



## The Correlation between Perception on Dormitory Food and Nutrient Intake of Young Athletes Residing at Athlete's Dormitory

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### Abstract

Young athletes who go to training centers, may fulfill their dietary needs from meals provided in the accommodation facilities, yet they can also access foods outside the dormitories. Perception on institutional food can influence one's of food intake and nutritional adequacy. This study to investigate the correlation between perception on dormitory food and daily nutrient intake of young athletes, who living at athlete's dormitory. It used cross-sectional design and involved 24 athletes of martial sports, using purposive technique sampling and sample recruited from Student Education and Training Center (PPLP) Central Java Indonesia, who resided in Jatidiri athlete's dormitory Semarang. Variables were measured using questionnaire, food record form, and body weight measurement. Whereas data were analyzed using Pearson and Spearman correlation test. Perception on dormitory foods had no correlation with intake of energy, macro-nutrient, vitamin C, and calcium from dormitory food ( $p > 0.05$ ). But, it had significant correlation with intake of energy, protein, and fat from meals from outside the dormitory ( $p < 0.05$ ). Perception on dormitory food had no correlation with intake of energy, macro-nutrient, vitamin C, and calcium from dormitory foods. Menu improvement is proposed to increase the intake of dormitory meals.

### INTRODUCTION

Nutrition arrangement for athletes is essential so it needs to be designed, organized and given to the athletes according to the stages of their sports activities, either during a certain period of practice or before, during, and after the match (Ministry of Health, 2014). In Indonesia, selected athletes from various regions will follow the Regional Training Center (PUSLATDA) at the district or provincial level. Athletes who live in boarding houses, include those at the age of children and adolescents. Micheli & Mountjoy

(2009) described athletes who are still in growth phase need a healthy food intake. Rusli (2011) also argued that food plays an important role of an athlete's achievement as food will affect a person's physical growth.

At the Training Center, there must be a harmonious mix of the food arrangements with the programmed physical trainings. Provision of food that exceeds the requirement, will result in increased fat reserves so as not to reach the appropriate body composition. On the other hand, providing food that is less than the nutrient need,

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will cause difficulty in development of body muscles. Vitamins and minerals to monitor for athletes are include calcium, vitamin D, iron, and some antioxidants such as vitamin C, vitamin E,  $\beta$ -carotene, also selenium. Severe and prolonged training patterns, have been shown to increase the need for vitamin C. Physical performance of athletes will decrease in athletes who have deficiency of vitamin C (Rodriguez et al., 2009). Combat sports particularly belong to the type of sport that has weight class divisions. Accordingly, all athletes within this sport are required to maintain specific weight according to their class (Pettersson, 2013). As a result a lot of athletes achieve their target weight, through various means that involves severe energy restriction and dehydration (Langan-Evans et al., 2011).

Sedyanti (2014) stated that provision of food in training camps has the purpose of serving food according to the athlete's training program. In case of outsourcing system, the catering needs to consider the number of caterers, distance between kitchen and serving area, and the possibility of consumer getting bored during a contract period. Thus, menu planning is a determinant of the success in food production and one of the first steps in the food service function. Study on student athletes living in the dormitory of Student Education and Training Center (*PPLP*) of DKI Jakarta Province showed that 74.1% of the subjects' menus were poor in qualities wherein 55.5% of the menu had energy content which categorized as deficit (Swamilaksita et al., 2018). Likewise, study on athletes living in Jatidiri Athlete's Dormitory Semarang demonstrated 87.5% of the taekwondo athletes-subjects indicated the color and appearance of food served was not interesting, 75% of subjects believed that the food served had an unpleasant aroma, and the increased score of menu evaluation by subjects were followed by increased energy also protein intake. A study undertaken among play sports athletes at South Sulawesi *PPLP* revealed that intake of energy, carbohydrates, fats, vitamin C, and calcium in all athletes (100%) belonged to inadequate category (Kamaruddin, 2013).

