantly outperformed the control group in the vertical jump, but no significant difference was found in the vertical jump between the aquatic and land-based groups.
Dundar *et al.* [16]	Randomized controlled trial	65(47)	35.3(7.8)/ 34.8(8.3) (aquatic / land-based)	Exercise program in aqua or on land (5 times a week for 4 weeks)	Spinal range of motion Schober test Visual analogue scale for pain Oswestry low back pain disability questionnaire Short-form 36 health survey for quality of life	Before the treatment After the treatment (after 4 weeks and 12 weeks)	Statistically significant improvements were detected in all outcome measures except the Schober test compared with baseline ($p<0.05$).
Kim *et al* [9]	Randomized controlled trial	22(27)	26(4.1) / 26(3.1) (aquatic / land-based)	Early functional rehabilitation program in aqua or on land (5 sessions per week for 3 weeks)	Visual analogue scale for pain Static stability Dynamic stability Percentage single-limb support time	Baseline After 2 weeks After 4 weeks	Both groups showed decrease in the visual analogue scale, static and dynamic stability, and percentage single-limb support time at 2 and 4 weeks ($p<0.05$). There were significant

contd. table

Authors	*Design*	*N (% female)*	*Mean age (SD) in years*	*Intervention/ Training*	*Outcome measures*	*Assessment/ Follow-up*	*Results*
							group by time interactions for the visual analogue scale, static and dynamic stability, and percentage single-limb support time($p<0.05$).
Asimenia *et al.* [21]	Pretest / Posttest	30(46)	20.58 (0.64)	Balance program in aqua or on land (3 times per week for 6 weeks)	Total anterior-posterior and medial-lateral stability for static stability Dynamic stability test	Before the program After the program	In both groups, balance ability of the injured leg was significantly improved after the training period ($p<0.05$). In the final measurements, no statistically significant differences were found between the injured and non-injured.
Nualon *et al.* [23]	Repeated measures	47(8)	20.79(1.89)/ 20.04(1.22) (hydro/ land-based)	Functional rehabilitation program in aqua or on land (twice a week for 6 weeks)	Single-limb hopping test Ankle joint position sense	Baseline After 6 weeks After 3 months	In the hydrotherapy group, the time taken for the single-limb hopping test decreased significantly immediately after exercise and at follow-up compared with the base line ($p=0.001$). In the land-based group, time taken for the single-limb hopping test decreased significantly at follow up compared with baseline ($p=0.05$). No significant differences were detected between groups in the ankle joint position sense ($p>0.05$).

The results of this study strengthen the development of therapy science and rehabilitation from various aspects of the study. One of the studies that needs to be developed is on the business opportunity aspects of sports services related to therapy and rehabilitation of injuries. In principle everyone will keep his health, because healthy is expensive. So when people are hit by injury it will immediately find a suitable drug even though the price of the drug is very expensive. Thus the opportunity for the development of sports injury services is an excellent opportunity.

Business Opportunities Therapy and Rehabilitation Services for Sports Injuries Physical therapists have an important role to play in the prevention of sports injuries.

The process is effective one of risk management and should be based on a proper risk analysis. Many older studies give a misleading impression of the incidence and consequences of different sports injuries. Older studies on the causes of sports injuries were also poorly designed and misconceptions concerning injury risk factors are common. For example, there is little hard evidence that poor flexibility and hamstring-quad muscle imbalance are significant sports-injury risk factors.

The aquatic environment is ideal for early rehabilitation of injuries due to buoyancy, which decreases the effects of gravity on the body, and viscosity, which offers assistance or resistance [11]. Performing joint movements in water provides the limb support and allows the range of motion, without excessive muscle activation, and a transition to dry matter [12]. Konlian reported that aquatic physical therapy helps athletes return to exercise early and speeds up the overall rehabilitation process [11].

The results of the above study are the basis for therapy and rehabilitation. While in Indonesia has its own uniqueness. The uniqueness is supported by demographic aspects, and the development of existing therapy and rehabilitation science. In the last few years in Indonesia there are still many unfamiliar masseurs and no certificates, because they are self-taught and hereditary. In the current development has begun to emerge expert therapists resulting from the process of spreading and training. In one example, the number of educated masseurs is not enough, while every event always needs masseur services to accompany the athletes. On the other hand in the community many people who encountered fatigue and injury, so the service has not been taken by many people.

In this case it can be exemplified that there is a person who initially does not have a job, and then follow the massage training with diligence and focus after a long practice that finally was said to have been able to do therapy. Such a person does not have a high education certificate, but has a knack for massage. Currently patients who come for an average injury therapy every day 20 people. The patients give an average service of 50 thousand, in a month work for 25 days. So the average income in a day of 20 people x 50 thousand = 1 million. If one month work 25 days then the income of 1 million x 25 days = 25 million rupiah per month. The result if converted with the result of government employees is equivalent to the group IV carrier. Whereas to reach Group IV takes a long time and undergraduate degree. With this analogy, the business of therapeutic services and rehabilitation of the sport is very big opportunity to be developed in Indonesia.

CONCLUSION

The results of a pocket book media development study guiding the handling of injuries and rehabilitation of ankle joints are categorized as worthy of use as a medium of instruction to provide an understanding of how to deal with injuries and rehabilitation of ankle joints against sports actors. This can be seen from the results of the assessment of material experts 95% and media experts 85% and based on the results of small group trials 85.25% and large group trials 85.62%. The results of the review and observation that the service of rehabilitation therapy and rehabilitation is a very prospective opportunity for the development of entrepreneurship or sports business.

BIBLIOGRAPHY

Ali Satia Graha. (2009). *Massase Terapi Cedera Olahraga Metode Ali Satia Graha (Therapy Massage Sport Injury).* FIK UNY.

Ali Satia Graha & Bambang Priyonoadi.(2012). *Terapi Massase Frirage Penatalaksanaan Cedera Pada Anggota Gerak Tubuh Bagian Bawah.* FIK UNY.

Ali Satia Graha. (2005). Kegunaan Rehabilitasi Dan Terapi Dalam Cedera Olahraga. *Medikora*: (volume 1, no 1).

Andun Sudijandoko. (2000). *Perawatan dan Pencegahan Cedera.* Jakarta: Depdiknas.

A. W. S. Watson. Sports injuries: incidence, causes, prevention. *Journal Physical Therapy Reviews.* Volume 2, 1997 - Issue 3. *https://doi.org/10.1179/ptr.1997.2.3.135*

Edi Santoso, Siswantoyo (2013). *Pengembangan Media Pembelajaran dan Latihan "Kartu Pintar Bermain Sepakbola" dalam Memperkenalkan Teknik dalam Permainan Sepakbola untuk Anak Usia Dini.* Skripsi. FIK UNY.

Eko Ari Anto, Siswantoyo. (2015). *Pengembangan Media Pembelajaran Coloring Book Sepakbola Untuk Anak Usia Dini.*Skripsi. FIK UNY.

Giam, C.K. dan Teh, K.C. (1992). *Ilmu Kedokteran Olahraga.* (HartonoSatmoko, Tejemahan). Jakarta: Binarupa Aksara.

Giri Wiarto. (2013). *Fisiologi dan Olahraga.* Yogyakarta: Penerbit Graha Ilmu.

Heri Purwanto. (2009). *Penatalaksanaan Pencegahan dan Terapi Cedera Pinggang Serta Anggota Gerak Tubuh.* Yogyakarta: FIK UNY.

Iskandar Junaidi. (2011). *Yang harus dilakukan pertama kali saat gawat & darurat medis.*Yogyakarta: Penerbit Andi.Robert S. Gotlin, Do. (2008). *Sports Injuries Guidebook.* Usa: HumanKinetics.

Konlian C (1999). Aquatic therapy: Making a wave in the treatment of low back injuries. OrthopNurs 18: 11-18.

Mukhamad Ikhwan Zein. (2016). *Pencegahan dan perawatan Cedera.* FIK UNY.

Novita Intan Arovah. (2009).*Diagnosis Dan Manajemen Cedera Olahraga.*FIK UNY.

Novita Intan Arofah. (2009). Terapi Dingin{*Cold Therapy)* Dalam Penanganan Cedera Olahraga. *Medikora:* (Vol.V, no 1: 102-107).

Pfeiffer, P. Ronald. *et al.* (2009). *Sport First Aid and Injury Prevention (Pertolongan pertama dan pencegahan cedera olahraga).* Alih bahasa: dr. Huriawati Hartanto. Jakarta: Penerbit Erlangga.

Roth AE, Miller MG, Richard M, Ritenour D, Chapman BL (2006). Comparisons of static and dynamic balance following training in aquatic and land environments J S R 15: 299-311.

Sri Sumartiningsih. (2012). Cedera Keseleo pada Pergelangan Kaki (*Ankle Sprains).Jurnal Media Ilmu Keolahragaan Indonesia:* (volume 2 edisi 1).

Sugiyono. (2012). *Metode Penelitian Pendidikan Pendekatan Kuantitatif Kualitatif dan R&D.* Bandung: Penerbit Alfabeta

——. (2013). *Metode Penelitian Kuantitatif, Kualitatif, dan Kombinasi (Mixed Methods).* Bandung: Alfabeta.

Susan J. Garrison. (2001). *Dasar-dasar Terapi & Rehabilitasi fisik.* Jakarta: Hipokrates.

Taylor, M. Paul & Taylor, K. Diane. (1997). *Conquering Athletic Injuries (Mencegah Dan Mengatasi Cedera Olahraga).* Penerjemah: Jamal Khabib. Jakarta. PT. Raja Grafindo Persada.

Eunkuk Kim* and Hokyung Choi, (2015) Aquatic Physical Therapy in the Rehabilitation of Athletic Injuries: A Systematic Review of the Literatures. Journal of Yoga & Physical Therapy. **Published date:** August 05, 2015.

Man In India, 98 (1) : 255-260

STRATIFICATION OF BIOMOTORS IN A GYMNASTIC TALENT SCOUTING EARLY CHILDHOOD

Endang Rini Sukamti

The performance test was implemented by the stratification identification to evaluate the biomotor component of the students even though the test could potentially harm the students either physically. This research was conducted to overcome the emergence of the problems (physical). during the biomotor component test of the school students. This study is a descriptive quantitative research that uses five variable – the biomotor component profile divided by flexibility, strength, power, agility, and balance. The observation guidelines consist of enthusiasm, excitement, and discipline. All of these aspects were used as the instrument of data collection. The objective of the research is to determine the biomotor component profile of the school students. in this research, the biomotor component profile is assessed using observation guidelines to avoid the profile. Based on the observation guidelines, the results of the research shows that the biomotor component male profile is as follows: (1) very talented (1 %), (2) talented (12.1 %), (3) average talented (66.2 %), (4) not talented (17.2 %), and (5) very poor talented (3.5 %). The results of the second, biomotor component talented in scouting talent are as follows: (1) power (29.172 %), (2) balance (19.635 %), (3) agility (17.875 %), (4) strength (10.630 %), and (5) flexibility (7.103 %). According to the results of the research, and based on the observation guidelines, it can be concluded that the biomotor component profile of the assessed school students is average.

Key Words: Biomotor Component profiles; student school; gymnastic

INTRODUCTION

In the stage of peak performance achievement required regular, structured, measurable and programmed exercises. Breeding and scouting talent needs to be done as early as possible because to print the athlete achievement takes a long time. The target of breeding is elementary school children ranges from 6-12 years old. This age group needs to be given continuous, uplifting and continuous training from the talent / seedling scouting, forming, sports branches and performance improvements. The process is divided into several stages: short term, medium term, and long term. Bompa (2009) states that for artistic aged gymnastics ages begin training for daughters between the ages of 6-8 years and 8-9 year olds, a specialization stage between the ages of 9-10 years for girls and 14-15 years for the son while the age of achievement achievers at the age of 14-18 years for the daughter and at the age of 22-25 years for the son.

The dominant elements in talent scouting include several aspects: anthropometric, biomotor, and psychological aspects. Aspects of anthropometry related to weight, height, chest circumference, pelvic circle and so on. Biomotor aspects include strength, flexibility, balance, agility, power and so on. Each sport in talent search (talent scouting) has standards for every aspect. As with gymnastics

* Sport science Faculty of Yogyakarta State University, Indonesia, *E-mail: endang_fik@uny.ac.id*

there are major criteria in anthropometry that distinguishes it from other sports. Bompa (2009) adds that the basic components of biomotor include strength, robustness, speed, coordination and flexibility. The other components are a combination of several components so as to form one term itself, such as power is a combination or product of strength with speed; agility is a combination of speed and coordination. Here is a chart that shows the interconnection between biomotor capabilities. In equilibrium, coordination, agility and poweer are needed, reaction speed is also needed in gymnastics, while speed is needed but very little (Corbin, Welk & Corbin, 2009). Sleeper, Kenyon, Casey (2012) suggests that speed, strength, endurance, agility, flexibility, balance and strength are physical abilities that play a role in the success of a competitive gymnast. Individual tests for flexibility, strength, endurance, and strength have been proposed as a useful tool for measuring potential in gymnastics.

Similarly, the biomotor aspect is a criterion that should be owned by athlete gymnastics. Of the various studies that have been done have not found biomotor stratification (strength, flexibility, balance, power, and agility) in the gymnastics branch. Therefore the research intends to conduct research on biomotor stratification in the early artistic gymnastics talent scouting.

RESEARCH METHODS

(A) Materials and methods

This study is a descriptive research to determine the independent variable value (either one or more variables) without comparing or relating the variables (Sugiyono, 2004, p.11). The variable of this research is the Biomotor component profile.

The subjects of this research were 198 students school. This was a census research because every subject was used as a research sample. Therefore, there was no generalization in this research, and the result was applicable only to student School in special region Yogyakarta, which was the subject of the research.

The instrument that was used to collect the biomotor component data from the School students was a non-test, which includes the observation guidelines that consist of five aspects such as flexibility, strength, power, agility, and balance. Each aspect has five descriptors. The instrument that was used to evaluate the technique of descriptive quantitative with percentage was used as the data analysis technique for this research (Suharsimi, 2006, p.215). Because there was no hypothesis in this research, the analysis was directed to answer the problem formulations. The analysis steps were as follows: (1) the aspect score of each student was summed, (2) the total aspect score of each student was divided by the total aspect observed, (3) the quotient result was converted to the assessment standard, (4) and the biomotor component score of a student was converted into percentage in talent scouting.

RESULT AND DISCUSSION

Stratification of Biomotor Dominant Factor in Scouting Artistic Gymnastics Early Age Gymnastics. Analysis of dominant factor of biomotor test in scouting artistic gymnastics talent early child son, in this research done with steps as follows: 1). Determine the best test results from biomotor, including: a. Specifications: sit and reach , right front split, and bridge (bridge); b. Strengths, including : push-ups, sit-ups, and chin-ups; c. Power jump without prefix; d. Agility; e. Balance; Calculate the z-score value of the data. 2). Calculate the value of t-score based on z-score value. 3). Calculating the average t-score of the test results of the formation and strength; because the two tests consist of several tests. 4). Five t-scores were obtained from the five tests. 5). Determine the score categories based on the t-score score, into 5 categories. 6). Summing up the t-score and categorizing the score into 5 categories: very talented, talented, gifted, gifted, and very talented. 7). Regression analysis. 8). Seeking relative donations and the effective contribution of each predictor. 9). Analysis from point a to point g, with the help of Microsoft Excel, the results can be seen in the attachment. The results are summarized in the following table.

