

The Influence of Modification Diet Zone on Body Composition of Athlete Sprinter

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ABSTRACT--- *Energy source for athlete come from carbohydrate intake, and protein intake as source muscle fiber. Diet Zone composed by high protein and low carbohydrate (40% protein, 30% carbohydrate) which diet special of sprint of USA athlete in olympic games. Commonly food composition pattern among Indonesian compose rich of carbohydrate and adequate protein, rare consumed of vegetables and fruits. This interest to study, how can apply diet of modify diet zone, but rich of vegetables and fruits affect perform, and body composition. It permitted by ethical commission of university board (No: 551-KEPK), research was done in case-control experiment of 20 athletes sprint age 15-18 years old, which divide in gender equity of group experiment have diet Zone which consist of mixed menu (Indonesian and west food) that it divided in three times meal and two times snack according type and time of daily training which given of program trainer for 14 days, and control group have balance diet. Result showed that perform was not found increased but fat free mass was increased in significant whose have diet high protein, low carbohydrate which compose in vegetables and fruits. Food preference influenced by culture and methods of cooking that changed in food composition.*

Keywords--- Athlete, diet zone, body composition

1. INTRODUCTION

Indonesian population now reaches approximately 250 million people. However from those millions, just a few people could be world-class athletes, especially in athletic. This fact happens because the increasing of physical condition still becomes a handicap to athletes from developing countries include Indonesia. This condition could be proved by some physical test results held by Central Coordination Indonesian Sport [1] in purpose to face some sport events such as ASEAN Games and SEA Games that show less adequate result status. Physical condition is an important element and becoming a foundation in technical, tactic, strategy and mental improvement.

Nutrition is supporting factor of athlete physical condition to achieve excellence condition. Merely consumes supplement prior to the competition is not enough. An athlete should consume nutritious foods daily to get a good performance while competing in competition. Talented and high motivated athlete will never achieve his best potential result without select his diet promptly [2].

Athlete diet should provide sufficient energy to support the needs while exercise as well as energy needs in daily life. It also should provide the needs of all nutrition including energy from macro nutrients such as carbohydrate, fat, protein and supported by vitamin, mineral and water. Diet should provide sufficient energy, not less or excess. Principally, balance diet consists of 55-60% carbohydrate, no more than 35% fat (saturated fat less than 10%) and 10-15% protein. Most of energy needed for sport or exercise activity is gained from fat and carbohydrate oxidation, while protein only provide 12-15% from energy intake. The higher exercise intensity, energy needs will increase and reliance to carbohydrate as energy supply will increase too [2].

Carbohydrate is the fastest energy source that could provide energy needed by altering it to glucose, including glucose storage called glycogen. Whereas fat actually produces the biggest energy while exercise endurance but it process is slow because first, fat should be broken down from it complex form called triglyceride to it basic components, glycerol and free fatty acid. Only free fatty acid could be used to produce ATP. Otherwise, protein needed to be altered through gluconeogenesis (protein or fat altered to be glucose) or lipogenesis (protein altered to be fatty acid).

A research study about athlete nutrition in US, it conducted by Sear B. in 1997, discovered menu pattern which contains adequate protein, moderate carbohydrate, low fat and rich of fruits and vegetables. With ratio carbohydrate: protein: fat is 30%:40%:30%. This diet menu had been trial to swimming athlete in Stanford University, who were in olympic 1992 won 8 gold medals in Barcelona. In 1996, with this same diet, male and female swimming athletes won 8 of 10 in NCAA Swimming Championship. They had followed this diet for 2 years since 1992. Angel Martini, a 29-years-old US female swimming athlete, won 2 gold medals and 2 silver medals in Atlanta olympic with this diet even without well programmed exercise[3].

Both statements about athlete nutrition above, seem different, which some literature showed that main energy requirement for an athlete taken from carbohydrate and most of his/her nutrition needs (55-60%) were provided by carbohydrate. While another research conducted by Sears showed that optimal result of calory resources was taken from protein and carbohydrate with protein ratio higher than carbohydrate (40%:30%). It called Zone diet.

Generally, Indonesian people’s diet had rice as the biggest portion, protein lesser than fat, and rarely ate fruits and vegetables in menu components. It’s interesting to be researched how the menu that could increase US athletes’ performance becoming menu for Indonesian athletes. Dietary pattern in Indonesia was different with those in western countries. Beside big proportion of energy comes from carbohydrate, protein is less eaten and only function as side dish compared with western menu proportion. Moreover Indonesian menu is full of local specific seasoning so receptivity of menu is strongly influence Indonesian diet habit.