As such, this study was aimed to assess athletes' perception on the menu organized by dormitory in terms of presentation, taste and variation of foods, as well as its correlation with the intake of energy, macro-nutrients, vitamin C, and calcium.

## METHOD

An observational study with cross-sectional design was conducted during August - Sep-

tember 2016 at Jatidiri Athlete's Dormitory, Semarang as a residence of *PPLP* athletes in Central Java Province. In this study, the population was combat athletes (silat, taekwondo, karate) in which food intake is considered the most prominent for this sport type. Athletes within this sport are required to maintain specific weight according to their class, which may lead to various activities related to unhealthy dietary intake such as skipping meals and avoiding certain food items. That foods are essential to meet the nutritional needs of athletes. Samples were selected using purposive sampling technique with inclusion criteria : live in Jatidiri Athlete's Dormitory Semarang, have stayed in the dormitory for at least 1 month and were present at the time of the study. There was no exclusion criterion for sample selection, because they were in a controlled environment. The sample size was determined using correlation formula below (Sastroasmoro & Ismael, 2011):

$$n = \left\{ \frac{Z\alpha + Z\beta}{0,5 \ln \left( \frac{1+r}{1-r} \right)} \right\}^2 + 3$$

Assumption of correlation coefficient ( $r$ ) referred to Perdanawati (2006) who found a relationship between menu and athlete's protein intake with  $r=0.409$ . Using the desired  $\alpha$  value of 0.05 ( $Z\alpha=1.96$ ) and power value ( $\beta$ ) of 0.80 ( $Z\beta=0.84$ ), the number of sample needed was at least 28 athletes. A total of 29 athletes had initially participated in this study. However, final sample size obtained 24 athletes as 5 persons experienced loss to follow up because they had to temporarily leave the dormitory due to the competition schedule.

Data collection included primary and secondary data. Primary data consisted of perception, food intake, age and body weight while secondary data collected was the dormitory menu cycle. Athlete's perception on dormitory menu was defined as athlete's assessment on the food provided by the dormitory organizers (catering) in a menu cycle. The evaluation was made on several aspects of the menu that was served in 1 meal time, i.e. meal presentation (including shape, texture and color), flavor (including aroma, texture and temperature), and variety (of food-stuffs and cooking method). The instrument to measure perception used a questionnaire with 4-point likert scale ranging from totally disagree to totally agree. This questionnaire was modified from Perdanawati's (2006) and validated on 24 athletes of volley ball and *sepak takraw* sports who lived in the same dormitory. The questions were tested as reliable and valid ( $r>0.343$ ). Perception

Table 1. Characteristics of Subjects

Characteristic	n	%	Min	Max	Median	Mean	SD
Sport							
Karate	6	25					
Taekwondo	7	29.2					
Silat	11	45.8					
Sex							
Female	9	37.5					
Male	15	62.5					
Age (years)			13	17	15.73	15.67	0.96
Body weight (kg)			42.5	85.1	59.2	59.2	9.65

was categorized as good ( $\geq 70\%$  of total score) and poor (less than 70% of total score).

Intake of energy, macro-nutrients (protein, carbohydrate, fat), vitamin C, and calcium from food provided by dormitory as well as from food outside the dorms was compared to individual nutritional needs of the subjects and expressed in percentages. Data of nutrient intake were obtained using food record form for 3 consecutive days with 2 working days and 1 weekend and then calculated using Nutrisurvey software. Nutritional needs for each subject was determined after weight measurement and recall of physical activity and training. Energy need was calculated using formula of  $((\text{BMR} + \text{SDA}) \times \text{AF}) + \text{energy requirement for training}$  (Ministry of Health, 2014). Basal Metabolic Rate (BMR) was calculated based on subjects' body weight, age and sex. Specific Dynamic Action (SDA) was set at 10% of BMR. Physical activity factor (AF) was assumed at the category of light activity level because the subjects were still a student. The additional energy requirement for training according to the subject's sport type was calculated as follows:  $5/7 \times \text{training's duration (in minute)} \times \text{training's load (in kcal)}$ . The coefficient in the formula, i.e. 5/7, corresponds to training days undertaken in a week (5 out of 7 days). Using this formula, athletes who weighed 50 kg and 60 kg had an energy requirement for training of 1217 kcal and 1435 kcal respectively (for silat), 1164 kcal and 1371