TABEL 1: CATEGORY RESULT TEST BIOMOTOR SCOUT GYMNASTICS ARTISTIC TALENT EARLY AGE SON

Biomotor	*Category Scores*	*Frequency*	
		f	*%*
Flexibility	Very Good	0	0,0
	Good	19	9,6
	Average	149	75,3
	Poor	24	12,1
	Very Poor	6	3,0
Strenght	Very Good	3	1,5
	Good	37	18,7
	Average	112	56,6
	Poor	37	18,7
	Very Poor	9	4,5
Power	Very Good	12	6,1
	Good	50	25,3
	Average	72	36,4
	Poor	32	16,2
	Very Poor	32	16,2
Agility	Very Good	11	5,6
	Good	45	22,7
	Average	88	44,4
	Poor	21	10,6
	Very Poor	33	16,7
Balance	Very Good	21	10,6
	Good	33	16,7
	Average	72	36,4
	Poor	71	20,7
	Very Poor	31	15,7

The final result of scouting talent in early childhood sons, are shown in the following table.

TABEL 2: END RESULT ARTISTIC GYMNASTICS ARTIST EARLY AGE CHILDREN

Talent Category	*Category Scores*	*Frequency*	
		f	*%*
Very Talented	22 – 25	2	1,0
Talented	18 – 21	24	12,1
Average	13 – 17	131	66,2
Poor Talented	9 – 12	34	17,2
Very Poor Talented	5 – 8	7	3,5
Total	198	100,0	

From the results mentioned above, then analyzed with regression analysis to know the contribution of each independent variable (biomotoric) to the dependent variable of artistic gymnastics artistic of early child age. The results of multiple regression analysis, are summarized in the following table.

TABEL 3: RESULTS OF MULTIPLE REGRESSION ANALYSIS (MULTIPLE REGRESSION) ARTISTIC GYMNASTICS FACTORS EARLY CHILDHOOD GYMNASTICS

Model Summary[b]

Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*
1	.919[a]	.844	.840	.273

a. Predictors: (Constant), Balance, Flexibility, Agility, Strenght, Powerb. Dependent Variable: Scouting Talent

ANOVA[b]

Model		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
1	Regression	77.645	5	15.529	207.993	.000[a]
	Residual	14.335	192	.075		
	Total	91.980	197			

a. Predictors: (Constant), Balance, Flexibility, Agility, Strenght, Powerb. Dependent Variable: Scouting Talent

Coefficients[a]

Model		*Unstandardized Coefficients*		*Standardized Coefficients*			*Correlations*		
		B	*Std. Error*	*Beta*	*t*	*Sig.*	*Zero-order*	*Partial*	*Part*
1	(Constant)	-.260	.125		-2.083	.039			
	Flexibility	.258	.034	.218	7.566	.000	.326	.479	.216
	Strength	.193	.026	.221	7.346	.000	.481	.468	.209
	Power	.249	.020	.415	12.462	.000	.703	.669	.355
	Agility	.185	.020	.298	9.189	.000	.599	.553	.262
	Balance	.205	.017	.356	11.962	.000	.551	.653	.341

a. Dependent Variable: Talent Scouting

The result of multiple regression analysis, in the above, obtained by double correlation coefficient (R) equal to 0,919; coefficient of determination (R^2) 0.844; and Fregresi 207,993 with significance (sig.) or p-value 0,000. It is evident that the significance is less than the specified significance level, ie 5% ($p < 0.05$); then Freigo is significant, which means that the multiple correlation coefficients are significant. Judging from the beta coefficient (â) are all positive, it can be concluded that there is a positive and significant contribution of biomotor test results on giftedness in early childhood of men.

This contribution is 0.844 or 84.4% and furthermore, to know the contribution of each biomotor factor to giftedness in early child age, data analyzed with SPS 2005 software aid, relative contribution (SR%) and donation effective (SE%) of each of the predictors summarized in the following table.

TABEL 4: SUMMARY OF PREDICTOR CONTRIBUTION WEIGHT (BIOMOTOR) AGAINST MEN'S EARLY CHILDHOOD GIFT

No.	*Predictors (Independent Variable)*	*Relative Contributions (SR) %*	*Effective Contributions (SE) %*
1.	Flexibility	8,415	7,103
2.	Strength	12,592	10,630
3.	Power	34,558	29,172
4.	Agility	21,175	17,875
5.	Balance	23,260	19,635
	Total	100,000	84,415

From the table as presented in the table above, it can be explained that giftedness in early child of male sex is determined by power factor (29,172%); followed by balance (19.635%); agility (17.875%), strength (10.630%) and flexibility (7.103%). Thus the greatest biomotoric factor contributing to giftedness in early childhood is the power and balance.

CONCLUSSION

Based on the results of data analysis research, hypothesis testing and discussion, can be drawn some conclusions as follows: The results of this study indicate that the stratification of biomotor in scouting talent artistic gymnastics early son 1.0% very talented, 12.1% gifted, 66.2% talented enough, 17.2% not talented, and 3.5% very not talented. Biomotor biomotor talent in scouting artistic gymnastics talent of early age is determined by power factor (29.172%); followed by balance (19.635%); agility (17.875%), strength (10.630%) and flexibility (7.103%).

References

Baechle, T.R. Earle, R.W. (2014). Weight training steps to succeed. United States: Human Kinetics.

Bompa, T.o & Haff, G.G (2009). Theory of periodization and training methodology. Fifth Edition. Canada: Human Kinetic.

Bompa, T.O. and Buzzichelli, C. (2015). Periodic training for sports. United States: Human Kinetics.

Clowes, Hannah., Knowles, Zoe. (2013). Exploring the effectiveness of pre-performance routines in Elite Gymnasts: Mixed Investigation Method. Journal of Gymnastics. Vol 5 pp 27-40.

Corbin, C.B, Welk, G.J., & Corbin, W.R. (2009) The concept of fitness and wellnes. Toronto: McGraw Hill. Company.

Irfan, M. (2012). Physiotherapy for the Stroke Person. Yogyakarta: Graha Ilmu.

Jemni, Monem., Sands, William A., Friemel, Francoise., Stone, H. Michael., Cooke, B. Carlton. (2006). Any effect of gymnastics training on upper body and lower body aerobics and power components in national and international male gymnasts? .Journal of Strength and Conditioning Research. Vol 4 pp 899-907.

Kahle, Nicole and Tevald A., Michel. (2014). Strengthening of core muscles improves balance performance in adults living in community: Pilot Study. Journal of Aging and Physical Activity 22 (1) pp 65-73.

Karter, K. (2007). Stable Stability Stability Exercises for Core Strength and Carved Body. Canada: Webcom.

Knudson, D. (2007). Fundamental of Biomechanics 2nd Ed. USA: Springer.

Mutohir, T.C., Muhyi, M. Fernanlampir, A. (2011). Character with exercise. Exercising with character. Surabaya: PT. Java Library Group.

Dallas, Goerge., Kirialanis, Paschalis. (2013). The effect of two different conditions of the whole body vibration on flexibility and performance jumps on the artistic gymnast. Journal of Gymnastics. Vol 5 pp 67-77.

Dwyer, G.B. and davis, S.E. (2008). A Guide to the assessment of physical fitness related to ACSM health. American College of Sport Medicine: USA.

Ricotti. L. (2011). Static and Dynamic Balance on Young Athletes. J. Hum. Sports Exercise. Vol. 7 (2) March / April 2008. pp 1-20.

Scott Sue. (2008). Reliable body balance training. United States of America. Human Kinetics.

Sheppard J.M and Young W.B. (2007). Agility literature review: Classification, Training and Testing. Journal of Sport Science, September 2006; 24 (9): 919-932.

Sleeper, Mark D., Kenyon, Lisa K., Casey, Ellen. (2012). Measuring Fitness in Female Tournaments: Gymnastics Functional Measurement. Journal of Physical Therapy of International Sport. Vol 7 Number 2 pp 124-138.

Sugiyono. (2004). Method of administrative research [Administration of research methods] (issue 11). Bandung: Alfabeta.

Suharsimi. (2006). Research procedure: A practice approach [Research procedure: Practical approach] (8th ed.). Jakarta: Rineka Cipta

Sukadiyanto and Dangsina, Muluk 2011. Introduction to theories and physical reasons. Bandung: CV Lubuk Agung.

Werner W. K. H. and Sharon A. H. (2010). Principles and laboratories for physical fitness. Wadsworth: United States.

Man In India, 98 (1) : 221-229

CONTENT AND CONSTRUCT VALIDITY OF SOCCER TALENT TEST INSTRUMENT IN SSO REAL MADRID UNIVERSITAS NEGERI YOGYAKARTA STUDENTS

Hari Yuliarto

Instrument is a tool to measure a measuring object. Good instruments must satisfy the element of validity. The purpose of this study is to find out: 1) content validity of football talent measurement instruments consisting of three variables: play creativity, play skills, and task commitment, and 2) construct validity of task commitment instruments.

The subjects of this study are students of SSO Real Madrid Universitas Negeri Yogyakarta. Football talent measurement instruments consist of: 1) written test to measure task commitment; 2) guidelines for observation of a series of football performances that include passing, receiving, dribbling, and headings to measure the skills of playing football; and 3) observation guidelines on the creativity of playing football. Measurement of instrument validity is based on content validity (Aiken Index) and construct validity (CFA).

Based on the result of the research, it can be concluded as follows: 1) the content validity of the football talent measurement instruments is good with the coefficient of Aiken obtained the lowest value of 0.83 and the highest is 0.94, and 2) the construct validity of task commitment instruments is either obtained (X2 = 5.06) , (p-value) = 0.40871, and (RMSEA = 0.020).

***Keywords*:** validity, instrument, football talent

I. INTRODUCTION

The development of Indonesian football can be seen through the competition held PSSI. Measurable achievements of national achievement based on the main division of the Indonesian Football League. There are still shortages and problems that need to be observed at the clubs that competed in the competition in the Football League Indonesia in 2016 ago. The pace of acceleration of Indonesian football achievement in the international level is slower than some other countries such as China, South Korea and Japan who can compete in the World Cup.

Efforts that can be made to catch up the achievement of Indonesian football is by improvements in all areas, including facilities and human resources involved in it. This lag will encourage the need for structuring the national football coaching system. The most basic sports coaching pyramid is breeding and shooting followed by talent scouting from an early age. One of the improvements that can be made with the development of a talent scouting system is especially the development of measurement instruments of talented soccer athletes.

Validity of football talent measurement instrument is very important to be able to capture the talent of football optimally. A test can be said to be good as a

* Sport Sciences Faculty of Universitas Negeri Yogyakarta, Indonesia, *E-mail: hariyuliarto@uny.ac.id*

measuring device must meet the main criteria / principles of the preparation of tests in order to obtain a good and correct test equipment, so that the test results describe the true state of the object being measured. The test is said to be good if it can provide precisely related data. A good test if it qualifies for validity, reliability, objectivity, and practicality (Miller, 2002, pp.55-63; Ismaryati, 2006, pp.13-36). Research on the validity of the content and the validity of the constructs of football talent measurement instruments is important as some studies of soccer talent instincts have been done that only distinguish gifted and gifted children based on criteria and indicators that are still simple because it only touches the ability and physical skills. The results of the study include: (1) Allan's research, JP et al (2007) who only studied about anthropometry profile and physical appearance; and (2) Hirose's research, N. et al (2007) identifies the talents of teenage football players from a physical, physiological, and biological perspective. Other things like mental and physical proportions have not been discussed in depth.

Research on the validity of the constructs of football talent measurement tests is important because the development of an understanding of the constructs of football talent measurement is always evolving and has a different understanding of the variables used in composing the instruments. This research is expected to produce an instrument that can optimally capture the talent of football.

II. STUDY REFERENCE

2.1. Football Talent

Football is one of the most popular sports in the world. The number of football enthusiasts is increasing rapidly each year. Many parents are enrolling their children at football clubs to be trained to be excellent footballers. Speaking of professional football is certainly related to achievement. Many factors influence achievement in football (Hirose 2011; Fernandez & Mendez, 2014; Hujigen B.C.H. et al., 2015). These factors include physical factors, physiological, psychological, technical skills and tactics. There are four key stages in the formation of professional footballers namely detection, identification, selection, and talent development (Hirose, 2011, p.1). This shows that talent is very important in achieving football achievement.

Football talent is a capability that someone has in accordance with the needs of the characteristic of soccer sport so that it can be a potential to achieve football achievement. Football talent can be seen as a whole on the concept of three ring conception from Renzulli. The identification of a soccer talent based on above-average ability, task commitment, and creativity will capture the talents of football well. These three variables indirectly represent factors that influence one's success in achieving soccer achievement such as skill factor of tactical and psychological techniques.

A child who has the above average ability of his peers is one indicator that the child has talent. Being able to show good technical skills is an above-average form of ability. Another indicator of creativity that someone has. Problem solving faced as it can do deceitful motion when playing football as a way to get through the opponent is a hallmark of creativity. In addition to above-average capabilities and creativity of other indicators is task commitment. A child who has a strong mentality, confidence, and motivation in football practice is an example of a child who has a good duty commitment. If all three indicators are met then it can be said that the child is talented in the field of football.

Basic Concepets of Testing, Measurement, and Evaluation

Tests, measurements, and evaluations are important elements in the science of sports (Haris B.S, Blom, L.C. & Visek A.J., 2013, p.201). Implementation of tests, measurements and evaluation in the field of sports is very supportive of the development of sports science because the test, measurement and evaluation can prove the incident scientifically. Tests, measurements, and evaluations are essentially different things.

According to Djemari Mardapi (2017, p.94) the test is one form of the instrument consisting of a number of questions used to perform the measurement. This can be interpreted as a matter of class increase test, psychological questionnaire, performance questionnaire are some examples of test forms. Overton (2012, p.3) states that the test is a method to measure the ability of students. From the expert statement on the test it appears that the test is part of the measurement and can be said that the test is only as a tool or instrument. It can be concluded that the test is a measuring instrument or instrument used to obtain data about a person's ability.

Another case with a test that is only a measuring tool, more measurement refers to a process of determining the number of test results that have been done. Djemari Mardapi (2017, p.5) states that measurement is basically an activity of determining numbers for an object systematically. Measurement as the activity of determining the numbers by comparing the test results with certain criteria so that the form of measurement is a number or numerical. Gordon (2012, p.7) argues that measurement is a process of obtaining information in numerical form about one's ability. These two expert opinions indicate that the essence of measurement of numbers determines the state or individual capabilities. Such capabilities can be cognitive, affective, and psychomotor abilities. It can be concluded that the measurement is an activity of determining the number of the state or ability of a person.

Continuation of the measurement is the assessment as a form of high-low description or good-badness of measurement results. To be able to know the estimated ability of a person who is measured using a test, it is necessary to evaluate the results of the assessment of measurement results. Evaluation is a judgment of

the value of the measurement or the implications of measurement results (Griffin & Nix in Djemari Mardapi, 2017, p. 3).

Based on the definition of the tests, measurements and evaluations that have been submitted can be ascertained that these three things are different. When viewed more intelligently again, from the whole sense seen that the tests, measurements and evaluations are interconnected form a stage to produce a basis for improving ability.

Appropriate and good evaluation results require that measurement results should have the smallest possible errors. This error rate is related to the reliability of the measuring instrument. A good measuring instrument gives a steady result when used repeatedly. The measurement error is random and systematic. Random errors are caused by the measured physical and mental states. Systematic error is caused by measuring instruments, measured and measured (Djemari Mardapi, 2017, p.7). Consistency of measurement results obtained from the accuracy of measuring instruments used, so that in the implementation of the measurement test should be tailored to the needs.