With a good diet, as suggested by Spears B., great physical condition would be achieved so that the athletes could exercise and compete in tough competition, got faster recovery, and decrease injury risk. Human body composition consisted of total body fat (essential fat and fat deposit), free fatty acid, bone mass, muscle mass and water. To achieve athletes excellent condition, balance body composition was required [4].

Based on above explanation, this research was aimed to investigate the influence of adequate protein, moderate carbohydrate, low fat and a lot of of fruits and vegetables diet to the athletes body composition [4].

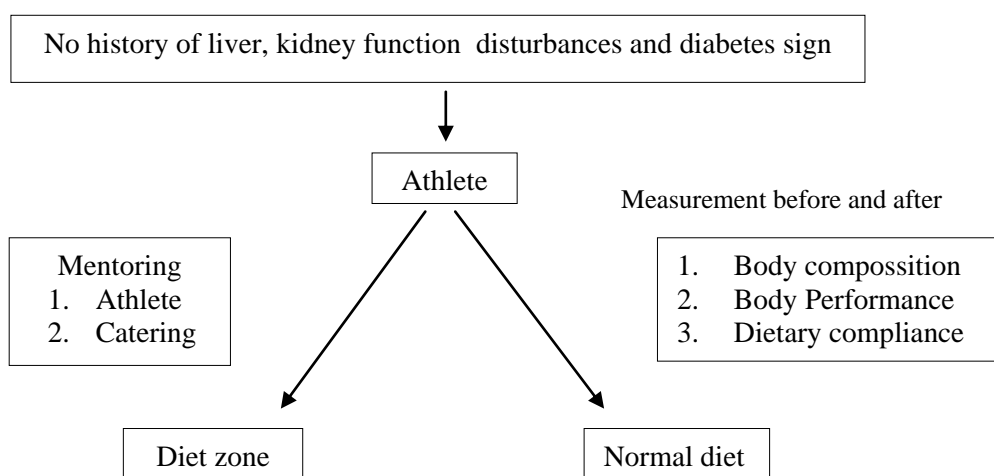


Figure 1. Research Scheme

2. RESEARCH METHODS

Based on the dimension, this research is a quasi experimental research because researchers give planned treatment to the research’s subject. In this research there are two groups, control group and experimental group.

Research population is all of East Java , Indonesia Athletes Unity (PASI)’s athletes, male and female, who joined exercise in regional training center (Puslatda) in KONI Surabaya’s field at April-August 2014. Research subject is a part of population that fulfilled inclusion criteria, they are normal liver condition, normal kidney condition, and did not have diabetes mellitus then they willing to participated in this research and sign the informed consent. Research subject are 20 sprint athletes.

Variable and Operational Definition

Body Mass Index (BMI): Nutritional status measurement with anthropometric measurement of weight and height of the subject. Measurement conducted twice and the data collected are the average score $BMI = \text{Weight (kg)} / \text{Height}^2 \text{(m)}$

Category based on WHO criteria, normal if BMI score 18,5-24,9 kg/m^2

Fat mass: Body composition measurement by Bio composition analyzer Tanita BC 541 which calculate fat mass in subject body before and after intervention. Classification of normal fat mass Male athlete: 6-13% and Female athlete: 14-20%.

Modify Zone diet: Menu composition that contain 30-40% protein, 20-30% carbohydrate, 20-30% fat, Mostly consist of western diet or Indonesian food without rice which serve in a day, depend on how much counting energy expenditure for training [5].

Control Diet: Menu composition that contain 15-20% protein, 50-60% carbohydrate, 20-30% fat, that serve same food with diet zone which rice, and fruit juice replace with sugary drink (lemonade flavor which look like lemon juice, strawberry which look like guava juice etc).

Diet compliance: Measure the amount of each menu after meal of every subject. Measure left overs food and interview the reason why they not finished the meals in every subject every day during the research.

Athlete's performance: Measure leg muscle strength and running speed, Measure time needed for 60 meters running and hop test before and after intervention [6].

Researcher prepare menu and organoleptic test of menu. Zone Diet is a combination of menu that consist of 3 times snack and 3 meals time which calculated by total 3000-4000 calories for each day, concerning to training and matches schedule. The variation of menu was arranged for 7 days that served for 2 weeks, included which traditional Indonesian menu, and western menu that calculated energy source Carbohydrates 30-40%, Protein 20-30%, and fat 20-30 & that consist of protein, vegetables and fruits and without rice [7].

3. RESULT AND DISCUSSION

The study was carried out among 20 athletes were systematically selected by simple random sampling and divided into two groups, one was control group and the other was experimental group. Table 1 revealed gender-oriented of sample group that control group composition has equal distribution, while experimental group has men a lot more than women.

