

Sports Nutrition Development Model

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Abstract— Nutrition is one of the factors that influence the achievement of North Sumatra sportsmen, so it needs to be considered and adjusted for nutritional needs with physical activity during the training program. This study aims to obtain models of sports nutrition development that can improve achievement. The research method used is qualitative methods with a descriptive approach. The study population was all North Sumatra sports that competed in the 2016 National Sports Week in West Java. The research sample is the 3 sports that won the most gold medals, namely Wushu, Karate, and Pencak Silat. The technique of obtaining data is by using questionnaires, interviews, documentation, and group discussion forums (FGD). Test the validity of the data, namely with credibility, transferability, dependability, and confirmability. The results showed that the model of sports nutrition development was carried out with balanced nutrition techniques consisting of carbohydrates, proteins, fats, vitamins, minerals, and water. The guidance model is applied based on the calorie needs of athletes with the right source of nutrition. Athletes' calories are measured by Basal Metabolic Rate (BMR).

Keywords: *model, nutrition, athlete*

I. INTRODUCTION

Maximum performance improvement can be achieved if the athlete can improve the physical condition of all components and is developed according to needs. Therefore the development of athletes requires a variety of preparations with the main priority is physical preparation, technical preparation, tactics preparation, and mental preparation. This means that physical preparation is a very important thing to plan and do before other aspects. Because physical conditions are the basis of fluency in coaching [1].

The branch of sports (sports) Province of North Sumatra (North Sumatra) who competed in the National Sports Week (PON) in 2016 West Java is numbered "... " sports. The results obtained ranked North Sumatra at the top 10, namely rank 8. Sports which have a role in donating gold so that it can make North Sumatra experience an increase from 2012 which

consists of 3 sports including Wushu, Karate, and Pencak Silat.

Wushu, karate, and pencak silat sports become the flagship sports of North Sumatra so that they can be a guideline for other sports in gaining gold medal and making North Sumatra's sports achievements continue to increase. The data obtained related to the achievement of achievements was influenced by the nutritional intake of athletes according to their needs. Control of nutritional intake is carried out by each sport in organizing training patterns and nutritional requirements needed so that athlete's fitness can be maximized and can avoid technical problems involving body preparation during exercise and competition. peculiarities. For example, the head margin in this template measures proportionately more than is customary. This measurement and others are deliberate, using specifications that anticipate your paper as one part of the entire proceedings, and not as an independent document. Please do not revise any of the current designations.

Balanced nutrition for sports or often known as sports nutrition needs to be known and carried out by every athlete [2]. Sportsman nutrition is one of the keys to supporting an athlete's performance, this is seen from the form of physical work carried out daily by athletes. Proper nutrition is not only important for the growth, maintenance and replacement of body tissues, but also for providing energy. Physical use in an athlete is not much influenced by the amount of energy produced by the muscles of the body, but more is determined by the body's ability to use the energy produced by the body's muscles to make the necessary movements.

II. RESEARCH METHODS

The method used in this study is a descriptive survey. [3] states that "In general descriptive surveys are used to make an assessment of a condition and the implementation of a program in the present, then the results are used to develop a plan for improving the program". From this, it can be stated that the method used is appropriate, which is in accordance with the background of the research conducted. Therefore this

study has a research method as a way of obtaining information about certain conditions, so that the research carried out in accordance with the aims and objectives of the study.

The technique of obtaining data is by using questionnaires, interviews, documentation, and focus group discussion (FGD). Test the validity of the data, namely with credibility, transferability, dependability, and confirmability. Based on this, the researcher conducted the collection using the techniques and instruments as follows:

1) *Descriptive field notes*: this is the longest part and describes all the efforts of researchers to record details that occur in the field [4]. The descriptive field record carried out by the researcher was to record all the events that occurred and were available.

2) *Records of reflective fields*: in addition to descriptive material, field notes contain sentences and paragraphs that reflect a more subjective understanding of research [4]. The reflective field record carried out by the researcher is by recording the progress obtained by the researcher.