Validity of Test

Validity in the test states the degree of accuracy of the measuring instrument of the actual content or meaning measured. Validity is important in finding quality tests. According to Djemari Mardapi (2017, p.32) validity refers to the support of evidence and theory to the interpretation of test scores according to the purpose of the use of the test. The validation process includes the accumulation of evidence as the basis of scientific measurement for the purpose of interpreting scores. Another expert opinion states the validity of the measuring instrument is how far the measuring instrument is able to measure what should be measured (Saefuddin Azwar, 2007, p.45). It can be concluded that the validity of the test is a condition that refers to the ability of a test in shaving and produce interpretation of the score in accordance with the purpose of the test.

Validity can be grouped into four, namely: 1) content validity; 2) construct validity, 3) validity based on internal structure, and 4) validity based on relationship with other variables (Djemari Mardapi, 2017, p.33). Validity is an integrated evaluative policy of the extent to which empirical facts and theoretical reasons support the adequacy and suitability of inferences and actions based on test scores, and are related to the accuracy of measurements.

Some things to note regarding the validity and reliability of tests by Ismaryati (2006, pp. 33-34) are: a) the results of less experienced players' achievements are usually less reliable when compared to high performers; b) special test reliability for the tested group. The same reliability coefficients can be expected to be obtained provided they are used for similar groups and under similar conditions; c) the number of subjects can affect reliability, therefore more trust will be given to the

reliability coefficient of a test calculated from a large number of subjects; and d) low validity coefficient indicates an element of inaccuracy in measurement.

III. RESEARCH METHOD

3.1. Scope and Types of Research

This study uses a quantitative approach. This study was designed to measure the validity of the contents and the validity of constructs of soccer talent measurement instruments.

3.2. Population and Sample Research

The population used in this study were all SSB students of SSO Real Madrid. Sampling technique used in the form of purposive random sampling, with SSB student criteria SSO Real Madrid aged 10-12 years. Therefore, the research sample used in this study is SSB students Real Madrid SSO age 10-12 years, amounting to 16 people.

3.3. Data and Data Collection Techniques

The type of research data is quantitative data obtained from 1) written test in the form of task commitment consisting of 15 items; 2) measurement of the observer on the ability to play football through observations when the subject plays football; 3) the observer's results on the creativity of playing football. Based on the scoring figures of each of these instruments can be confirmed on the norms that can be used to determine the talent of football.

3.4. Data Analysis Technique

The data analysis technique used Aiken analysis to measure the validity of the instrument content, while the validity of instrument construct was measured using confirmatory factor analysis (CFA) as the data analysis technique.

IV. RESEARCH RESULTS AND DISCUSSION

4.1. Content validity

Content validity is intended to measure the extent to which the instrument items used cover the entire contents of the object to be measured. The validity of the instrument contents in this study was conducted by using rational analysis that is whether the grain on the instrument grille describes the indicator of the measured variables of each instrument consisting of: 1) task commitment; 2) the skills of playing football consisting of passing, receiving, dribbling, and heading skills in playing football; 3) the creativity of playing football consisting of fluency, flexibility and originality in playing football.

Task Commitment

The coefficient value of content content of six (6) people rater with four (4) categories of answers is good if the coefficient of validity is obtained at least 0.78. The results of data analysis indicate that all items of task commitment instrument have met the criteria. Overall, the average is 0.89, with the lowest value of 0.83 and the highest value of 0.94.

TABLE 1: INDEKS AIKEN ITEM TASK COMMITMENT ANALYSIS RESULTS

Task Commitment			
Item	*Result*	*Item*	*Result*
1	0.83	9	0.83
2	0.89	10	0.94
3	0.83	11	0.94
4	0.89	12	0.94
5	0.89	13	0.89
6	0.83	14	0.89
7	0.83	15	0.89
8	0.94		
Mean	**0,89**		

Football Playing Skill

The result of index analysis of aiken skill of playing football shows that the content validity index using Aiken coefficient obtained the average passing ability of 0.94, the average of receiving ability is 0.94, the average dribbling ability is 0.94, and the heading ability is 0.93. The average overall result of soccer playing skills that includes passing, receiving, dribbling and heading of 0.94. Based on the conversion value of Aiken's validity coefficient, all instruments are said to be good because the value of validity coefficient is more than 0.78.

TABLE 2: INDEKS AIKEN ANALYSIS RESULTS OF FOOTBALL PLAYING SKILL

Football Playing Skill							
Passing		*Receiving*		*Dribbling*		*Heading*	
Btr	*Hasil*	*Btr*	*Hasil*	*Btr*	*Hasil*	*Btr*	*Hasil*
1	0.94	1	0.96	1	0.93	1	0.93
2	0.92	2	0.94	2	0.94	2	0.93
3	0.96	3	0.93	3	0.94	3	0.94
4	0.93	4	0.93	4	0.93	4	0.92
Rerata	0.94		0.94		0.94		0.93
Mean	0,94						

Creativity

The result of the content analysis of the content of playing skill using Aiken index coefficient obtained the smoothness in playing football equal to 0,93; average

flexibility of 0.90; and the average originality of 0.93. The average creativity coefficient of playing football as a whole is 0.92. Based on the conversion value of Aiken's validity coefficient, all instruments are good including the validity coefficient of more than 0.78.

TABLE 3: INDEKS AIKEN ANALYSIS RESULT OF ITEM PLAYING FOOTBALL CREATIVITY

Passing Kelancaran		*Receiving Keluwesan*		*Dribling Originalitas*	
Item	*Result*	*Item*	*Result*	*Item*	*Result*
1	0.94	1	0.94	1	0.89
2	0.94	2	0.89	2	0.89
3	0.94	3	0.89	3	0.94
4	0.89	4	0.89	4	0.94
5	0,94	5	0.89	5	1
Rerata	0.93		0.90		0.93
Mean	**0,92**				

The results of the content validation analysis of the overall variables of football talent measurement instrument show that the Aiken index coefficient of football talent measurement instrument obtained including satisfactorily with the coefficient of grain aiken each variable move from the value of 0.83 to 0.94. This indicates that the validity of the content of the items in each of the compilation of the test variables used in this study is satisfactory and reflects the overall content or matter tested in a propositional manner.

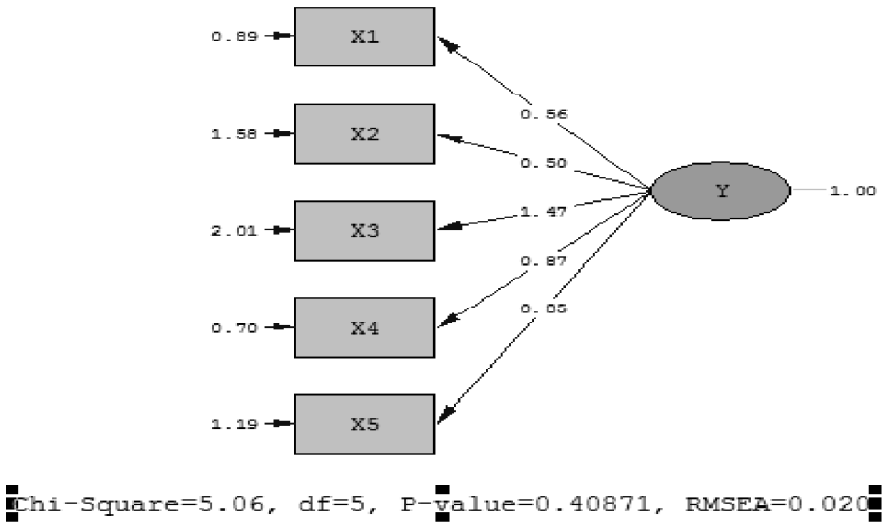
4.2. Construct Validity

In determining the construct validity is done theoretical review process of a concept of task commitment variable in football. The formulation of constructs is based on systesis and theories about the concept of task commitment in playing football through a logical analysis process.

The construct validity in this study aims to see whether the instrument grain measures the construct to be measured and to know the suitability between the theoretical concepts and the empirical data. The instrument items measured in this studyseveral suggestions are:

1. In quantitative research it is suggested to researchers that the instruments that measure manifest variables are used valid instruments, one of them through the validity of the content.
2. If the instrument used is an instrument that measures latent variables, then the instrument validity is recommended based on the validity of the construct.
3. Suggested further research to be more careful in doing data analysis, because many things that can be delivered using confirmatory factor

analysis. are written test items of the task commitment variable consisting of five observer variables: X1 = curiosity, X2 = persistence, X3 = mental endurance, X4 = selfconfidence, and X5 = achievement boost, and one latent variable Y = task commitment. For this purpose used two criteria, namely the value of calculation results (p-value) and RMSEA.



x1= 0,56 x2= 0,80 x3= 1,47 x4= 0,87 x5= 0 ,85

Picture 1: Confirmatory Factor Analysis Result of Task Commitment Variable

The acceptance criteria for the model are p-value> α and RMSEA <0.08 (Mueller, 1996, p.163). Figure 1 shows the result of confirmatory factor analysis with p-value significance value of 0.40871 (with a significance level of 0.05). The value of p> α, RMSEA = 0,020 <0,08. It can be concluded that the model offered is fit in accordance with empirical data.

V. CONCLUSIONS AND RECOMENDATIONS

5.1. Conclusion

1. The validity of the contents of football talent measurement instruments is quite good with Aiken coefficient obtained the lowest value 0.83 and the highest 0.94.
2. The construct validity of the task tool device is good, obtained (X2 = 5.06), (p-value = 0.40871, and (RMSEA = 0.020)

5.2. Recomendations

Based on the conclusions obtained then there are several suggestions are:

1. In quantitative research it is suggested to researchers that the instruments that measure manifest variables are used valid instruments, one of them through the validity of the content
2. If the instrument used is an instrument that measures latent variables, then the instrument validity is recommended based on the validity of the construct.
3. Suggested further research to be more careful in doing data analysis, because many things that can be delivered using confirmatory factor analysis.

Bibliography

Allan, J. P, et all. (2007). Characteristics of selected and non selected elite junior Australian footballers. *Journal of Sports Science and Medicine (2007) Suppl. 10.* Diakses tanggal 7 Februari 2017 dari *http://www.jssm .org.*

Djemari Mardapi. (2017). *Pengukuran penilaian & evaluasi pendidikan*. Edisi Revisi. Yogyakarta: Parama Publishing.

Fernandez, R.J & Mendez, G.A. (2014). Talent detection and development in soccer: a review. *Journal of Sport and Health Research,* 6(1), 7-18.

Gordon. (2012). Assesment, teaching, and learning. *Journal of The Future of Assessment in Education*, 2(2), 1-8.

Haris B.S, Blom, L.C. & Visek A.J. (2013). Assessment in youth sport: practical issues and best practice guidelines. *Sport Psycology Journal,* 27(2), 201-211.

Hirose, N *et al.* (2007). Possible predictor of talent identification of professional soccer players. *Journal of Sports Science and Medicine, 10.*

Hujigen B.C.H, Leemhuis S., Kok N.M, Verburgh L., Oosterlaan J., Elferink-Gemser M.T., & Visscher C. (2015). Cognitive functions in elite and sub-elite youth soccer players aged 13 to 17 years. *Journal PLoS one,* 10(12), 1-13.

Ismaryati. (2006). *Tes dan pengukuran olahraga*. Surakarta: Sebelas Maret University Press.

Miller, D. K. (2002). *Measurement by the physical educator, why and how*. New York: McGraw-Hill Higher Education

Overton, T. (2012). *Assessing learners with special needs: an applied approach.* New Jersey: Pearson Education, Inc.

Saefuddin Azwar. (2007). *Dasar-dasar psikometrik*. Ed. II. Yogyakarta: Pustaka Pelajar.

Man In India, 98 (1) : 261-278

EFFECT OF "S & E TRAINING MODEL" TO INCREASE STRENGTH AND ENDURANCE IN MARTIAL ATHLETES; (EXERCISE PHYSIOLOGY STUDY)

Panggung Sutopo, Bambang Priyonoadi, Okky I.Pamungkas and Nova Aulia Rahman

This study aims: (1) to prove the effect of S & E exercise model on strengthening, (2) to prove the effect of S & E training on increasing endurance athletes of Pencak Silat Teenagers. This research is an experiment with two group prettest-posttest design. The population of the study were teenage adolescents totaling 20 athlete. Data collection using tests conducted before and after treatment. Data analysis technique using t-test. Strength test using wall sit test, push-up test, sit-up test, chin-up test, back-up test, and endurance test using balke test. The results of the research analysis showed that strength (group 1) with wall sit test increased by the right limb support á 12,9 and the left limb support á 13,4; push-up test increases by á 9.4, crunches test increases by á 10.5, back-up test increases by á 13.6; pull-up test increases by á 2. Endurance (group 2) using balke test increase by 2.28. Based on the above results it can be concluded that the S & Edapat exercise model improves strength significantly with p: 0,000 and endurance training can significantly increase endurance by p: 0,000.

Keywords: exercise model, biomotor strength and endurance, adolescent athlete

PRELIMINARY

Pencak Silat is a form of martial art sport. History of the birth of pencak silat is not known for sure, but martial arts pencakiri already known by the people since ancient times, which in its development can be contested. The fighters in performing the match must have a good biomotor component. the biomotor components needed in martial arts for the fighters include strength, speed, power, flexibility, resilience and coordination. In addition, the psychic aspect of emotional mastery, motivation and intelligence and other elements related to psychology is needed to be more supportive to be a good fighter.

Improvement of physical condition is the first element in training, because the elements in this coaching both during heating, playing and others must be accompanied by physical formation. In addition to reducing the occurrence of injury to the athlete when performing techniques and simple tactics to the complex (Nugroho, A., 2001). The two biomotor components of strength and endurance are important to the trainer to the adolescent athlete, because the strength as a foundation in forming other biomotor components. While endurance will affect the fighter in order not easy to experience fatigue and can be more quickly in

* Sport Science Faculty, Yogyakarta State University, Yogyakarta, Indonesia, *E-mail: panggung_s@uny.ac.id*

recovery, and to the peak of achievement should be started from the development of aerobic ability, anaerobic excitatory threshold, anaerobic exercise, and the peak is the speed to achieve the highest achievement (Hariono, 2006). Everything is required in the category of matches, art category (single, double, team).

In parallel to the above explanation, research related to strength and adolescence, Rashid, A. (2014) whose research used the age group of 15-19 years resulted that "plyometric training had a significant effect on the effectiveness of strengthening and leg muscle strength in badminton sport" . That is, plyometric exercises can improve the ability of biomotor strength and power, plyometric is a biomotor component of the combination of basic strength (maximum strength) and speed (maximum speed) components with concentric and eccentric motion always cyclical contraction (continuous) and use of age group 15 - 19 years of age indicate an increase in plyometric training. Siswantoyo (2014) found that "there was an increase in the ability of the adolescent limb power of 6.6 cm. Changes in increased limb power occur with increasing-decrease-increase pattern back ". That is, modified plyometric exercise can improve the ability of limb power and adolescent athlete indicated there is an increase. Soethama, Silakarma, Dedi., & Wiryanthini (2016) resulted in "an increase in pectoralis major muscle mass and bicep in adolescents after weight training. There is an increase in pectoralis major muscle mass and bicep in adults after weight training ". There is an increase in pectoralis major and bicep muscle mass greater in adults than in adolescents after weight training. That is, weight training can already be given to adolescents in increasing muscle mass even though the mass increase is greater than in adults because of age factors related to the principles of readiness, individuality, adaptation and variation.