Table 1. Biologic Character of Control and Treatment Group

	Control (n=10)	Treatment (n=10)	Total (n=20)
Sex			
- Man	5 (50%)	7 (70%)	12 (60%)
- Woman	5 (50%)	3 (30%)	8 (40%)
Age (year)			
-13	2 (20%)	0 (0%)	2 (10%)
-14	1 (10%)	1 (10%)	2 (10%)
-15	2 (20%)	2 (20%)	4 (20%)
-16	4 (40%)	5 (50%)	9 (45%)
-17	1 (10%)	2 (20%)	3 (15%)

From table 2 showed The average systole pressure in treatment group more higher than control group but after consume diet zone in 14 days, condition was reverse in significantly among treatment group which showed average of systole pressure less than control group. The average pulse in control group was found significant different when measurement before and after.

Table 2 Blood Pressure (Systole and Diastole) and Pulse of Control and Treatment Group

	Control		Paired T Test	Treatment		Paired T Test
	Mean	SD		Mean	SD	
Systole (mmHg)						
- before	113.10	13.287	P=0,371	115.80	9.053	P=0,015
- after	110.80	9.875		107.50	8.972	
Diastolic (mmHg)						
-before	61.50	7.906	P=0,717	62.60	8.475	P=0,198
-after	60.30	8.179		59.90	6.367	
Pulses (x/menit)						
-before	77.30	11.046	P=0,033	80.90	7.680	P=0,121
-after	70.70	8.769		75.90	9.620	

From observation of compliance diet was found left over of food serve mostly in vegetables. From table 3 showed compliance was influenced of average actual intake and the energy portion of macro nutrient. It showed in table 4 the average actual intake of energy in treatment group was 2927,65 Kcal it was less than average plan. It was also happened to control group. The actual intake of energy in control group was sufficient for energy expenditure of sprinter. However in control group the average actual intake of energy was risk energy deficiency. Energy source from macro nutrient was showed 26,2% origin from protein, 37,2% from fat, 36,6% from carbohydrate. The composition of energy source in treatment group was worse, it was showed energy source from protein, fat, carbohydrate was respectively 30,2%, 50,2% , 19,2%. Actual energy intake of treatment group consist of 30.2% come from protein, 50% from fat, and 19.2% from carbohydrate. Increasing of fat was come of frying methods (some twice a day) , and prefer in traditional food which mostly rare consist meat and does not like western salad, steak. Example pecel is traditional salad with peanuts salad, boiled vegetables, peanut and small fish cracker or peyek which nice eating with rice, prefer sate (chicken meat which

chop bake in traditional methods and eat which peanut and soy sauce, chilly and onion and rice roll) than chicken steaks [8].

Table 3. Comparison Food Intake Between Control and Treatment Group

Nutrient Type	Control		Treatment	
	Average Plan	Average Actual Intake/Day	Average Plan	Average Actual Intake/Day
Energy (kcal)	2235,3	2191,62	3035,93	2927,65
Protein (gram)	146,0	142,69 (26,2%)	216,28	205,61 (30,2%)
Fat (gram)	90,7	89,84 (37,2%)	155,08	151,63 (50, 2%)
Carbohydrate (gram)	204,7	198,80 (36,6%)	141,82	132,99 (19,2%)

Body composition measured by Body composition monitor with brand name Tanita BC 541. This equipment weakly in measured all body composition of human if below 18 years old except *body fat*. Fat free mas, bone mass calculated from weight minus body fat. It was showed that actual intake of food influenced of body composition of weight (p=0,001) and body fat (p=0,024) in treatment group.

Table 4. Body Weight and Body Fat Between Control and Treatment Group

Variable	Control			Treatment		Paired T test
	Average	SD	Paired T test	Average	SD	
Weight (kg) -before -after	55,31 56,22	7,327 9,152	P= 0.043	53,50 56,85	9,48 7,86	P=0.001
Body Fat (%) -before -after	17,800 18.580	5,4263 6.0718	P= 0,001	17,650 18.620	7,1226 7.3593	P= 0.024

The actual food intake of diet zone was not influenced the perform indicator, but in control group was significant influenced test run 60 meter (p=0,0031). This was interesting because the time achievement in treatment group better than control group.