kcal (for karate) and 1685 kcal and 1989 kcal (for taekwondo) (Heydenreich et al, 2017; Haaf & Weijs, 2014).

Carbohydrate requirement was determined as 60% of total energy need, protein was 15% of total energy requirement, fat was 25% of total energy requirement and vitamin C was 200 mg / day. The daily needs for calcium in male athletes were 1200 mg/day (12-15 years) and 1000mg/day (16-18 years) while for female athletes they were 1000 mg/day (12-15 years) and 800mg/day (16-18 years). The intake level was categorized as deficit ( $< 90\%$  of the requirement), normal ( $90\% < X < 119\%$  of requirement) and above requirement level ( $\geq 120\%$  of requirement) (Ministry of Health, 2014).

Univariate analysis was performed on the studied variable and displayed in the form of frequency distribution and percentage. Bivariate analysis used Pearson correlation test to analyze the correlation between subject's perception and intake of energy, carbohydrate, protein and fat while Spearman test was used to analyze correlation between perception and intake of vitamin C as well as calcium. Data analysis was done using SPSS program at the significance level of 0.05.

## RESULTS AND DISCUSSION

### Characteristics of Subjects

Of the 24 athletes, 45.8% of which were silat athletes, 62.5% were males and all subjects belonged

Table 2. Nutritional Requirement of the Subjects

Nutrient	Min – Max	Mean $\pm$ SD
Energy (kcal)		
Activity	1836 – 3231	2398.68 $\pm$ 308.81
Training	1164 – 2292	1500.13 $\pm$ 350.03
Total	3053 – 5145	3898.81 $\pm$ 574.47
Carbohydrate (gram)	457.95 – 771.75	584.82 $\pm$ 86.32
Protein (gram)	114.49 – 192.94	146.20 $\pm$ 21.57
Fat (gram)	84.81 – 142.92	108.30 $\pm$ 15.98
Vitamin C (mg)	200 – 200	200 $\pm$ 0
Calcium (mg)	800 – 1200	983.33 $\pm$ 130.77

Min: Minimum Max: Maximum

SD: Standard Deviation

Table 3. Energy and Nutrient Fulfillment from Dormitory Menu

	Energy (kcal)	Carbohydrate (g)	Protein (g)	Fat (g)	Vitamin C (mg)	Calcium (mg)
Average nutritional value of the menu	3727.90	563.70	139.93	101.67	144.33	712.50
Average nutritional requirement	4465.31	669.80	167.45	124.04	200.00	983.33
% Fulfillment (nutritional value / requirement x 100%)	83.49%	84.16%	83.57%	81.97%	72.17%	72.46%

to adolescent age group (Table 1).

Subjects had a training schedule of 2 times per day in the morning and afternoon for 5 days a week. Nutritional requirement of the subjects are depicted in Table 2.

#### Food Service in Athlete's Dormitory

Athlete's Dormitory Jatidiri is under the management of the Office of Youth and Sports (*Dinpora*) of Central Java Province. This facility accommodates athletes who are members of *PPLP*, funded through national budget (*APBN*), and *PPLPD* or local *PPLP*, funded through local budget (*APBD*). The food service at Athlete's Dormitory Jatidiri is organized by a catering which has been appointed by Central Java Dinpora, through auction process which is held per year. The dormitory menu uses a 10-day menu cycle with the calculation of athlete's nutritional need and standard weight of the foods, done by the dietitian of Dinpora. It contains 2500 - 4000 kcal per day in accordance with the calculation of the average needs of each sport. Meals are served in a buffet dining room for 3 main meals and 3 extra meals or snacks in the morning, afternoon and evening respectively. To ensure the food service process runs well, a committee of Dinpora conducts monitoring activity in dormitories every 2-3 days. The catering and Dinpora meet every 2-3 months to discuss the possibility of menu replacement in order to avoid consumer getting bored. Nutritional content of dormitory menu served during the study (menu cycle 2, 3, and 4) is shown in Table 3.