In addition Uliyandari's (2009) study found that "there was an increase in VO2max in girls aged 11-13 years who received programmed physical exercise". That is, At the age of 11 - 11 years on female students can already be given physical exercise programmed proved an increase in VO2max value. The Brøgger, Mathisen, Pettersen (2013) study found that "children can raise their VO2max after five weeks of practice with two sessions at high intensity per week. The study also revealed that children can exercise up close to their average heart rate peak in a time period lasting up to four minutes ". That is, that the age of children ie 10 years of age in boys or still at the multilateral stage of the training pyramid is able to respond to aerobic activity training program in 5 weeks with 2 sessions per week. While Ulum's research (2013) concludes this research that "short interval training can increase anaerobic endurance in hockey players ". That is, it is known that short interval training when applied regularly, programmed, continuous, and high discipline proven to increase anaerobic endurance in adolescents aged (15-18 years) high school. Some of the above research shows that strength and endurance can be given in adolescence.

RESEARCH METHODS

This research is a quasi-experimental research. Two-Prettest-Posttest Design. The subjects of the experiment were given pretest with strength and endurance test. This study was conducted in two experimental groups given treatment in the form of strength training and endurance training (S & E training model). Time of study conducted 12 meetings with frequency 3 times a week, research conducted for 2 months. The population in this study were martial arts athletes with the age of 14 - 17 years or juvenile cateori, with the number of 20 athletes and divided into two groups. Group one is 10 people for strength training and group two is 10 people for endurance training. Variables in this study consist of independent variables that is strength training model and endurance. Dependent variables are strength and endurance capability. Data analysis techniques used: normality test, homogeneity test, and t test. The analysis results revealed that there is a difference if the significance value is less than 0.05 ($P < 0.05$). Data obtained from pretest and final test (posttest) will be analyzed statistically descriptive using t test by using SPSS program with 5% significance level.

RESEARCH RESULT AND DISCUSSION

From this research process obtained data relevant to the purpose and hypothesis research. The data of this research is obtained from pretest and posttest which is given a treatment that is strength training effect and endurance. Initial tests were taken to determine strength and endurance capabilities. After the treatment is given strength training and endurance training in accordance with the appropriate dose of exercise, then the next stage performed the final test. This posttest aims to determine the effect of the treatment that has been given during the exercise. The way is done to determine the ability of strength with wall sit, sit-up test, push-up test, back-up test, chin-up test. While the ability of endurance with balke test. Full exposure of pretest and posttest result data can be seen in table 1 below:

TABLE 1: PRETEST AND POSTTEST RESULTS OF STRENGTH AND ENDURANCE

Uji Tes	*Pres test*	*Posttest*	*α*
Strength			
Right Wall seat	19,8	32,7	12,9
left Wall seat	19,4	32,8	13,4
Push Up	30,3	39,7	9,4
Sit Up	32,8	43,3	10,5
Back Up	53,7	67,3	13,6
Pull Up	4	6,7	2
Endurance	*Pretest*	*Posttest*	α
Balke Test	36,31	38,59	2,28

Based on the above results can be seen the average value of right wall seat for pretest value of 19.8 and posttest value of 32.7, then the difference of pretest to posttest increase of 12.9 with information increases. The average value of the left wall seat increases. The average pretest value of 19.4 and posttest value of 32.8 then the difference of pretest to posttest increase of 13.4 seconds. The average value of push up pretest 30.3 and posttest 39.7 then the difference of pretest to posttest increase of 9.4 seconds. Average sit up value for pretest value 32,8 and posttest value 43,3 hence difference of pretest increase to posttest equal to 10,5 increase. The mean value of back up for pretest value 53,7 and posttest value of 67,3 hence difference of pretest increase to posttest equal to 2 (increase). The average value of pull up pretest 4 and posttest 6.7 (increased). The average test score pretest 36.31 and posttest 38.51 then the difference of pretest to posttest increase of 2.28 (increase). conclusion is the result of strength and endurance after the treatment between pretest and posttest result of the increase significantly.The normality test results from all test items showed normal distribution strength (p> 0.05). And homogeneity test showed the result of significance of p> 0,05, thus all test result used was homogeneous. The result of variance homogeneity test with Lavene statistics shows significance value (> 0,05), then the data can be said homogeneous. Furthermore, data analysis continued with t test, while the result as follows.

TABLE 2: RESULTS OF T STRENGTH AND ENDURANCE TEST DATA

Training model		
Strength	*t*	*Significant*
Right wall seat	-17,501	0,000
Left wall seat	-11,132	0,000
Push Up	-13,695	0,000
Sit Up	-24,523	0,000
Back Up	-27,261	0,000
Pull Up	-12,650	0,000
Endurance	t	Sig.
Balke test	-10,714	0,000

Based on the data in table 4 pretest and posttest shown with significance value 0.000. It was concluded that six test items of strength occurred a significant increase. And endurance also increased with a significance of 0.000. The exercise program used in strength training is as follows.

Muscle strength is defined as the ability to generate strength to the load and is rated as the maximum removable load or maximum torque that can be generated during movement "(Signal, N.E.J., 2014). In this case the development of muscle

TABLE 3: STRENGTH TRAINING PROGRAM

Model training	*Dosage*		*purpose*
Weight training	Intensity	: 70% – 90% of	Develop strenght
	1 RM Volume	: 3 – 5 set / 6 – 10 repetition	
	T. Recovery	: 2 – 5 menit	
	T. Interval	: 2 – 5 menit	
	Irama	: 2:1:2	
	Frequency	: 3 kali week	
	Periodization	: 4 week	

strength in sports body contact, body builder can use the target practice and maximum strength hypertropy because this exercise suits the needs of sports. Hypertrophy and maximal strength are joint exercises with eccentric and concentric base motion with angular type of joints. Implementation of hypertropy exercises using moderate intensity of 67% - 85% of 1 RM, Repetitions 6 - 12, 3 - 6 sets, and breaks between sets 30 - 1.5 minutes (Binkley, HM, 2014) and maximum strength training exercises using weight using the heavy intensity of 80% - 100% of 1 RM, reps 1 - 8, set 3 - 5, and rest between sets 2 - 5 minutes (Hariono, A., 2006).

Combining the use of the hypertropy practice method of maximum strength, based on Sharkey's opinion that At age 10-12 years for daughters and 12-14 years for boys there is dramatic growth and development, increased secretion of testosterone hormones for men and progesterone for women. At the peak of muscle and bone growth, there is a balance disorder. At this time the exercise is aimed at improving muscle strength and heart lung fitness. Resistance exercises can increase oxygen by 33% or more. Various skill exercises and correct techniques begin to be trained on athletes and begin to be prepared for more strenuous exercise. At the age of 15-19 years to improve the functional capacity of the muscles and heart lung fitness done with more severe exercise, for example with weight training in accordance with the needs of the sport (Sharkey, 1986) .. This means teenagers are complex, multi-process transition system that involves the development from immaturity and social dependence in childhood to adult life with the goals and expectations of fulfilled development potential, and social accountability (Curtis, 2015). In this case, adolescents aged 14-17 years are said to be provided with moderate intensity training both in developing strength and endurance capability remain in the supervision of the coach

The results showed a greater statistical increase in high intensity than moderate intensity in squatting strength. Or, a statistically greater increase in lateral thigh muscle thickness is noted for moderate than weight. These findings suggest that weight training is superior to the goal of maximal strength when moderate load training is more suitable for hypertrophy-related goals when the same number of sets is performed between conditions (Schoenfeld, BJ, Contreras, B., Vigotsky, AD, et al ., 2016). However, in the research conducted the researchers combine an

alternative dose of exercise between hypertropy and maximum strength. Namely reps between 6 - 10, 3 - 5 sets, 70 - 90 intensity, rest between sets 2 - 5 minutes. And the results obtained increased by p: 0,000.

Improvement from pretest to posttest Right wall seat is shown with t value of -17,501 at significance 0,000. It is concluded that the increase of Right Wall seat value before and after training has increased significantly. The increase from pretest to posttest left wall seat is shown with a t value of -11.132 at a significance of 0.000. It is concluded that the increase of pre-and post-training values has increased significantly. The results are measured using the sit sit test. There are several studies that support the test results sit sit. The results of other studies have a significant effect on the squat and leg press exercises for increased strength and hypertrophy of the leg muscles. The squat exercise is greater than the leg press and control group on increased strength and hypertrophy of the leg muscles (Rachman, A., 2014). In addition, obtained by doing treatments on leg muscles or lower extremities. In the research conducted by Anggraeni, Jubaedi, & Nuseto (2013), this study aims to find out a clear picture about the relationship of arm muscle strength and legs with the achievement of 25 meter freestyle pool on the students of 2012 class year 2012/2013. Instruments used strength test of arm muscles (pull and push strenght test), leg strenght test, and 25 meter swimming test. The result of research is there is a significant relationship between arm muscle strength and leg muscle strength to freestyle pool with contribution of 41,86%. That is, leg muscle strength contributes to freestyle pool achievement. When associated with sports achievements of martial arts, the dominant work of muscles using legs or lower extremities is certainly very supportive of the athlete's ability to perform kick movements, clippings, sweeps.

In addition, in the study who want to know how much influence the press exercise to increase the ability leap in a jump serve on the game volleyball in high school. So it can be concluded there is a positive influence between leg press exercises on the ability of the top service on the game volleyball (Saleh, H.U., 2013) .As of this research problem the importance of leg muscle strength in supporting the technical skills on the martial arts branch. There are studies that compare the effect of effective exercise between leg curl and leg extension on the ability to kick the ball. Based on the results of this study can be concluded that leg curl exercise and leg extension exercise are equally improve the kicking of the ball, but according to statistical calculations leg extension exercise is better than leg curl exercise in improving the results kick the ball. For that it is recommended: 1) The players should do leg extension exercises to improve long-distance kicks. 2) Trainers should provide leg extension and leg curl exercises to extracurricular participants in improving long-distance kicks (Bahar, A.T.I., 2012). While in another study to determine the difference of hamstring curl on swiss ball training with lying leg curl exercise to increase the strength of hamstring muscle in futsal players.

The conclusion of the research is the difference of hamstring curl on swiss ball training with lying leg curl training to increase hamstring muscle strength in futsal players (R, Khoiriyah, 2014).

The increase from pretest to posttest sit up test is indicated by a t value of -24.523 at a significance of 0.000. It was concluded that the increase in pre- and post-training values experienced a significant increase. The result is measured using push up test. There are several studies that support the results of push up test.Terapat research that the conclusion that sit up exercise can improve the ability heading in the game sepak takraw at sepak takraw athletes. (Marselina, M., Baan, A., & Appe, U., 2015). There is also research that the purpose of this research is to know the effect of sit up and medicine ball practice on throwing ability in class XI soccer game in SMA. The conclusion of this research is that the sit up and medicine ball exercises can improve throw in ability and it can be concluded that both of these exercises can be concluded that medicine ball practice is more dominant than the result obtained in throwing ability (Suhendra, TA, Jumain, & Marhadi, 2015). This means that the two researches that sit up exercises can give good results to the skills in the sports. In research conducted by the researchers are very synergistic with the above research, because the ability of pencak silat techniques supported by abdominal muscle strength, because abdominal muscles are central or part of the core muscle, which is responsible for helping all daily activities. And strength training can already be given to adolescent athlete but it is necessary to be given carefully dose of exercise, principles of practice, dominant biomotor and energy in sport of martial arts. And proved in the table results above the presence of significant results typed t test done, using sit up test.

The increase from pretest to post test push up is indicated by a t value of -13.695 at a significance of 0.000. The results are measured by using a push up test. There are several studies that support the results of the push up test. In a study aimed to prove the effect of physical exercise programmed on muscle endurance. Treatment is the amount of push-up modifications without a break that can be done at week 0 (pretest) and 12 (post test) is assessed with a table of muscle endurance Mc Ardle. The conclusion is 12 weeks of programmed physical exercise in girls aged 9-12 years can improve muscle endurance (Parahita, A., & Hardian. 2009). In addition, there is a study aimed at identifying and identifying push-ups and triangle push-up exercises for arm muscle explosive strength. The conclusion of the research is better push-up triangle exercises compared to the push-up cluster training on the muscle power of the arms in the students of Junior High School (Munanda, Ferdinan, Hermawan, R. & & Suranto, 2016). There is also research that aims to be achieved in this research is to know the effect of bench press and full over training program on the result of over head pass basketball in the class X students in high school. The results showed: first, t arithmetic = 13,140> t table = 2,131 means there is a significant influence on the bench press exercise program

of 133%. Second, t count = 27,843> t table = 2,131 there is significant influence on training program full oversebesar 115,15% (Armaica, M.R., Sitepu, A., & Suranto, 2013). At that point, there is a research aim is to know the influence of bench press exercises and push-up exercises against free throw shots in basketball games, and whether there are differences in results from both forms of exercise. The conclusion is that there are significant effects of bench press exercises and push-up exercises on free throw shots in basketball games, and there are differences in results from both forms of exercise (Taryono, 2010.). And there is research that aims to know: 1) difference of influence between bench press angle 45 ° and bench press angle 135 ° to result of repulsive force O'Brien style, 2) difference of influence between normal weight of lean and normal weight of fat against the outcome of the O'Brien style bullet, 3) the interaction between bench press exercises and weight loss against the O'Brien style shot force. In conclusion There is no interaction between bench press exercises and weight loss against O'Brien style shot-strike. It is expected that the results of this study can be useful for teachers of Physical Education and trainers who are interested to develop a shot putter, when preparing the exercise program should be the bench press exercise of 135 ° angle is incorporated as an alternative exercise, because the bench press exercises at 135 ° angle give better influence compared to bench exercises press angle 45 ° to the outcome of the O'Brien style ball beam, and pay attention to weight factor, because in this research proved that the weight of normal fat give better influence compared with the normal weight of lean against the outcome of the shotgun style O'Brien (Muhlisin. 2007).

From some of the above research, it is concluded that push-up exercise is very influential to increase strength in chest and arm muscles, especially given bench press exercises more support such strengthening research, bench press is very influential on the technique skills over head pass on basketball, when on martial arts sports will help against the technique of kickback, blow technique. In addition, the results of bench press exercises can be maximized not only the dose of exercise alone, but based on research bench press exercises can be maximized when adjusted angle of practice. And proved in the table results above the existence of significant results typed t test done, using push up test. The increase from pretest to posttest back up is shown with a t value of -27.261 at a significance of 0,000. The results are measured using back up test. There are several studies that support the results of back up test. While the purpose of research to be achieved is to know and examine the presence or absence of the influence of back up training on the ability of heading in the game of football on the students. Based on these results then the hypothesis states There is an influence of back up exercises on the ability of heading in the game of football on students (Reval, 2013). That is, back-up exercises when given correctly and appropriately in accordance with the dosage that has been adjusted to the rules of practice will have an impact on the increased technical

skills and not only that, physical, tactical and mental can be achieved well. And evident in the results table above the presence of significant results.