The method used in this study is a qualitative research method with descriptive survey techniques. [3] states that "In general, descriptive surveys are used to make an assessment of the conditions and implementation of a program in the present, then the results are used to prepare plans for improving the program".

The sample in this study used Purposive sampling with the criteria of the North Sumatra flagship sports branch and the sport branch which won the most medals in the 2016 West Java National Sports Week. Based on the required sample criteria, in this study 3 (three) sports branches were obtained, namely Wushu, Karate, and Silat. Data collection techniques are using questionnaire instruments, interview guidelines, and documentation. The results of the data acquisition are then carried out data analysis through a focus group discussion (FGD) and data validity test that is with credibility, transferability, dependability, and confirmability.

III. RESULTS AND DISCUSSION

A. Research result

The research was carried out in the flagship sports in North Sumatra which won the most gold medals at the Pekan Olahraga Nasional 2016 (PON). The sports branches studied were: 1) Wushu, 2) Karate, and 3) Pencak Silat. Data acquisition is described as follows:

1) Wushu

Wushu is the martial arts branch with the most winning medals with 14 people. Nutrition status in athletes is carried out by carrying out food consumption patterns as follows:

TABLE I. FOOD TYPES OF WUSHU ATHLETES' EXERCISE

Type of food	quantity
Rice	500gr
Jam	25gr
Syrup	50cc
Sugar	40gr
Vegetables	200gr
Fruits	200gr

TABLE II. FOOD PORTIONS FOR 2-3 HOURS BEFORE THE MATCH

Type of food	Portion Size
Mixed vegetable dishes	150gr
Nonfat milk	200cc
Juice	150cc
Cakes	50gr

2) Karate

Karate is a martial arts branch with the highest number of winners with 10 people. Nutrition status in athletes is carried out by carrying out food consumption patterns as follows:

TABLE III. FOOD PORTION TYPES OF KARATE ATHLETES

Food	Ukuran
Rice	500gr
Bread	50gr
Sugar	40gr
Butter	25gr
Egg	2 butir
Meat	150gr
Milk powder	25gr
Vegetables	200gr
Fruits	200gr

TABLE IV. FOOD PORTIONS FOR 2-3 HOURS BEFORE THE MATCH

Food	Portion
Grilled fish / chicken	100gr
Mixed vegetable dishes	150gr
Nonfat milk	200cc
Juice	150cc
Fruits	200gr

3) Pencak Silat

Pencak Silat is the martial arts branch with the most winning medals with 15 athletes. Nutrition status in athletes is carried out by carrying out food consumption patterns as follows:

TABLE V. FOOD PORTION TYPES OF SILAT ATHLETES EXERCISE

Food	Standart
Rice	500gr
Bread	50gr
Biscuits	75gr
Jam	25gr
Syrup	50cc
Sugar	40gr
Butter	25gr
Egg	2 butir
Meat	150gr
Fruits	200gr

TABLE VI. FOOD PORTIONS FOR 2-3 HOURS BEFORE THE MATCH

Food	Portion
Potatoes (boiled / puree + milk)	150gr
Grilled chicken / meat	100gr
Nonfat Milk	200cc
Cakes	50gr

Based on data obtained from food consumption and its size to meet the nutritional status of athletes, it can be seen that the purpose of food is to meet nutritional needs. Nutritional status needs to be done to make athletes avoid problems related to body conditions such as fatigue, loss of concentration, and accuracy of using the right energy for each movement. The food consumed must be varied to avoid athletic saturation or psychological disturbances during the preparation process of the competition.

B. Discussion

Good nutritional status is needed to maintain the degree of physical fitness and health and support the development of athletes' achievements. Measurement of Body Mass Index (BMI) and percent body fat can describe a person's nutritional status. Some research conducted shows that athletes who have BMI and percent of optimal body fat have better physical fitness [5].