Table 3 shows that the energy, carbohydrate, protein, and fat content of food served had fulfilled 80% of subjects' average needs, except for

vitamin C and calcium. This indicates a chance for improvement in terms of provision of a diverse menu, especially for vegetables and fruit as a source of vitamin C and minerals. In an effort to provide food sources of calcium, the catering has in fact been serving an extra food in the morning in forms of milk, soybean, and mung bean drinks.

#### Perception on Dormitory Food

As shown in Figure 1, majority of the subjects had poor perception on the dormitory menu.

Two-thirds (66.7%) of the subjects had poorly perceived the appearance and taste of the dormitory food. From the evaluation on menu aspects in the questionnaire, it was known that only half (50%) of the subjects agreed that the food served has various or interesting color and the temperature was suitable according to the type of food (e.g. rice and side dishes should have served in hot temperature). Marcus (2013) states the presentation of food with an interesting color shows the quality of the food, including levels of freshness and also texture of the dish. Side dishes and vegetables served on a buffet basis in the dormitory, also without food warmers might cause someone who arrive towards the end of dining hours, would get a side dish and vegetables that are not warm.

A total of 87.5% of subjects had poor overall perception on the menu provided by the dormitory. This result concurs with the study among adolescent athletes at DKI Jakarta *PPLP* (Swamilaksita et al., 2018) which indicated that more than half of the athletes regarded 3 out of 7-days menu provided in the dormitory as not meeting their preferences. There was also a possibility that after consuming foods in the dining room for some time, they were considered to be ordi-

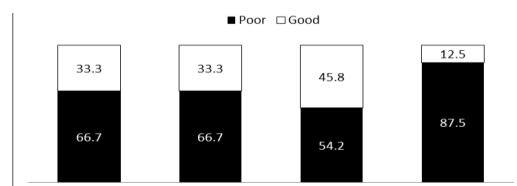


Figure 1. Athlete's Perception on Dormitory Food



Table 4. Intake Level From Dormitory Food

Intake level	n	%
Energy		
Deficit	24	100
Carbohydrate		
Deficit	24	100
Protein		
Deficit	24	100
Fat		
Deficit	21	87.5
Normal	3	12.5
Vitamin C		
Deficit	18	75
Normal	3	12.5
Above nutritional need	3	12.5
Calcium		
Deficit	23	95.8
Above nutritional need	1	4.2

nary hence a decline in the subjects' perception. In addition, the requirement to maintain weight in combat sports athlete may establish subjects' eating habits to limit the food consumed and then choose foods that have the best appearance also taste among the various options available. Franchini et al. (2012) stated that a high proportion of wrestlers are fairly apprehensive, about their body mass and food intake which lead to frequent dieting or caloric restriction.

#### Energy and Nutrient Intake

Table 4 shows that the intake level of energy, carbohydrates, and protein for all subjects were deficit which means dormitory intake fulfilled less than 90% of their individual nutritional needs.

The study was carried out ahead of competition period for all sports. Majority of the subjects at that time claimed to be reducing their food intake. Athletes in martial sports try to lower or maintain their weight, under the category that is considered normal or optimal for them to gain advantage against smaller opponents (Kazemi et al., 2011). In this study, most athletes who were undergoing weight reduction, reduced consumption of rice. Instead, they preferred to increase

the intake of side dishes and milk. This resulted in low energy and carbohydrate consumption, but increased consumption of fats also protein, because the sides dishes were mostly processed using oil. Burke & Cox (2012) made some nutrition recommendations for combat athletes and coaches including to receive information pertaining to caloric balance as well as how to prepare each food portion. Food using low fat ingredients and snacks with low caloric content using fruits also vegetables.