The increase from pretest to posttest pull up is indicated by a t value of -12.650 at a significance of 0.000. The results are measured using a pull up test. There are several studies that support pull up test results. This study aims to find out which is more effective between the influence of push up and pull-up exercises on improving the service accuracy of youth athlete volleyball men. The test results showed the pull experiment group experiments better than the push-up experimental group on improving the accuracy of volleyball service, as indicated by the posttest value difference of 2.4, meaning that the experimental group of pull-up experiments is more tested than the experimental group of push-ups (Merrydian, O. 2012). In addition, there is research with the aim of knowing the effect of pull up and dumble biceps curl exercises in increasing the stroke arms swimming on vocational students. Frequency of practice as much as 3 times in semingu, as many as 2-4 sets with 8 times each set and break time 2 minutes each set. The training program is given for 6 weeks. The difference in effect suggests that the pull-up exercises are better at improving straighter breaststroke armor than the practice of dumble biceps curl and control exercises (fcount 3,420> ttable 3.23 (Arismunandar, Y., Husin, S. & & Hermawan, R. 2013) .The conclusion that pull-up exercises are more effective is evident from the above research, from comparative pull-up exercises to push-to-service precision, in addition to the pull-up and bicep curl pull-downs of the freestyle pool, all of which conclude that pull-up exercises are more effective at improving skills on the sport. So in the sport of martial arts pull-up strength training is useful to support the technique of kickback, that is when someone pulls the opponent's leg to do. shown in the results table above the presence of significant results typed t test.

TABLE 4: ENDURANCE TRAINING PROGRAM

Training model		*Dosis Latihan*	*Tujuan Latihan*
Endurance training	Intensity	: 85% – 90% maks	Training for *aerobic* & *anaerobic*
	Duration	: 2 – 5 menit	
	Repetition	: 6 rep	
	Set	: 1 set	
	T. interval	: 1:1/2 -3	

The increase of pretest to posttest balke test is shown with t value of -10.714 at 0.000 significance. It is concluded that the increase of balke test value of athlete before and after training has increased significantly. Other research results show that the experimental results for two weekly sessions of maximal strength training are enough to increase the maximum strength. The increase in tethered pool strength correlates with a 400 m freestyle increase and hence it is concluded that strength training is important for improving swimming medium distance. Adding two weekly

sessions-high intensity interval training for high volume training situations is not enough to improve VO2peak in swimming (Aspenes, S., Kjendlie, P.L., Hoff, J., Et al., 2009). endurance is a condition or condition of the body that is able to practice in a long time, without experiencing excessive fatigue after completing the exercise "(Kardjono: 2008). If an athlete has good endurance ability, the quality in the cardiovascular system, respiratory, and circulatory system works well so that the fulfillment of energy during activity can take place smoothly. The advantage will be owned by athletes at the time of competing athletes will be faster in mererecovery himself, athletes will be able to work longer in high work intensity because it is not easy to get tired quickly.

Evident in the training center IPSI Surabaya with research analysis of physical condition of adolescent athlete showed that the condition of physical condition component of young men in training center IPSI branch of Surabaya city as a whole in less category (Pujiantoro, T.: 2014). This can be examined how to provide endurance training to develop endurance for adolescent athlete ?. The trainer should pay attention to the athlete's physiological ability in principle individually, because an athlete in responding to the training load for each athlete will vary, so that the training burden for each person can not be equated with one another, that is from heredity, maturity, , rest time, fitness level. Adaptation principle is one important factor that must be considered by the trainer because it is related to human organs that tend to be able to adapt to environmental changes. The principle of overload needs to be applied in training development in developing endurance capability. On this principle, the training load must reach or exceed slightly above the excitatory threshold. Because the burden is too heavy will result in not able to be adapted by the body, while if too light does not affect the physical quality improvement, so the burden of training must meet the principle of moderate. There are still some principles of practice that must be applied by the trainer, the need for endurance exercise measurable, planned, progressive based on the principles of principles and methods of physical exercise.

Selection of physical exercise method on the sport of pencak silat one of them must pay attention to predominant energy system. By knowing the predominant energy system used, can be used as a basis for consideration in choosing and determining the method of improvement. Based on simple observation, predominant of pencak silat energy system is ATP-PC: 73,75%, LA-O2: 16,25%, and O2: 10% "(Hariono, A .: 2005). By paying attention to these predominances, it will result in measurable exercise that ultimately obtained athletes who can display the results of the exercise at the time of the game with a brilliant performance because of its excellent durability.

After knowing the energy predominant at the sport of pencak silat. It requires appropriate training to improve the quality of exercise. Interval training methods, because interval training is the most appropriate method to improve the physical

quality of the athletes. In interval training, it is preferred to give time interval (break) during inter sets, with the form of activity among others can be by running and swimming. In a study that high intensity aerobic training interval resulted in a significant increase in VO2 max compared to long-range intensity and lactate-threshold. Percentage increase for 15/15 and 4? 4 minimum groups were 5.5 and 7.2%, respectively, reflecting an increase in VO2max 60.5-64.4 mLIkg j1Imin j1 and 55.5-60.4 mLIkg j1Imin j1. Stroke volume (SV) increased significantly by approximately 10% after interval training. In conclusion, high-intensity aerobic exercise intensity resistance interval was significantly more effective than doing the same total work in both lactate threshold or 70% HR max, in increasing VO2 max (Helgerud, J., K. Hkydal, E. Wang, et al .: 2007) . This suggests that developing endurance training by providing high-intensity interval training methods to the athlete will have a significant impact on the increase in VO2 max provided that the interval training method is in accordance with the rules of practice, if it is not in accordance with the rules of practice then not will have a significant impact on what is trained to the athlete. The dominance of low intensity, long practice in fewer combinations, highly intensive attacks may be complementary in terms of optimizing adaptive signals and technical mastery at acceptable levels of stress (Yuliastrid, D .: 2010). This means that the stages in the interval training with high intensity should be initiated with the intensity of light, medium, and high with the aim that the body is ready to adapt to changes in the burden of pressure from outside that causes changes to the physiological factors and psychological that gives a person strong against the pressure that will given next.

In the other research results obtained the average endurance in pre test of 41.8 ml / kg / min and at post test 44.4 ml / kg / min. Based on normality test of pre test data obtained table bigger than count (9,488> 2,8319) and post test (9,488> 3,2628), so that data is normal distribution. The calculation of difference test of resistance duration before and after being given physical exercise using the ball obtained t arithmetic equal to 10.4 and t value table with significance level 0,05 with df = 19 is 2,093. Since t is greater than t table (10,4> 2,093), Ho is rejected which means there is difference of mean endurance before and after being treated or physical exercise using ball (Roziqin, A. K., & Widodo, A .: 2013). In this study, using a circuit training model with an interval method with high intensity is also consistent with the results of research indicated that regular aerobic exercise can increase VO2 max by making the heart and respiratory system more efficient, thereby channeling O2 to more active muscles. The exercise muscles themselves become increasingly able to use the O2 distributed to them (Siler, S .: 2010). Aerobic exercise runs for 30 minutes with a weekly dose of 4 times for 4 weeks. VO2 max is measured by using cooper test. The results showed that the effect of aerobic exercise on maximal VO2 increase in adolescents aged 18-20 years (Kumarudin, A. 2013). And this is in accordance with the research conducted

with the provision of a circuit training model to develop endurance capabilities in adolescent athlete.

In subsequent research, this study aimed to determine the effect of training intervals and circuit training on aerobic endurance improvement, and to determine the increase in aerobic endurance between training intervals and circuit training. From the research objectives obtained: 1) There is the effect of interval training and circuit training to improve aerobic endurance, where t values obtained between the initial test and the final test at the training interval = 8.64> t tabel = 2.12, In the circuit training obtained value t = equal to 5.02> t table = 2.12, and the initial test and the final test of the training interval and the training circuit obtained t value = 4.02> t table = 2.12. The difference in aerobic endurance increases at training intervals by 13%, and at training circuits by 8%. 2) The interval trains better influence compared to circuit training to increase aerobic power (Khotimah: 2011). It can be interpreted that training interval training and training circuit both can improve aerobic endurance, in research conducted by researchers using circuit training model with high intensity interval method can also improve the quality of endurance, proved after posttest. It is seen that there are significant differences before treatment and after treatment. Show that training interval training and circuit training or circuit training model with interval method can improve the physical quality, that is endurance.

In his other research explaining the martial arts as a fighting sport whose basic character is a free-handed fist and foot to repulse an opponent, where the match takes 2 minutes in 1 turn with a high enough intensity that the athlete is active in the attack. and counterattack during the game with energy needs and it requires good physical condition. This study involves the issue of cardiovascular endurance To use in this taekwondo sport which is treated using interval training and fartlek training on cardiovascular endurance in junior athlete's son. The results of the study concluded that: (1) training interval training had significant effect in improving Cardiovascular endurance in Junior High School Taekwondo Wild Club Medan 2006/6 (t count> t table = 7,00> 1.73), (2) Fartlek exercise significantly in increasing Cardiovascular endurance in male junior athletes (t count> t table = 6.89> 1.73). (3) Fracture training is no better than training interval training to improve cardiovascular endurance ability in Junior athletes (t count <t table = 0.22 <1.70). (Indrayana: 2012). In harmony with this research, research is motivated by a lack of awareness of trainers and students about the importance of endurance training for martial arts sports. Based on the above description, this study looks at the effect of training and fartlek training interval on increasing VO2 Max athletes of martial arts. There is a training interval training effect to improve VO2 Max. 3) The training interval training method is better than fartlek to the increase in VO2 Max, with an increase of 10.07% better than before the exercise. (Patria: 2017). Therefore, it is very much in tune with research conducted by researcher who want

to develop and improve the biomotor endurance using the exercise model, that is the endurance training model.

Results obtained by circuit training model with high intensity interval method can increase VO2max in juvenile martial arts athletes. Indeed, VO, max is very influential in everyday life, so it can increase physical activity, especially martial art players achieve maximum achievement. In order to improve the VO, max it is necessary to practice a careful, systematic and orderly exercise. Seen in futsal athletes whose research wants to know the increase in VO, max futsal players through continuous run and circuit training. The results obtained in the continuous run exercise there is the influence of the VO, max player futsal improvement. And on circuit training means there is an effect of increasing VO2max. There is a difference in the effect of circuit training on increasing VO, max futsal players. Continuous running and circuit training can improve VO, max futsal players. However, the provision of circuit training is more effective in improving VO, max than continuous running exercise. (Masdar: 2017). This means it is clear that the research developed by this research is developing a circuit training model that aims to improve and develop endurance biomotor can be used as an alternative exercise in support to physical qualities athletes because based on research on the circuit training can or very significant if do training to athletes.

Further research aimed to determine the effect of low intensity continuous circuit training and running on improving cardiovascular endurance. The type of this study was Cardiovascular endurance measured by Multistage Fitness Test (MFT). The result of data analysis showed the change of mean value on the variable of cardiovascular endurance. In the circuit training group there was an increase of 3.26 ml / kg / min, in the low intensity continuous training group there was an increase of 5.79 ml / kg / min and in the control group increased by 0.47 ml / kg / min. then the low intensity continuous training group is better than the circuit training on cardiovascular endurance improvement of 2.40000. From result of data analysis and discussion can be concluded that; (1) low intensity continuous circuit and continuous training have an effect on the improvement of cardiovascular endurance (2) there is difference of effect of circuit training and low intensity continuous run to the improvement of cardiovascular endurance where the training of low intensity continuous run better. (Sutyantara, K., Arsani, N.L.K.A., Sudarmada, I.N .: 2014). In addition there is a study aimed at measuring the effectiveness of circuit training with short-term periodization in improving the condition of stamina in athletes. The study included experimental treatment in the form of short circuit training, 75-90% training intensity of DN Max, 45-60 minutes of training duration and frequency of exercise three times per week for 6 weeks. The results showed that the average stamina condition before the treatment of 104.24 seconds was included in the condition of "moderate" stamina, more slowly than the average after treatment which was 99.88 seconds which included the

condition of "good" stamina, thus stated that the circuit training with short-term periodization effectively improving the condition of athlete's stamina (Ariadi, I: 2012). This means that circuit training can also be used to improve the physical quality of stamina. Stamina is very important for an athlete, because stamina is closely related to endurance when athletes do the match in a long time with a very high intensity.

As long as the circuit training is adjusted to the sport, energy system, and practice rules that must be considered and used as guidance in the manufacture of training periodization program so that the goals and objectives that have been designed and arranged are achieved. This study also aims to prove the influence of circuit training on leg muscle strength and VO2max in adolescent boys. This study was a quacy experiment Leg muscle strength was measured with back and leg dynamometer and VO2max was measured by multistage fitness test (MFT) test. The result of limb muscle strength data analysis showed significance value = 0.001 and significance value VO2max = 0.000. From these data, the significance value of leg muscle strength and VO2max is smaller than á = 0.05 so that the research hypothesis is acceptable. Based on the results of data analysis and discussion it can be concluded that circuit training effect on increased muscle strength of limbs in adolescent boy students with less than 0.01 significant value and circuit training effect on increasing VO2max in juvenile students with a significance value less than 0.01 . It is recommended for sports actors to use this training as an alternative in improving leg muscle strength and VO2max (Hariyanta, I.W.D., Parwata, I.G.L.A., & Wahyuni, N.P.D.S: 2014). An effective circuit training model is used for defined practice purposes. Circuit training model can be used with the aim of improving physical quality. Physical quality, among others, increases strength, endurance, speed, agility. It is seen above that circuit training can be used to increase leg muscle strength while increasing VO2max, although the above research has shown that the effect of circuit training on increasing limb strength is less than the increase in VO2max.

By still based on circuit training with guidance on the rules of practice that is from the dose of exercise, the components of the exercise, the principle of exercise, energy sources used, and components of biomotor to be trained according to the sports branches in focus. This study aims to determine the effect of training intervals on physical fitness and VO2 max. The results of data analysis showed that the training interval showed a significant increase in physical fitness 15,270> 2,039. Interval training showed a significant increase in VO2 max of 5,590> 2,039. In conclusion, interval training can provide a significant effect in improving physical fitness and VO2 max. (Syaifudin, A.W .: 2015). In conclusion, the difference in effect suggests that the latter group is better than the interval training group and the control group in increasing the VO2max (Setiawati, A., Hermawan, R., & Sulistianta, H., 2013). That is, given the training interval training in accordance

with a measurable and precise dose of exercise will produce quality exercise. Although the above only use interval training training but in interval study used to be an interval method on the circuit training model which results can be applied to the exercise when trying to boost endurance or increase it VO2 max.

There are other studies that confirm that circuit training can improve VO2Max. The research aims to determine whether there is influence of circuit training and cross-country exercises on the increase of VO2Max in students who follow extracurricular activities taekwondo son. The data retrieval technique for this VO2Max test uses a 15 minute Run (Balke Test). The results showed that there were significant effects of circuit training exercise of 22.36 and cross country of 33.54 to VO2Max in students extracurricular taekwondo son (Ambarwati, R.H., & Jubaedi, A., 2014). All of the above results from both strength training and endurance exercises show strength training and endurance exercises should be given at the beginning of the exercise that includes the specialization stage because if the initial foundation is well established it will also affect the development of other biomotor so that the fighters in doing the exercise and match will be more efficient in using energy for technical movement, as well as, tactics and psychics are also better. In addition it will support the achievement of sports achievements that they do.

CONCLUSION

The S & E Training Model exercises significantly influence biomotor strength. Besides, it also affects the increased endurance before the treatments are given and after the treatments are given. Effective exercise to increase strength in adolescent athlete. in the endurance exercise also provides increased endurance capability in adolescent athlete. Thus S & E Model training can be used as one of the models to increase the strength and endurance of adolescent athletes.

References

Ambarwati, R.H., &Jubaedi, A. (2014). Pengaruh latihan circuit training dan cross country terhadap vo2max. *Jurnal Pendidikan*, Vol. 2, No. 2.

Anggraeni, N., Jubaedi, A., & Nuseto, F. (2013). Hubungan kekuatan otot lengan dan tungkai dengan prestasi renang gaya bebas. Jurnal Pendidikan, Vol 1, No 7.