Table 5. Perform Indicators Between Control and Treatment Group

Perform Indicators	Control		Paired T Test	Treatment		Paired T Test
	Average	SD		Average	SD	
Test Run 60 Meter Before After	7,9670 8,0980	0,55255 0,60417	P= 0.031	7,8610 8,0189	0,55167 0,48940	P= 0.095
HOP Test - Leg Right Before After	6,25 6,387	0,592 0,6401	P= 0.676	6,47 6,570	0,613 0,4329	P= 0.49
- Leg Left Before After	6,166 6,4833	0,7357 0,57554	P= 0.220	6,379 6,4933	0,74590 0,65949	P= 0.265

Increasing of body composition because of nutrient intake which contain adequate protein, moderate amount of carbohydrate, low fat and lots of fruits and vegetables was happen due to following matters:

1. Food pattern was influenced by socio-cultural factor, availability type of food and sensor reception of trained sense, moreover psychological factor. There might be cultural and meal value differences since most of athletes were from districts in East Java province. Diet zone given to subject group was a finding of American researcher named Spear with the largest portion of serving was side dishes and almost no rice in each menu. It was similar with

food pattern of American. Its diet zone was difficult to be applied because in Indonesia almost all of menu consist of high protein dishes and high rice portion. When choosing food depends on taste which is affected by culture and food value (Sanjour). Hence preference taste is important on rejecting several western menu as salad which consisted of fresh vegetables and mayonnaise. It might has a strange taste for Indonesian which usually like peanuts salad with steam vegetables “pecel”. Most likely wasn’t due to type of menu, but because of some Indonesian teenage rarely consume vegetables in daily. It was seen from a green vegetables least leftovers when serve menu was peanut salad like pecel or gado-gado, shrimp paste salad “rujak suroboyo” also on soup was found a green vegetables leftovers almost 30% subjects. Popular menu of Thailand such as tom yam which has no vegetable has been eaten away by experimental subject or control subject. However, high-protein menu no rice such as steak and hoka-hoka bento ‘japanese style’ found lots of vegetables leftovers weren’t consumed. Another cause as less appropriate taste such as fried fish, satay of mackerel. Therefore, intervention efforts to reduce non preference food still need time to meet the expectation [9].

2. Body composition change may occur because body cells didn’t have energy deficit due to constant and no fluctuate food ordering. The body received regular frequencies and portions according to nutritional needs like mealtime setting thrice a day according research phase. When exercise, energy breakdown occurs rapidly then filled again on the next energy consumption [10]. It occurs because meal schedule adjustment carried out based on exercise schedule such as giving snack 30 minutes before exercise. Serve of a big meal after exercise or more than 2 hours before exercise schedule [11]. They got some difficulties when accepting because their food pattern have been set three times a day for entree and twice a day for snack. Compliance data revealed dinner dessert didn’t consumed due to full. The great finding related energizer snack was banana. This fruit has been popular in every subject and no one rejected to consume. Furthermore, banana contains much of potassium as good for heart blood pump and energy even has a good receptivity for morning exercise performance. When banana menu served every 30 minutes in the morning, there were no complain of starving from subjects [12].
3. Increasing body composition such as body fat following increasing weight may occur because of imbalance between energy intake and energy expenditure. There was no energy expenditure because no exercise schedule on Saturday and Monday, while meal schedule continues. In the time-sharing system, this equal with energy was slightly reduced [13].
4. The body fat composition increase may occur because over consumption of great energy sources. Cooking process by frying (even in tofu and tempe in rujak and gado-gado salad) or ingredient option of spices contains lot of fat (peanut sauce), so excessive energy occur and fat deposits formed.
5. Foodstuff of animal protein has more fat than fish. While, acceptable menu was animal protein in order to enable switching energy use from protein to fat.
6. Weight control for athletes need to be done everyday in order to maintain body composition. All subject have do physical training twice a day in daily except Saturday and Sunday, but all food serve in maintain always daily. To control excessive energy for two days which is difficult to breakdown can be done by control variation of protein, vegetables and fruits diversity even though subject doesn’t eat rice everyday.

There is no significant in second hypothesis may occur due to:

1. According to body composition measurement, there is body muscle composition of athlete hasn’t been formed from moderate protein dietary component within 14 days. Muscle formation through natural food takes longer time than using supplement, but it’s safer.
2. Increasing of muscle strength occur and proven from performance and hop test results, however measurement tools may not able to reveal the results therefore to calculate the result using the other specific methods of muscle strength and mass.

4. CONCLUSION

1. Muscle composition increases because of given adequate protein food pattern, moderate amount of carbohydrate and low fat, and lots of fruits and vegetables diet. Muscle mass measurement was carried out indirectly by BIA tool due to age constraints of research subject less than 18 years old.
2. There is significant improvement of blood pressure due to adequate protein food pattern, moderate amount of carbohydrate and low fat, and lots of fruits and vegetables diet.
3. Food culture factor makes fat component becomes prominent such as more like fried foods or Indonesian seasoning with peanut taste.
4. Banana fruit contain of potassium and adequate energy for morning exercise.
5. There is no significant increasing of performance on adequate protein, moderate amount of carbohydrate and low fat, and lots of fruits and vegetables diet.

5. ACKNOWLEDMENT

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