The number of nutrients needed for each individual has a different portion, the calculation is based on age, weight, gender, physical activity, environmental conditions (temperature), certain conditions (sick, pregnant or lactating women) (Daryanto, 2015). Energy requirements needed by an athlete are needed for: (1) basal metabolism (Base Metabolism Rate (AMB) / Need for rest); (2) physical activity, and (3) food or special dynamic effects of SDA (specific dynamic action) and in general the greatest energy needs are needed for basal metabolism [6].

Calculation of the number of caloric requirements per day for athletes can be done by calculating BMI (Body Mass Index) with the formula $\text{weight (kg)} / \text{Height}^2$, BMR (basal metabolic rate) found in the table, SDA (specific dynamic action) of 10% BMR, physical activity energy in the table, and exercise energy based on the table. The need for energy for a person depends on the body's metabolism and physical activity and the food consumed is then measured by the standard count. Based on balanced nutrition guidelines explained that the level of need for athletes can be measured by the applicable provisions, making it easier for athletes to fulfill nutrients according to the recommended rules. Calculation of BMR can be done with calculations based on body weight contained in the table as follows:

TABLE VII. BMR CALCULATION

Age (Years)	No.	BMR: MJ/day	See ^a	BMR: kcal/day	See ^a
Males					
< 3	162	0.249kg - 0.127	0.292	59.512kg - 30.4	70
3-10	338	0.095kg + 2.110	0.280	22.706kg + 504.3	67
10-18	734	0.074kg + 2.754	0.441	17.686kg + 658.2	105
18-30	2879	0.063kg + 2.896	0.641	15.057kg + 692.2	153
30-60	646	0.048kg + 3.653	0.700	11.472kg + 873.1	167
≥ 60	50	0.049 kg + 2.459	0.686	11.711kg + 587.7	164
Females					
< 3	137	0.244kg - 0.130	0.246	58.317kg - 31.1	59
3-10	413	0.085kg + 2.033	0.292	20.315kg + 485.9	70
10-18	575	0.056kg + 2.898	0.466	13.384kg + 692.6	111
18-30	829	0.062kg + 2.036	0.497	14.818kg + 486.6	119
30-60	372	0.034kg + 3.538	0.465	8.126kg + 845.6	111
≥ 60	38	0.038kg + 2.755	0.451	9.082kg + 658.8	108

*Weight is expressed in kg. Predictive equations for children and adolescents are presented for the sake of completeness. *Source:* Schofield, 1985

*see = standard error of estimate

Sumber : [7]

TABLE VIII. PHYSICAL WORKING FACTORS (MULTIPLICATION WITH BMR)

Activity Level	Male	Female
Sleep	1,2	1,2
Very light working	1,4	1,4
Light working	1,5	1,5
Medium-Light Working	1,7	1,6
Medium working	1,8	1,7
Hard work	2,1	1,8
Heavy Working	2,3	2,0

1) Nutrition Training and Athlete Match

1. Adequate nutrition of athletes

As an athlete, it is necessary to have sufficient nutrition before the match, this serves to facilitate the athlete in running the match. One that must be fulfilled before competing is the energy supply. Energy reserves are stored in the muscles and liver as glycogen, if a little energy supply will result in fatigue due to exhaustion.

2. Energy supply

Reserves of glycogen in the body can be enlarged through the "carbo-loading" technique, which is to give as much carbohydrate input into the athlete's body so that it will encourage the formation of large amounts of glycogen reserves. Energy supply can be done by carbo-loading process by providing high carbohydrate intake to athletes [8].

The production of adenosine triphosphate (ATP) in muscle work depends on the availability of muscle glycogen and blood glucose. Muscle tissue is the main glycogen deposit (400g or 6.7MJ), then liver (70g or 1.2MJ) and blood glucose (2.5g or 342kJ). This amount can vary and depend on factors such as food intake or intake. Although carbohydrates are not the only source of energy, carbohydrates are more needed as a muscle energy source for high physical activity [9].