Ariadi, I. (2012). *Efektivitas latihan sirkuit dengan periodisasi jangka pendek terhadap stamina pada atlet puslat kendal tahun 2012.* (Skripsi). Semarang: UNNES.

Arismunandar, Y., Husin, S.,&Hermawan, R. (2013). Pengaruh latihan pullup dan dumblebicepscurl terhadap kemampuan kayuhan lengan renang gaya dada. *Jurnal Pendidikan,* Vol.1, No.2.

Armaica, M.R., Sitepu, A.,&Suranto. (2013). Pengaruh latihan bench press dan full over terhadap hasil over head pass. *Jurnal Pendidikan,* Vol.1, No. 7.

Aspenes, S., Kjendlie, P.L., Hoff, J., *et al.* (2009). Combined Strength and Endurance Training in Competitive Swimmers. *J Sports Sci Med*, 8(3), 357–365.

Bahar, A.T.I. (2011). *Pengaruh latihan leg curl dan leg extention terhadap kemampuan menendang bola pada peserta ekstrakurikuler sepakbola SMA 1 Bae Kudus.* Skripsi. Semarang: FIK UNNES.

Binkley, H.M. (2017). Strength, Size, or Power?. *Performance Training Journal,* Vol.1, Num.4, 14 - 18. Diakses pada tanggal 1 Maret 2107 di *http:// www.nsca-lift.org/perform.* (12)

Brad J. S., Contreras, B, Vigotsky, A.D., *et al.* (2016). Differential effects of heavy versus moderate loads on measures of strength and hypertrophy in resistance-trained men. *Journal of Sports Science and Medicine* 15, 715 – 722.

Brøgger, R.J., Mathisen, Gunnar., & Pettersen, Svein Arne. (2013). Effect of high intensity activity on children's aerobic power. *Journal of Physical Education and Sport*, 13(4), Art 80, 511-516.

Curtis, A.C. (2015). Defining adolescence. *Journal of Adolescent and Family Healty,* Vol.7, Issue2, 1-39. (15).

Esco, M.R. (2013). Resistence training for health and fitness. *The American College of Sports Medicine,* 1-2. (13).

Gentil, P., Steele, J., Pereira, M.C., *et al.* (2016). Comparison of upper body strength gains between men and women after 10 weeks of resistance training. *PeerJ*, DOI 10.7717/ peerj.1627, 1-10.

Hariono, A. (2005). Predominan sistem energi dalam pencak silat kategori tanding. *Majalah Ilmiah Olahraga*, Vol.11, Desember 2005, Th. XI, No.3, 427 – 440.

Hariono, A. (2006). *Metode melatih fisik pencak silat*. Yogyakarta: FIK UNY.

Hariyanta, I.W.D., Parwata, I.G.L.A., & Wahyuni, N.P.D.S. (2014). Pengaruh *circuit training* terhadap Kekuatan otot tungkai dan *vo2max.* e-Journal *IKOR* Universitas Pendidikan Ganesha Jurusan *Ilmu Keolahragaan,* Volume I, Thn.2014: 1 – 11.

Helgerud, J., K. Hkydal, E. Wang, et al. (2007). Aerobic High-Intensity Intervals Improve VO2max More Than Moderate Training. *Journal of the American College of Sports Medicine*, 665 – 671, DOI: 10.1249/mss.0b013e3180304570.

Indrayana, B. (2012). Perbedaan pengaruh latihan interval training dan fartlek terhadap daya tahan kordiovaskuler pada atlet junior putra teakwondo wild club medan 2006/2007. *Cerdas Sifa, Edisi No.1. Mei – Agustus 201: 1 – 10.*

Kardjono. (2008). *Modul Mata Kuliah Kondisi Fisik*. Bandung: UPI.

Khotimah, N. (2011). Pengaruh interval dan circuit training terhadap peningkatan daya tahan aerobik. (Skripsi). Surakarta: UNS.

Kumarudin, A. (2013). Pengaruh latihan aerobik terhadap peningkatan volume oksigen maksimal (v maks) pada remaja usia 18-20 tahun. Naskah Publikasi Diploma IV, Universitas Muhamadiyah Surakarta, Surakarta.

Kumarudin, A. (2013). *Pengaruh latihan aerobik terhadap peningkatan volume oksigen maksimal (v maks) pada remaja usia 18-20 tahun*. Naskah Publikasi Diploma IV, Universitas Muhamadiyah Surakarta, Surakarta.

Marselina, M., Baan, A., &Appe, U. 2015. Pengaruh latihan sit up terhadap kemampuan heading dalam permainan sepak takraw pada atlet club binatama kayumalue kecamatan palu utara sulawesi tengah. *Jurnal Pendidikan*, Vol 3, No 9.

Masdar , R.I. (2017). Pengaruh latihan lari kontinyu dan *circuit training* terhadap peningkatan *vo, max* pemain futsal. (Publikasi Ilmiah). Surakarta: Universitas Muhammadiyah Surakarta.

Merrydian, O. (2012). *Pengaruh latihan pull up dan latihan push up terhadappeningkatan ketepatan servis atlet bola voliremaja putra yuso sleman*. Skripsi**.** Semarang: FIK UNY.

Muhlisin. (2007). *Pengaruh Latihan Bench Press dan Berat Badan terhadap Hasil Tolak Peluru Gaya O'Brien pada Peserta Didik Kelas II SMK Negeri 1Wanareja Kabupaten Cilacap Tahun Pelajaran 2006/2007.* Tesis. Semarang: PPs UNNES.

Munanda, Ferdinan., Hermawan, R., & Suranto. (2016). Perbandingan latihan clap push-up dan latihan triangle push-up terhadap power otot lengan. *Jurnal Pendidikan*, Vol.4, No.2.

Nugroho, A. (2001). Diktat pedoman latihan pencak silat. Yogyakarta: FIK UNY.

Paiman. (2010). Pengaruh gizi terhadap prestasi olahraga pencak silat. (Proseding Seminar Nasional III), Yogyakarta, 104-251.

Parahita, A., & Hardian. (2009). Pengaruh latihan fisik terprogram terhadap daya tahan otot pada siswi sekolah bola voli tugu muda semarang usia 9-12 tahun.Semarang**:** Fakultas Kedokteran UNDIP.

Patria, F.D.B. (2017). Pengaruh latihan *fartlek* dan *interval training* terhadap peningkatan *vo2 max* atlet pencak silat persaudaraan setia hati terate cabang blitar tahun 2016. *Artikel Skripsi:2 – 9.*

Pujiantoro, T. (2014). Analisis komponen kondisi fisik pesilat remaja puslatcab ipsi kota surabaya tahun 2014 (kategori tanding). *Journal Kesehatan Olahraga*, Vol.02, No 02, 198-210.

R. Khoiriyah. (2014). Perbedaan pemberian latihan hamstring curl on swiss balldenganlatihan lying leg curl terhadap peningkatan kekuatan otot hamstring pada pemain futsal. *Jurnal Fisioterapi, Vol.14, No.2, Oktober.*

Rachman, A. (2014). Pengaruh latihan squat dan leg press terhadap strength dan hypertrophy otot tungkai. Jurnal Multilateral, Vol.13, No.2 Desember.

Rasyid, A. (2014). Efektivitas pelatihan plyometrics dan weight training dalam peningkatan strength dan power otot tungkai. *Jurnal Pelopor Pendidikan*, Vol.6, No.2, Juni 2014, 135-142.

Reval. (2013). Pengaruh latihan back up terhadap kemampuan heading dalam permainan sepak bola pada siswa mts alkhairaat pinotu kabupaten parigi moutong. Jurnal Pendidikan, Vol 1, No 3.

Roziqin, A. K., & Widodo, A. (2013). Pengaruh Model Latihan Fisik Menggunakan Bola Terhadap Daya Tahan Aerobik Pemain Sepakbola Usia 15-18 Tahun. *Journal Kesehatan Olahraga*, Vol.01, No.03, 53 – 56.

Saleh, H.U. (2012). *Pengaruh Latihan leg press terhadap peningkatan kemampuan lompatan dalam melakukan jump serve pada permainan bola voli di SMA negeri 4kota gorontalo.* Skripsi. Gorontalo: FIK Universitas Negeri Gorontalo.

Setiawati, A., Hermawan, R., & Sulistianta, H. (2013). Pengaruh latihan interval dan latihan lari berselang terhadap hasil vo2max. Jurnal Pendidikan, Vol.1, No.10.

Sharkey, B.J. (1986). *Coaches guide to sport physiology*. U.S.A: Human Kinetics Publishers. (14)

Signal, NEJ. (2014). Strength training after stroke: Rationale, evidence and potential implementation barriers for physiotherapists. *New Zealand Journal of Physiotherapy*, 42 (2), 101-107.

Siler, S. (2010). What is Best Practice for Training Intensity and Duration Distribution in Endurance Athletes?. *International Journal of Sports Physiology and Performance,* 2010, 5, 276-291.

Siswantoyo. (2014). Peningkatan power tungkai pesilat remaja melalui latihan pliometrik. *Jurnal Ilmiah Pendidikan Cakrawala Pendidikan*, Th.XXXIII, No.1, Februari 2014, 80-91. (5).

Soethama, G.R.R, Silakarma, D., & Wiryanthini, D. (2016). Pengaruh latihan beban terhadap penigkatan massa otot pectoralis mayor dan biceps pada remaja dan dewasa. *Majalah Fisioterapi Indonesia*, Vol.2, No.1, 52. (6).

Suhendra,T.A., Jumain, & Marhadi. (2015). Pengaruh latihan sit up dan medicine ball terhadap kemampuan throw in dalam permainan sepakbola kelas xi di sma negeri 1 bolano lambunu. *Jurnal Pendidikan*, Vol.3, No.11.

Sutyantara, K., Arsani, N.L.K.A., Sudarmada, I.N. (2014). Pengaruh pelatihan sirkuit dan lari lari kontinyu intensitas rendah terhadap daya tahan kardiovaskuler pada siswa putra kelas viii smpn 2 nusa penida tahun pelajaran 2013/2014. *e-Journal IKOR Universitas Pendidikan Ganesha Jurusan Ilmu Keolahragaan,* Volume I, Thn 2014: 1 – 11.

Syaifudin, A.W. (2015). Pengaruh *interval training* terhadap kebugaran jasmani dan *vo2 max* siswa kelas ix smp negeri 3 negeri katon tahun 2014/2015. (Jurnal). Lampung: Universitas Lampung.

Taryono. (2010). Perbandingan antara latihan kekuatan otot lengan dengan gerakan bench press dan push up terhadap hasil tembakan free throw dalam permainan bola basket. *MOTION*, Vol. I. No.1, September.

Uliyandari, A. (2009). Pengaruh latihan fisik terprogram terhadap perubahan nilai konsumsi oksigen maksimal (vo2max) pada siswi sekolah bola voli tugu muda semarang usia 11-13 tahun. Karya Tulis Ilmiah Sarjana, Universitas Diponegoro, Semarang.

Ulum, M.F. (2014). Pengaruh Latihan Interval Pendek Terhadap Peningkatan Daya Tahan Anaerobik Pada Pemain Hoki SMA Negeri 16. *Jurnal Kesehatan Olahraga*, Vol.02, No.01, 1 – 10.

Yuliastrid, D. (2010). Peningkatan ventilasi paru selama latihan fisik dan peningkatan vo_2max akibat latihan fisik. *Ilmu Keolahragaan,* Vol 6, No 2, 1 – 10.

Man In India, 98 (1) : 63-69

INTELLIGENCE STIMULATION ON KINDERGARTEN STUDENT THROUGH PHYSICAL ACTIVITY BASED ON PERCEPTUAL MOTOR

Yudanto[1], Sugiharto[2], Hari Amirullah Rachman[1] and Setya Rahayu[2]

The research intends to produce model of physical activity based on perceptual motor to develop multiple intelligences for Kindergarten students. The procedure of this development research adopts Borg and Gall research and development procedures (1983: 775), which are originally 10 steps modified into 7 steps. These steps are: 1) collecting information in the field, 2) analysing the information collected, 3) developing the initial product/draft, 4) validating and revising the initial product/draft, 5) conducting small group trial and revision, 6) conducting large group trial and revision, and 7) compiling the final product. The subjects of small group trial involve 10 Grade B Kindergarten students and large group trial 54 Grade B Kindergarten students. Instruments for collecting data use: interview guidelines and value scales. The data analysis techniques used are by descriptive quantitative analysis and qualitative analysis. The research result is a model of physical activity based on perceptual motor consisting of 8 (eight) games: 1) my personal-themed game, 2) my family-themed game, 3) my neighbourhood-themed game, 4) animal-themed game, 5) plant-themed game, 6) vehicle-themed game, 7) universe-themed game, and 8) my country-themed game.

Keywords: Intelligence Stimulation, Kindergarten Student, Physical Activity, Perceptual Motor.

INTRODUCTION

The development of multiple intelligences in learners in kindergarten should get serious attention by teachers. Teachers are required to be able and willing to provide various stimulus to develop multiple intelligences for kindergarten students. The provision of stimulus should be based on the belief that each learner has various intelligences whose the development requires stimulation or appropriate stimulation. Multiple intelligences includes linguistic verbal intelligence, mathematical logical intelligence, spatial visual intelligence, musical intelligence, kinesthetic intelligence, interpersonal intelligence, intrapersonal intelligence, naturalist intelligence, and existential intelligence. One form of stimulus that can develop multiple intelligences in kindergarten student can be done through physical activity in the form of playing. The opinion by Tadkiroatun Musfiroh (2008: 42-43) explains that through playing student can develop all parts of the brain in children, which include: the reptile brain (brain stem), the limbic system, and the neocortex (mammalian brain). In kindergarten children (4-6 years), the reptilian brain and mammalian brain develop about 80%, indicating that at that moment the child's intelligence is open. In addition, it is explained that through the activity of playing, they can be able to

[1] Faculty of Sport Sciences, Universitas Negeri Yogyakarta, Indonesia, *E-mail: yudanto@uny.ac.id*
[2] Postgraduate Program, Universitas Negeri Semarang, Indonesia

move ideas, solve problems, and bring happiness. Michael Rettig (2005: 255-256) argues that multiple intelligences are also related to brain function and brain process/working. Therefore, early childhood education is expected to focus on developing the overall brain, both right and left brain. Zahra Dolati & Abdorreza Tahriri (2017: 1-2) state that stimulating the academic ability of learners is an important thing that teachers do. This can be done through activity that includes all kinds of intelligence. The application of multiple intelligence theory of Gardner provides an advantage in education; firstly is to plan educational programs to realize the potential of the learners in accordance with their abilities and secondly is to make the learning process more active. This can occur if the teacher plans the learning by covering various activities related to various kinds of intelligence.