Levels of vitamin C intake of most subjects fell into the deficit category while almost all subjects had a deficit calcium intake level. On a calorie-restricted diet, several vitamins (B vitamins, vitamin C, vitamin D) and minerals (iron, calcium, magnesium, and zinc) are the most expected to be low (Gardner et al., 2010). In general, the consumption of fruits, vegetables and milk in the diet of athletes in this study was considerably low. To increase the intake of fruits and vegetables, it is recommended to add the portion and variations of vegetables also fruits. The added portion of fruit and vegetables served has proved to increase the consumption of fruits and vegetables among subjects (Mathias et al., 2012;

Table 5. Energy and Nutrient Intake from Dormitory Food and Outside Dormitory

Nutrient	Intake level from dormitory (%)	Intake level outside dormitory (%)
Energy <sup>1</sup>	34.68±16.30	24.60±13.62
Carbohydrate <sup>1</sup>	27.11±13.14	21.75±12.31
Protein <sup>1</sup>	38.71±18.94	19.73±12.53
Fat <sup>1</sup>	51.56±28.15	35.35±21.65
Vitamin C <sup>2</sup>	26.84 (1.60-253.58)	4.82 (0.00-46.41)
Calcium <sup>2</sup>	27.33 (2.74-168.85)	16.61 (0.54-68.66)

<sup>1</sup> Data was presented in mean ± standard deviation

<sup>2</sup> Data was presented in median (minimum – maximum)

Table 6. Correlation between Perception on Dormitory Menu and Food Intake From Dormitory and Outside Dormitory

Nutrient Intake	Dormitory Food		Outside Dormitory	
	p	r	p	R
Energy <sup>1</sup>	0,258	0,240	0,045*	-0,413
Carbohydrate <sup>1</sup>	0,058	0,397	0,151	-0,302
Protein <sup>1</sup>	0,974	0,007	0,008*	-0,526
Fat <sup>1</sup>	0,637	0,101	0,013*	-0,499
Vitamin C <sup>2</sup>	0.908	-0.025	0.415	-0.174
Calcium <sup>2</sup>	0.098	0.346	0.211	-0.265

<sup>1</sup>Pearson Correlation test <sup>2</sup>Spearman Correlation test

\*significant (p&lt;0.05)

Miller et al., 2015).

Apart from dormitory food, athletes also consume food from outside the dorm especially on the weekend that contributed to their daily intake of energy and nutrients (Table 5.).

As seen in Table 5, intake from outside the dormitory had contributed to fulfillment of daily needs of the subject, especially for fat intake. In this study, one reason for the high level of intake from outside the dorms, was because athletes sometimes miss the meal time in dormitory due to long training hours and short dining service hours. This often happens mostly during breakfast and dinner hours, in which athletes had to look for food from outside the dormitory. After morning training, athletes usually do not have time for breakfast because they have to leave for school. They sometimes undergo evening exercises as well, and by the time the night roll call is over, dinner time has already ended.

It was observed however that total intake of meals provided by dormitories and outside dormitories has not met 80% of the athlete's needs in a day. The athlete's habit of consuming food that does not meet the nutritional needs of the macro-nutrients, can lead to weight loss and muscle mass as well as increase the susceptibility to disease. Weight-class sports including wrestling, boxing, and judo have relatively high energy demands during both training and competitions. It is also depend on on both aerobic and anaerobic energy metabolism. Reduced stimulus for muscle growth together with negative energy balance, is likely to cause a reduction in lean body mass and may therefore impair strength also performance (Franchini et al., 2012; Nurdini & Probosari, 2017).