The production of adenosine triphosphate (ATP) during intensive muscle work depends on the availability of muscle glycogen and blood glucose. Mild physical activity allows it to be produced with low carbohydrate sources. Conversely, for high activity will require a large energy source. Muscle tissue

is the main glycogen deposit (400 gr:6.7 MJ), later (70 gr: 1.2 MJ) and blood glucose (2.5 g: 342 kJ). The amount of energy supply capacity varies between individuals according to the intake (food intake). Muscle glycogen content in endurance athletes trained with a mixed diet has muscle glycogen content of 130-230 mmol / kg muscle weight [10].

In the types of endurance sports with high intensity such as marathons, triathlons, martial arts and cross-country very much in need of high glycogen deposits. Because endurance sports (activity > 90 minutes) and ultra endurance (activity > 4 hours) if you have normal glycogen stores, energy requirements will not be fulfilled, thus causing a decrease in sports performance. To overcome this can be done with "Carbohydrate Loading" which serves to increase glycogen deposits from 200 to 300% in overcoming fatigue and the athlete's appearance can be improved.

According to Moehji, 2009: 99 The carbo-loading implementation can be done in two stages, namely:

1) Stage of emptying the body's glycogen

For several days athletes are given food with a composition of 20% fat, 15% protein, and 65% carbohydrate from the total calorie needs during training in one day. A week before the competition takes place, athletes are given a training load heavier than before. Then athletes are given a low carbohydrate diet that is 80-90 grams and not less than 80 grams. A low carbohydrate diet accompanied by a heavy burden of physical exercise is given for 3 consecutive days.

2) Stage of making carbohydrates (carbo-loading)

Three days before the match, the athlete's physical training load was lowered to a minimum. Then athletes are given a high carbohydrate diet and consume fat and protein no more than 20%. The size of the consumption of a high carbohydrate diet is up to 4 grams per 100 grams of muscle mass, or the overall body glycogen reserves reach 700 grams, equivalent to 2800 calories. Carbohydrate loading can be modified by applying seven days before the competition to apply heavy training (day 1) to consume glycogen deposits, then on day 2-4 a low carbohydrate diet high in protein and fat is given to meet energy needs, but prevents glycogen filling. A high carbohydrate diet (70% of total energy) is given on days 5-7 before competing to maximize glycogen in the muscle that is depleted of glycogen.

Glycogen levels can be increased within 24 hours with a high carbohydrate diet (7-10 g / kg body weight or 70-85% of total energy), it takes 3-5 days to reach the maximum level. Three (3) days of a high carbohydrate diet are generally felt to be sufficient for competition and also to minimize lipogenesis.

TABLE IX. EXERCISE FOOD TYPES CALORIE REQUIREMENT 3000-3500 CAL

Food	Standart
Rice	500gr
bread	50gr
Biscuits	75gr
Jam	25gr
Syrup	50cc
Sugar	40gr
Butter	25gr
Egg	2 butir
Meat	150gr
Milk Powder	25gr
Vegetables	200gr
Fruits	200gr

TABLE X. FOOD PORTIONS FOR 2-3 HOURS BEFORE THE MATCH WITH A CONTENT OF 700 CALORIES

Food	Portion
Potatoes (boiled / puree + milk)	150gr
Grilled chicken / meat	100gr
Mixed vegetable dishes	150gr
Nonfat Milk	200cc
Juice	150cc
Cakes	50gr

TABLE XI. MATCH FOOD SCHEDULE

Eating Time	Time	Food
Up early	05.00	Orange juice, toast, half-cooked eggs
In the Morning	07.00	Full breakfast + one glass of milk
Noon	10.00	Orange juice/ syrup/ fruit juices and snacks/ fruits
Noon	13.00	Lunch food complete
Afternoon	16.00	Tea/ syrup/ juice and snacks
Evening	19.00	Dinner complete
Toward Sleep	21.00	Tea + snacks

IV. CONCLUSION

The achievements of North Sumatra Athletes are based on the athlete's caloric needs as measured by the Basal Metabolic Rate (BMR) and the source of calories given with food ingredients that are reminiscent or not burdensome to the digestive aspects of vegetables, fruits, fish / eggs (occasional meat), milk (for morning / night), nuts, and drinking enough water. The application of sportsman nutrition models can provide a high role in gaining achievements in a sportsman.

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