In accordance with the Kindergarten curriculum, physical activity is the scope of physical, sports and health learning programs. In the learner in kindergarten, the form of physical activity that contains the perceptual elements of motor and delivered in the form of playing is very important. This is based on the findings of several research results, among others: 1) Elena Bodrova & Deborah J. Leong (2005: 6), state that playing has correlation with the cognitive development and social skills needed in the learning process of children. Such as, playing grows memory, self-organization, to communicate orally, and recognizing symbols. Playing also improves literacy skills and other academic areas, 2) Scott G. Eberle (2011: 19) claims that playing provides benefits in developing mental, physical, and social skills. Furthermore, playing can be used as a medium in developing intelligence of children, 3) the results of the research indicate that the ability of the perceptual motor has a relationship with the academic ability of the children, (Pravias Nourbakhsh, 2006: 40), 4) the research results show that the physical education program containing the perceptual motor elements can improve academic achievement in math, reading, and writing exams (Gonzales, Coretes, and Dobbins (2003) in Pravias Nourbakhsh, 2006: 41), 5) the research results conducted by Rajni Dhingra, *et al* (2010: 143) says that visual, auditory and kinesthetic perceptions of 4-6 year-olds have correlation with academic achievement in reading, spelling and math, 6) research results from Seyed Sajad Hosseini *et. al* (2011: 764) suggests that physical activity programmed within preschool period has an impact in the children's cognitive skills, 7) research results of Jose Morales, *et.al* (2011: 410) claims that perceptual motor performance is associated with academic achievement, children with good perceptual motor also have good cognitive, 8) Vannier and Gallahue in Hari Amirullah Rachman (2011: 14) states that perceptual motor can be developed optimally when children aged 2-6 years and at this age, it is golden age to lay the basic skills, and 9) Johnstone and Molly Ramon (2011: V) state that the age of 3-6 years is the optimal age for developing perceptual motor.

Perceptual motor-based physical activity allows sensory information to be gained and understood by appropriate reactions. Perceptual motor requires students to engage their brains and bodies in motion. Furthermore Jill A. Johnstone and Molly Ramon (2011: V) state that in perceptual motor conducted by children, will involve the brain and body to complete the task of motion together. Perceptual motor is different from ordinary motion activity, because perceptual motor contains perceptual components. According to Gallahue and Ozmun, (2002: 263) perceptual motor component consists of: body awareness, spatial awareness, directional awareness, and temporal awareness. Perceptual motor, essentially, is the individual's ability to accept, interpret and react appropriately to the number of stimulus that come to him/her, not only from outside but from inside. Perceptual motor is often also described as the correlation between motion and perception. Perception is the process of receiving, selecting, and understanding information or stimulus from the outside. Perception produces awareness of what is happening outside our bodies and is our ability to receive information through sensing. Perceptual motor refers primarily to activities undertaken with the intent of improving cognitive and academic ability. Gallahue and Ozmun (2002: 266) suggest that increased perceptual motor ability plays an important role in the development and improvement of motion abilities of children. Therefore, to achieve a successful performance of good motion ability, it is important to improve the perceptual motor ability from early age. In accordance with kindergarten curriculum, it shows that perceptual motor has not been specified in the curriculum, either independently or integrated in the field of physical/motor.

In addition, based on preliminary study conducted in several kindergartens in Jogonalan District of Klaten Regency related to physical/motor learning, it is obtained information as follows: 1) in the physical/motor learning in kindergarten, the teacher conveys the material according to the existing curriculum, but there is some undelivered material. This is due to the limitations of media and facilities, 2) lack of development of physical/motor material based on perceptual motor in kindergarten, 3) lack of kindergarten teacher with physical education and sport background, thus allowing the barriers in the development and delivery of physical and motor materials, and 4) no perceptual motor test conducted on kindergarten students. The right solution is needed to overcome the problems mentioned above. One solution that can be done is to develop model of physical activity in the form of perceptual motor-based playing to develop multiple intelligences for kindergarten students.

METHOD

This development research procedure adopted Borg and Gall (1983: 775) research and development procedures, which were originally 10 steps modified into 7 steps. These steps were: 1) gathering information in the field, 2) analysing the

collected information, 3) developing the initial product/draft, 4) validating and revising the initial product/draft, 5) conducting small group trial and revision, 6) conducting large group trials and revisions, and 7) compiling the final product. The subjects of small group trial employed 10 students of TK (Kindergarten) Pertiwi Plawikan and the subjects of large group trial employed 54 students, with details: TK Pertiwi Karangdukuh 13 students, TK Pertiwi Sumyang 10 students, TK ABA Plawikan 10 students, and TK ABA Ngering 21 students. The instruments for collecting the data used: interview guidelines and value scales. The data analysis techniques used were by descriptive quantitative analysis and qualitative analysis.

RESULTS AND DISCUSSION

The results of this research are a model of physical activity based on perceptual motor to develop multiple intelligence for Kindergarten students. To create this physical activity model, the researchers follow the procedures in research and development, i.e. initial product validation, small group trials, and large group trials. Before being piloted into the field, both small group trials and large group trials, the initial draft of physical activity model are validated by 2 material experts and 3 practitioners/kindergarten teachers. The validation of initial draft of physical activity model by material experts and practitioners is done with Content Validity Ratio (CVR) and Content Validity Index (CVI). CVR test results show the content validity of physical activity model based on perceptual motor is good or has high content validity, with CVR result in the range 0.600 – 1.000 that is above 0.30. Meanwhile, the CVI test results have high level of validity, as in the table below:

TABLE 1: RESULTS OF CVI TEST OF INITIAL DRAFT OF PHYSICAL ACTIVITY MODEL BASED ON PERCEPTUAL MOTOR.

No	*Name of Game*	*CVI*
1.	My personal-themed game	0.880
2.	My family-themed game	0.900
3.	My neighbourhood-themed game	0.880
4.	Animal-themed game	0.924
5.	Plant-themed game	0.905
6.	Vehicle-themed game	0.880
7.	Universe-themed game	0.900
8.	My country-themed game	0.900

Test of the reliability of physical activity model based on perceptual motor using Alpha Cronbach. Reliability test result is below:

TABLE 2: RESULTS OF RELIABILITY TEST OF INITIAL DRAFT OF PHYSICAL ACTIVITY MODEL BASED ON PERCEPTUAL MOTOR.

No	*Name of Game*	*Correlation Coefficient*	*Explanation/Status*
1.	My personal-themed game	0.908	Reliabel
2.	My family-themed game	0.894	Reliabel
3.	My neighbourhood-themed game	0.894	Reliabel
4.	Animal-themed game	0.951	Reliabel
5.	Plant-themed game	0.925	Reliabel
6.	Vehicle-themed game	0.894	Reliabel
7.	Universe-themed game	0.914	Reliabel
8.	My country-themed game	0.914	Reliabel

The results of the implementation of physical activity model based on perceptual motor in small and large group trial as follows:

TABLE 3: IMPLEMENTATION TEST RESULTS OF PHYSICAL ACTIVITY MODEL ON SMALL GROUP TRIALS.

No	*Name of Game*	*Test Place of Kindergarten Pertiwi Plawikan*
1.	My personal-themed game	3.7
2.	My family-themed game	3.8
3.	My neighbourhood-themed game	3.8
4.	Animal-themed game	3.8
5.	Plant-themed game	3.8
6.	Vehicle-themed game	3.8
7.	Universe-themed game	3.9
8.	My country-themed game	3.8
	Mean	3.8

TABEL 4: IMPLEMENTATION TEST RESULTS OF PHYSICAL ACTIVITY MODEL ON LARGE GROUP TRIALS.

No	*Name of Game*	*Test Place of Kindergarten*			
		Pertiwi Karangdukuh	*Pertiwi Sumyang*	*ABA Plawikan*	*ABA Ngering*
1.	My personal-themed game	3.9	3.9	3.9	3.9
2.	My family-themed game	3.9	3.9	3.9	3.9
3.	My neighbourhood-themed game	3.9	3.9	3.9	3.9
4.	Animal-themed game	3.9	3.9	3.9	3.9
5.	Plant-themed game	3.9	3.9	3.9	3.9
6.	Vehicle-themed game	3.9	3.9	3.9	3.9
7.	Universe-themed game	3.9	3.9	3.9	3.9
8.	My country-themed game	3.9	3.9	3.9	3.9
	Mean	3.9	3.9	3.9	3.9

The scale of implementation assessment of the physical activity model based on perceptual motor consists of 4 (four) scales: scale 1 (very less good/very less

acceptable), scale 2 (less good/less acceptable), scale 3 (good/acceptable) and scale 4 (very good/be accepted). The average test result of the implementation of physical activity model based on perceptual motor in small scale test 3.8 and large scale test 3.9. These results indicate that the physical activity model based on perceptual motor is in good category or accepted. The results of the study present physical activity model based on perceptual motor to develop multiple intellegences for Kindergarten students, covering 8 theme-based games. The advantages of this research are:

1. Development of Basic Elements of Motion in the Physical Activity Model Based on Perceptual Motor.

   The developed perceptual motor based physical activity model contains some basic fundamental motions. Locomotor movement is a movement that requires the movement of places, moving from one place to another. For examples: walking, running, jumping, leaping, and bouncing. Non locomotor movement does not require movement of place, for example: spinning and swirling. Meanwhile, manipulative movement is a movement to play a certain object by using one of body part. For example: throwing and catching the ball, bouncing ball, and kicking the ball.

2. Multiple Intelligences in the Physical Activity Model Based on Perceptual Motor

   Physical activity model based on perceptual motor developed in addition to functioning to develop physical motor also stimulate various types of intelligence. Intelligence honed in the physical activity model based on perceptual motor is linguistic verbal intelligence, logical mathematical intelligence, spatial visual intelligence, musical intelligence, kinesthetic intelligence, interpersonal intelligence, existential intelligence, and naturalist intelligence.

3. Ease of Physical Activity Model Based on Perceptual Motor for Kindergarten Students

   Physical activity model based on perceptual motor developed can be applied by adjusting to the stage of children development achievement. The movements in the Physical activity model based on perceptual motor are generally not difficult to perform. Instead the children are enthusiasm and challenged to do it. In addition, the equipments used presented or painted colourful to make children interested to try them.

CONCLUSION

Physical activity model based on perceptual motor can be recommended to apply in Kindergarten (5-6 years) students. Physical activity model based on perceptual

motor consists of 8 (eight) games: 1) self-personal-themed game, 2) my family-themed games, 3) my neighborhood-themed games, 4) animal-themed games, 5) plant-themed games, 6) vehicles- themed game, 7) universe-themed game, and 8) my country-themed game. Physical activity model based on perceptual motor developed in addition to functioning to improve physical motor also stimulating various types of intelligence.

References

Bodrova, E & Leong, deborah J. (2005). "Why Children Need Play". *Scholastic Early Childhood Today*. 20, (1): 6.

Borg, W. R. & Gall, M. D. (1983). *Educational Research: An Introduction Fourth Edition.* New York: Longman Inc.

Dhingra, Rajni., Manhas, S., & Kohli, N. (2010). "Relationship of Perceptual Abilities with Academic Performance of Children". *Journal Soc. Sci*., 23 (2): 143-147.

Dolati, Z. & Tahriri, A. (2017). "EFL Teachers' Multiple Intelligences and Their Classroom Practice". *Journal SAGE*, July-September: 1-2.

Eberle, Scott G. (2011). "Playing with the Multiple Intelligences". *American Journal of Play*, 4 (1): 19.

Gallahue, D. L. dan Ozmun, J. C. (2002). *Understanding Motor Development (Infants, Children, Adolescents, Adults)*. New York: Mac Graw Hill.

Hosseini, Seyed, S., Panahi, M., Naghilo, Z., & Ramandi, L. D. (2011). "The Effect of Exercise Training on Perceptual Motor Skills and Physicaal Fitness Factors in Preschool Children". *Middle-East Journal of Scientific Research*, 9 (6): 764-768.

Johnstone, J. A. & Ramon, M. (2011). *Perceptual-Motor Activities for Children.* USA: Human Kinetic.

Morales, Jose., Gonzales, L. M., Guerra, C. V., Virgili, C., & Unnithan, V. (2011). "Physical Activity, Perceptual Motor Performance, and Academic Learning in 9 to 16 Years Old School Children". *International Journal of Sport Psychology*, 42: 401-415.

Musfiroh, T. (2008). *Pengembangan Kecerdasan Majemuk*. Jakarta: Universitas Terbuka.

Nourbakhsh, P. (2006). "Perceptual Motor Abilities and Their Relationships with Academic Performance of Fifith Grade Pupils in Comparison with Oseretsky Scale". *Journal of Kiensiology*, 38 (1): 40-48.

Rachman, H. R. (2011). "*Kontribusi Pembelajaran Motorik dalam Meningkatkan Kualitas Jasmani Menuju Pengembangan Sumber Daya Alam Manusia*." (Pidato Pengukuhan Guru Besar). Yogyakarta: Universitas Negeri Yogyakarta.

Rettig, M. (2005). Using the Multiple Intelligences to Enhance Instruction for Young Children and Young Children with Disabilities. *Early Chilhood Education Journa*l, 32 (4): 255-256.

Man In India, 98 (1) : 167-174

PENCAK SILAT PHYSICAL TEST (ASSESMENT METHOD FOR INDONESIAN MARTIAL ART)

Siswantoyo[1], Deny Pradana Saputro[2] and S B Pranata Hadi[3]

This study aims to: (1) produce a physical testing tool for martial arts fighter, (2) know the validity, reliability and norms of physical test pencak silat for adolescent fighters. This development study refers to the steps developed by Borg & Gall that are grouped into 6 procedures. The result of this research is physical test of pencak silat for adolescent fighters, consist of 8 test items: (1) flexibility (sitting and range), (2) speed (30 meter sprint), (3) arm strength (push up 30 seconds), 4) leg strength (sit-on test), (5) side-step, (6) standing-jump strength, (7) anaerobic resistance (300 meters run) and (8) aerobic endurance multi fitness). This test is valid and reliable with $p < 0.05$. This martial art pencak silat test is an alternative that is used to measure the physical ability of the competing juvenile athlete. The result of this research can be concluded to test pencak silat feasible for use.

Keywords: assesment; physical condition; adolescent; martial art.

1. INTRODUCTION

Pencak Silat is a martial art that grows and develops in Indonesia. Pencak silat has been competed in national, regional and international events, including sea games and asian games. To show good performance requires physical skills, techniques, tactics and intelligence in the game. The following explanation describes the importance of scientific collaboration in order to solve problems whose scope can not be solved by using only one scientific study. Scientific linkages that will be discussed in this study with respect to martial arts who are in the scope of sports science as well as a source of the emergence of problems that will be in the search for the solution and physical tests that are in the scope of tests and measurements. In the field of sports, tests and measurements are one of the most important scholars in order to support sports coaching [8]. The goal of the coaching sciences itself is in order to foster athletes in order to achieve the desired peak performance. There are several aspects that need to be done in order to achieve the achievement of athletes peak performance. Among them are physical aspects, techniques, tactics and mental [4]. Physical aspects are the main foundation that needs to be improved in order to develop other aspects. The stronger the physical foundation, the greater the potential for developing technical, tactical, and psychological attributes [1]. Thus, coaching on the physical aspects can affect the appearance of the technique, tactics, and mental exercise of a sportsman.

The objectives of this study were teenage athletes of the match category. In human growth, adolescence is in the second phase after an early age and can not be said as an adult age. We define adolescence as the second stage of life, ages 10

* Yogyakarta State University, Indonesia, Correspondence, *E-mail: siswantoyo@uny.ac.id*

to 22, when young people experience significant biological, psychological, and social changes necessary to prepare for adulthhood [12]. The period of adolescence is more difficult to define in chronological years, because it varies in both its onset and its termination. Its onset is generally defined as the onset of puberty, when the secondary sex of development and sexual reproduction becomes possible, and its termination as the completion of growth and development processes, such as attaining adult height. For most girls, adolescence ranges from 8 to 19 years and for most boys from 10 to 22 years [7].