#### Correlation between Perception on Dormitory Menu and Athlete's Food Intake

Results of correlation tests (Table 6.) indicated that perception on dormitory menu was not significantly correlated with the level of energy and nutrients intake from dorm food (p>0.05). However, perception on dormitory menu had a

significant relationship with the average level of energy, protein, and fat intake; from food outside the dormitory with a negative correlation coefficient. This indicated that the smaller of perception score of the subject, the higher the average intake level of energy, protein and fat subject from outside the dorm. This finding corresponded with results of previous studies which showed no relationship between assessment of menu quality with energy intake and protein intake of subjects residing in a dormitory (Murbawani & Pertiwi, 2012; Franchini et al., 2012; Yustika, 2018).

Carbohydrate and calcium intake of the subjects, both from dorm food and outside dorm, were not influenced by subject perception on dorm food (p>0.05). This was plausible as it was observed that the subjects were found of snacks and drinks containing sugar and calcium. Although subjects consume portions of carbohydrates and calcium from dorm foods, from outside the dorm they also often buy and consume packaged beverages that have high sugar and calcium.

Mohalijah et al. (2014) suggested that food service organizers for athletes should pay attention to the sensory qualities of foods, in which flavors and other sensory traits greatly influence the food selection by athletes. Finding of this study supports, the idea in which athletes consider nutritional and fat content in the diet, was not the only important aspect that affects athlete's acceptance of the food provided. But, so are the variations of the menu and taste of the food.

Various studies have found that food variations increase one's intake. There is a phenomenon known as "variety effect" where increased in food intake occur when an individual is presented with many food choices also different sensory characteristics, such as flavor, aroma, texture, and visual appearance (Epstein et al., 2010). Sutyawan & Setiawan (2013) argued that there are two factors that affect menu acceptance. The first factor is the hedonic level for some food components, such as serving, vegetables, and desserts while the second factor is the temperature of the

food when it is first served. Which corresponded with finding of this study concerning poor temperature of the food served. Rohayati & Zainafree (2014) highlighted that the process of menu planning needs to be optimally carried out to produce output of an excellent school lunch program in elementary schools.

Majority of subjects in this study chose fruit pieces instead of fruit juice as source of vitamin C provided in dormitory menu. On the grounds that the fruit juice presented was less varied and not to their taste. Birkenhead & Slater (2015) claimed that taste is an important determinant in the selection of food at different ages and cultures. The smell, taste, texture, and appearance of food provide a sense of pleasure and enjoyment resulting in a rich also varied sensory sensation. Preferred food flavors have a direct effect on food consumption in children and adolescents which applied to subjects of this study.

On the other hand, there are numerous factors that may affect athlete's dietary intake. One of them is nutritional knowledge. Spronk et al. (2014) argued that most studies attest to a significant and positive relationship between nutritional knowledge and nutrient intake, especially for vegetable and fruit intake. Nutritionist from Dinpora stated that training regarding nutrition has often been held but only intended to coaches, so athletes are expected to gain knowledge on nutrition from their coaches. In addition, the relatively small sample size in this study ( $n < 30$ ) which was less than the minimum sample calculation and taken through purposive sampling may not represent athlete population in general who live in dormitories.

## CONCLUSION

In summary, perception on dormitory food was not significantly correlated with intake of energy, macro-nutrients, vitamin C, and calcium from dormitory food among athletes living in Athletes's Dormitory Jatidiri Semarang. Perception on dormitory food had significant relationship with intake of energy, protein and fat from food outside the dormitory, in which the poorer of athlete's perception on dormitory menu. The higher their intake of energy, protein and fat from outside the dorm.

In food service processes, the dormitory management and catering should consider inputs of athletes regarding dining hours and preferred food as well as to plan menu with better presentation, taste and variation, in order to increase the dormitory intake. Also, Dinpora is recommended to improve athletes' knowledge on nutrition. So

that, they pay more attention to their dietary intake.

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