The phase of teenagers is a phase where still not able to master and function maximally physical and psychological functions. However, it should be emphasized that the adolescent phase is a very potential phase for development in the cognitive, emotional and physical spheres [18]. Therefore, with regard to physical, it is necessary to do coaching at the age of adolescents so that later when adolescents adolescents are ready to perform physical tasks like adults and can reach the desired peak achievement. After physical coaching, to determine whether the physical guidance is increased or not, then required a test that can be used to determine the success rate of coaching is done. Related to that matter, the problem that exist at this time is not yet compilation of physical test of adolescent martial arts category. In fact, the test is something that is very important to know the status of an athlete's physical condition. In addition, the norms of physical tests have not been prepared so that decision-making on test results can not be done. On the basis of that, then this research is very important to do in order to support the peak performance of an athlete of martial arts, especially for the age of teens category of match.

2. METHODE

This development study refers to the steps developed which are grouped into 6 procedures, which is a summary of 10 procedures that have been simplified according to the needs of researchers. 6 steps are: information gathering, analyzing the results of information, initial product development, expert validation and revision I, product trial and revision II, and preparation of the final product and implementation [9]. The trial of the product was divided into small-scale trials involving nine college coaches and large-scale trials involving 20 coaches. The data of physical test was 88 athletes of pencak silat with the age 14-17 years old (42 male and 46 female). Data analysis for instrument validity and reliability used Pearson correlation calculation.

3. RESULTS AND DISCUSSION

In this discussion will be shown the results of the preparation of physical tests pencak silat adolescent category, the norms of physical tests along with the validity and reliability of test instruments. In order to prepare the physical test instrument, expert judgment is required in a Focus Group Discussion (FGD) forum, followed

by the preparation of norm of physical test and validity and reliability test by using mathematical calculation from the physical test result data of adolescent martial arts athletes. this is a complement of previous research which resulted in the compilation of mature pencak silat physical test categories: Flexibility using side split, sprint speed 40 meters, arm power using 30 seconds push ups, abdominal strength using sit ups, back strength using back up, leg power using standing triple jump, agility using shuttle run, anaerobic resistance using 300 meter sprint, and aerobic endurance using bleep test [17].

3.1. Result of Focus Group Discussion (FGD). The results of FGD are as follows: flexibility, test instruments used are sit and reach; speed, test instruments used are; run 30 meters; arm muscle strength, test instrument used is push up 30 seconds; strength of limbs, test instruments used are wall sit test; agility, the test instrument used is a side step; power limbs, test instruments used are standing broad jump; anaerobic endurance, the test instrument used is a 300 meter run; aerobic endurance, the test instrument used is multy fitness test.

3.1.1. Flexibility

Flexibility refers to the range of motion around a joint. Improving flexibility is a fundamental element of a young athlete's training program because of its excellent flexibility enables the athlete to perform various movements and skills and prevent injury [2]. Flexibility is divided into two namely, static flexibility and dynamic flexibility. In static flexibility is determined by the size and range of motion of one or several joints. While the dynamic flexibility is a person's ability to move at high speed [3].

Flexibility is one component of physical condition that has an important role for athletes and non-athletes. Similarly, in the match martial arts match category must also have good flexibility. With the support of good flexibility a fighter will be able to do the movement as much as possible to carry out attacks (punches, kicks, catches, clipping or slamming) as well as avoidance of the opponent. Without the support of flexibility, of course, a silat athlete can not perform the movement freely because it is disturbed by the limited range of motion.

3.1.2. Speed

Speed is the ability of a muscle or group of muscles to respond to stimuli in as fast as (as short) as possible. Speed as a result of the combination of the length of the leg swing and the number of steps. The long swing movement and the number of steps are a series of synchronous and complex movements of the neuromuscular system. Teen age is an age that can be done coaching associated with increased speed. Some experiments on boys and girls aged between 7.6 and 10.3 years have shown a significant improvement in running performance (up to 18%), but without an increase in VO2 max (Mocellin and Wasmund, 1973) [5].

Speed is one of the basic components of bimotor needed in the sport of pencak silat, especially pencak silat tanding category. Any sporting activity whether game, race, or match always requires a speed biomotor component. So also in sports martial category pencak silat.

The rate of a person's speed is determined by several factors, determined by heredity, reaction time, strength, speed technique, muscle elasticity, muscle type, concentration and will. In sports 100 m sprint performance is dependent on multiple factors and we have categorized them based on environmental, mechanical / equipment, biomechanical and psycho-physiological labels [13]. In addition to these factors the type of muscle also affects the rate of speed a person has. Pencak Silat is one sport that requires speed especially in the category of match. Attacks that are either kicks, punches, cuts or some other attack techniques must be done quickly so that the opponent can not anticipate the attack carried out.

3.1.3. Strength

Strength is the ability of a muscle or a group of muscles to overcome a burden or prisoner. Physiological understanding, strength is the ability of neuromusculer to overcome the resistance of external load and internal load. Muscle strength is the ability of a group of muscles to fight loads in one effort. Strength improves as muscle mass increases with age. Peak strength is commonly attested by age 20 in women and between ages 20 and 30 in men [7]. The benefits of strength training for athletes include: improving muscle and tissue skills, reducing injuries to sportsmen, improving performance, rehabilitating muscle strengthening and helping to learn or master the technique [3]. Strength is among the most important components for almost every sport. Strength training aims to increase the athlete's competition performance by: (a) enhancing the neural component of muscle contraction, and (b) augmenting the muscle-fibre size [8]. During adolescence, static and explosive strength and also speed of limb movement are clearly related to the maturity status. From the ages of 13 to 14 years, early maturers perform, on average, better than late maturers. However, it is difficult to conclude that there is a causal influence of maturity on motor ability, because other factors, such as height and weight, can confound the results [10]. Strength is an indispensable biomotor component to increase muscle endurance in overcoming the burden during sporting activities. Physiologically, strength is the ability of neuromuscular to overcome the load resistance to overcome the burden of external load and internal load. The benefits of strength training are to improve muscle and tissue ability, reduce and avoid injury, improve performance, therapy and rehabilitation of muscle injuries and assist in mastery of techniques. Thus, strength is also a very important biomotor component in martial arts sport. Especially the match category. In the end, strength is one component that can affect the

improvement of the achievement of a martial arts athlete category of course in this case need support from other things such as engineering skills, tactics and psychology is mature.

3.1.4. Agility

Having a good agility for a pesilat is very beneficial because a fighter will be able to attack, avoid or do both at once well. That's because agility is an important component needed by almost all sports including martial arts. Agility itself is a combination of several other physical components such as speed, coordination, flexibility, and power [11]. The lively person is a person who has the ability to change the direction and position of the body quickly and accurately, without losing balance and awareness of his body position while in motion [14]. Thus, having good agility for a competitor is a very important thing.

3.1.5. Power

Power, defined as the rate of doing work [15]. To measure the power usually the tests performed are standing broad jump or vertical jump test. In a martial arts sparring sport, power is a much-needed thing when attacking. Power relates to power and speed. Neither in the sport of martial arts martial category. Attacks must be strong and fast in order to produce a quality attack and certainly not easily anticipated by the opponent. With regard to power, there are many studies related to the power itself. Some of the things that are commonly discussed in the study are related to how to increase power, furthermore, connecting the biomotor power with the ability of someone to do something, and so forth. As one example related to it is related to the research which resulted in a conclusion that in order to improve the power of limbs of adolescent pesilat can be used alternative exercise model that is pliometric exercise [16].

3.1.6. Endurance

The term endurance or durability in terms of the ability of muscle work is the ability of muscles that work in a certain time. Muscular endurance means the ability to maintain muscle in the fight of the load [14]. In the world of sport is known as the ability of organs organs to fight fatigue during activity or work. Fatigue is always associated with length of work (duration) and work intensity. The longer the duration of the exercise and the higher the intensity of work that can be done by an athlete, then the sportsman is said to have good resilience. Resilience is influenced by several factors: the central nervous system, the willingness (motivation) of the athlete, aerobic capacity, anaerobic capacity, reserve speed, intensity, frequency and duration of exercise, heredity, age and sex [3]. By having good endurance integrated with other biomotor components, a fighter will be able to defend himself from a significant loss of fatigue. Sparring martial arts is a sport

that requires endurance in long-lasting burden rnagka. Such conditions would be advantageous for a competitor to defend themselves during a match.

3.2. Result of validity and reliability test

Intake of physical test data conducted, used to test the validity and reliability of the instrument as well as used to compile the norm of physical test instruments martial arts martial category. Test the validity and reliability of the physical test instrument of adolescent martial arts martial category using pearson correlation calculation.

Taking physical test data for reliability test is done twice (test-retest) with the same test instrument and research subject. To find the value of these two tests searched by using spss application 16. The results of validity and reliability testing instruments for adolescent boys and girls that include the kelility (sit and reach), speed (30 meters), arm strength (push up 30 seconds) , leg strength (side sit), standing arm power, anaerobic resistance (300 meters run), and aerobic endurance (multy fitness test) are valid and reliable with p <0, 05.

3.3. Norms of all the test

The overall norm of the test is set to 5 standard scales. The test should be carried out in its entirety, so that the number of test items that the athlete should be performing is 9 {skeletal test, speed test, arm strength test, limb strength test (two tests of right leg strength test and left limb strength test), agility test, power limbs, anaerobic endurance tests and aerobic endurance tests}. The minimum value that the athlete obtains on each test item is 1 maximum 5. The number of test items is calculated 9. Furthermore, the minimum value the athlete obtains for all test items is 9 and the maximum is 45.

From the above explanation can be searched range (R) to compile the norm of the test as a whole. The calculation is as follows:

R = Maximum value - Minimum value
R = 45-9
= 36

Many classes are set 5, so that the length of the class (p) = 36/5, ie 7.2. From these calculations can be compiled a range of test scores that can be used for athletes son and daughter as the following table:

TABLE 1: TABLE OF NORMS ALL THE TEST

Putra Dan Putri	*Kategori*
37,8 S/D 45	Very Good
30,5 S/D 37,8	Good
23,4 S/D 30,5	Medium
16,2 S/D 22,4	Less
9 S/D 16,2	Very less

4. CONCLUSION

From the research and development that has been done by going through several stages, finally this research and development produce several things, among them is to produce: first, the composition of physical test of adolescent martial pencak silat which amounted to 8 test items. The test items are: (1) flexibility, the test instruments used are sit and reach; (2) speed, the test instrument used is; run 30 meters; (3) arm muscle strength, test instrument used is push up 30 second; (4) leg strength, test instrument used is wall sit test; (5) agility, test instrument used is side step; (6) power limbs, test instruments used are standing broad jump; (7) anaerobic endurance, the test instrument used was a 300 meter run; (8) aerobic endurance, the test instrument used is multy fitness test. Item test can be used to know the status of physical condition of adolescent martial arts athletes with age range 14-17 years.

In addition, the physical test items are also equipped with the test norms as the coach's decision on the test results.

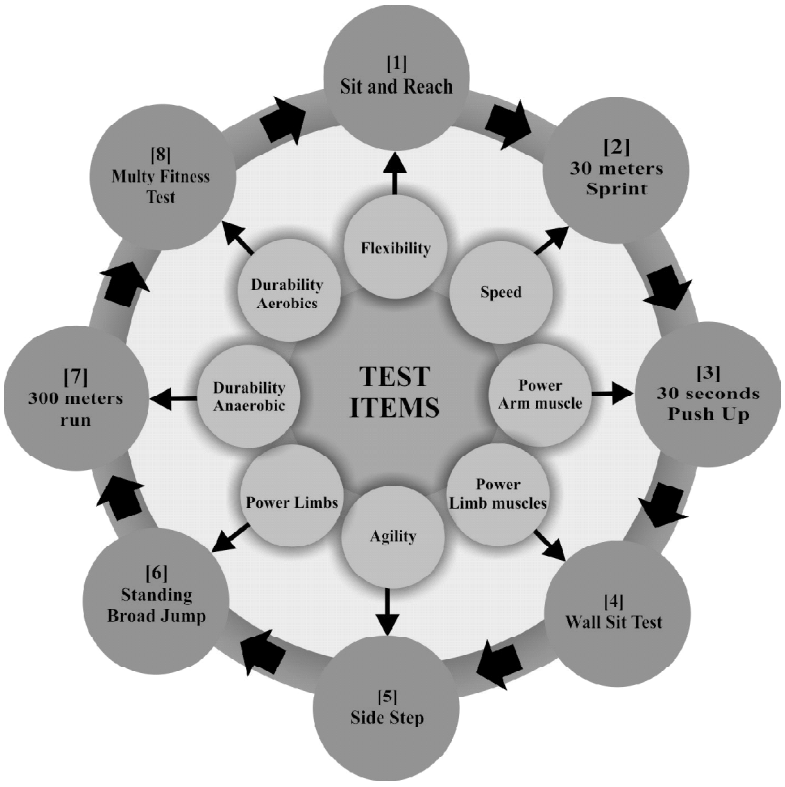


Figure 1: Figure of test items and the flow of physical test execution

References

Bompa Tudor. O and Haff G. Gregory. Periodization: theory and methodology of training. Champaign, IL: Human Kinetics, 2009, pp. 57.

Bompa, Tudor. O & Carrera, Michael. Conditioning young athletes. Champaign, IL: Human Kinetics, 2015, pp. 67.

Sukadiyanto & Muluk, Dangsina. Pengantar teori dan metodologi melatih fisik. Bandung: Lubuk Agung, 2011, pp. 60, 90, 137.

Harsono. Kepelatihan olahraga. Teori dan Metodologi. Bandung: PT. Remaja Rosdakarya, 2017, pp. 39.

Borms, J. Journal of Sports Sciences, 1986, 4 (1), 3–20, https://doi.org/10.1080/02640418608732093.

Mylsidayu, Apta & Kurniawan, Febi. Ilmu kepelatihan dasar. Bandung: Alfabeta, 2015, pp. 116-118.

Kenney, W L., Wilmore, J H & Costill, D L. Physiology of sport and exercise (5th ed). Champaign, IL: Human Kinetics, 2015, pp. 430.

Whyte, Gregory. Advances in sport and exercise science series. The physiology of training. United Kingdom: Elsevier, 2006, pp. 3,17.

Gall, Meredith D., Gall, Joyce P., & Borg, Walter R. Educational research: An Introduction (8th ed). United State of America: Pearson, 2007, pp. 589-593.

Lefevre J., Beunen G., Steens G., Claessens A and Renson R. Annals of Human Biology. 1990,17 (5), 423-435, *https://doi.org/10.1080/03014469000001202*

Bompa, Tudor. O & Buzzichelli C. Periodization training for sports. Champaign, IL: Human Kinetics, 2015, pp. 8.

Himberg, C., Hutchinson, Gayle E., Roussell, John M. Teaching secondary physical education. Preparing adolescents to be active for life. Champaign, IL: Human Kinetics, 2003, pp. 71.

Majumdar, Aditi S. and Robergs, Robert A. The Science of Speed: Determinants of Performance in the 100 m Sprint. *International Journal of Sports Science & Coaching*., 2011, 6 (3), pp. 479-493.

Suharjana. (2013). Physical fitness. Yogyakarta: Jogja Global Media, 2013, pp. 77, 151.

Dawes, Jay and Roozen, Mark. Developing agility and quickness. Champaign, IL: Human Kinetics, 2011. pp. 9.

Siswantoyo. Jurnal Cakrawala Pendidikan, 2014, 33 (1), 80-91, http://dx.doi.org/10.21831/cp.v1i1.1864

Kuswanto, C. Jurnal Keolahragaan, 2016, 4 (2), 145-154. doi:http://dx.doi.org/10.21831/jk.v4i2.6423.

Ali, M dan Asrori, M. (2012). Psikologi remaja. Perkembangan peserta didik. Jakarta: Bumi Aksara, 2012, pp. 9.