



THE RELATIONSHIP OF ENERGY ADEQUACY WITH NUTRITIONAL STATUS OF FOOTBALL ATHLETES OF INDONESIAN FOOTBALL ASSOCIATION

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ABSTRACT

Background: Football is a sport that requires a high level of energy. The combination of training and adequate nutrition can make better sports performance. Nutritional status can determine the quality of an athlete while competing and reducing the risk of illness and injury. **Objective:** This study aimed to determine the relationship between energy adequacy levels and the nutritional status of PSIS athletes. **Methods:** This correlational descriptive used a cross-sectional design. Subjects were observed for a 2 months period. A total of 104 football athletes participated in this study. The instrument of this research includes food recall and physical activity checklist for 3 x 24 hours, digital scale, Skinfold Caliper-Thickness, and microtoise. Research variables include the level of energy adequacy, body mass index, and percent body fat. **Results:** The result showed that the energy adequacy level was 101 athletes (97.1%), normal nutritional status was 70 athletes (66.7%) and normal body fat percent was 71 (67.6%). The relationship between the level of energy adequacy and the percentage of body fat in PSIS athletes with a p-value of 0.56 (>0.05) and a correlation with an r-value of 19%. The level of energy adequacy has a significant relationship with the percentage of body fat. **Conclusion:** it is recommended that dietary habits should be planned to improve performance in sports fields.

Keywords: *Energy adequacy, Nutritional status, Football.*

INTRODUCTION

Football is one of the most popular sports in the world. This exciting sport is easy to play and does not require special skills.⁽¹⁾ Physiologically, football is highly dynamic game with its richness of body movement activities and different intensities. The game has duration of 2 x 45 minutes. During the game the athlete runs as much as 9-12 km, this is influenced by the position and intensity of the game.^(2, 3) Intensity of the game on average ranges from 70-75% of VO₂ max.^(1, 2, 4)

Physical condition of athletes is certainly a very important thing in the game of football. The athletes require practices to get maximum results where the activities demand sufficient energy. This activity requires adequate energy sources to support both during training and during matches. Athletes need to learn what food are good for energy and sometimes face extra challenges in maintaining proper nutrition. In general, athletes need appropriate energy intake to maintain energy reserves.^(5, 6)

Fulfilment of nutritional intake is fundamental for football athletes.⁽⁷⁾ Nutrition is essential to provide energy and optimize performance. Adequate energy intake is an important foundation for physical performance so

that fuel can be available for both short-term and long-term energy needs. Football uses the largest source of energy in the form of aerobic metabolic processing.⁽³⁾ The use of anaerobic energy also occurs during intermittent periods of high-intensity activity.^(5, 8, 9) Active game in soccer last for 90 minutes intermittently. The total energy required for 90 minutes of sports matches ranges from 1200-1500 kcal.⁽¹⁰⁾

Several factors influence the success of football athletes. In addition to the athlete's natural ability factor, energy intake and good training are also supporting factors.⁽⁶⁾ Nutritional factors are known to have the greatest influence on an athlete's performance.^(2, 11) Good nutrition can help optimize energy production, reduce the risk of injury and recovery after workout.^(6, 8, 12, 13)

Physical conditions and ideal body weight greatly support the stamina of football athletes. Information about daily energy expenditure is important because it can help determine the target daily energy needs. Good energy intake is not only important during training but also during competitions. It maintains the immune function and condition of the athlete's body in the future.⁽¹⁴⁾

Evaluation of nutritional status, the type of food eaten is very important for football athletes, it



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is useful to see the fulfilment of nutritional needs. Energy intake of football athletes can be obtained from the athlete's food records for 3-7 days. Football athletes should have knowledge about nutrition. Athletes need to be equipped with good nutritional knowledge, so they can develop good eating habits. This habit will provide physical health because energy needs can be met.^(2, 13)

Football is sport that requires a lot of energy. For this reason, one of the factors that need to be considered is the fulfilment of energy adequacy and the nutritional status of athletes. This requires the handling and development of various experts, one of which is an expert who handles athlete nutrition. The role of nutrition requires experts to take special care of the nutritional needs of the players.⁽¹⁰⁾

Football in Indonesia was officially established with the formation of the Indonesian football association (PSSI) in 1930. Despite being the first Asian country to appear in the world cup, until now the Indonesian national team PSSI has not succeeded in entering the world cup championship. The achievements of Indonesian football athletes are matter of concern. Indonesian football athletes have never entered the final round of international football. PSIS is an Indonesian football association based in Semarang, Central Java which is one of the oldest football leagues in Indonesia.

To date, no previous studies have assessed energy adequacy and nutritional status of football athletes in Indonesia and research in the world is still limited. Further, research related energy needs of football athletes, are limited. Previous studies indicate that nutritional intake and a balanced diet are associated with athletic success. Football athletes are often found to have a lower daily energy intake than energy consumption. This is because the total energy needed is not sufficient.

This study aims to determine the relationship between energy adequacy level and nutritional status of PSIS central java football athletes. The expected output is in the form of data or findings that can be used as a basis for providing knowledge about the benefits of nutrition in improving the physical performance of football athletes. In addition, the information generated in this study can be used in determining proper nutrition guidelines for athletes as a preventive effort

that can be done to increase energy adequacy and improve nutritional status so that it can support optimal physical activity for Indonesian football athletes.

METHODS

This research is correlational descriptive with a cross sectional design conducted on football athletes of Football Association Indonesia in Semarang (PSIS).

Participants

One hundred and 4 healthy male football athletes volunteered to participate in this study with an age range of 12-34 years. They had similar conditioning levels and expertise participating in 4 training sessions per week. All participants were informed about the risks and benefits of the study and gave their written informed consent prior to their involvement in this study.

Experimental design

Anthropometric measurements were taken in players on the first day. All subjects were tested at the same day. The nutritional status on the study subjects was determined using the Body Mass Index (BMI). Weight (kg) and height (cm) was measured using digital scales and microtoise.

The body fat measurements of the study subjects were used skin fold caliper thickness. Body fat examinations were carried out in 4 areas of the body, namely biceps, triceps, subscapular and suprailiac.

Primary data were obtained from interviews regarding the characteristic of athletes using a questionnaire instrument and food recall 3 x 24 hours. Daily food intake was recorded by football athletes on Tuesday, Thursday and Saturday (excluding match day).

Statistical analysis

Statistical analyses of the data, descriptive analyses of test measurement of football players were calculated as mean and standard deviation. The data were analysed using the Spearman Rank Correlation.

RESULTS



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The subjects of this study were male football athletes who joined Indonesian football association in Semarang.

Table 1. Energy adequacy level in football players

Energy adequacy	n	%
Deficit	0	0
Low	0	0
Middle	101	97,1%
High	3	2,9%
Total	104	100

Based on the table 1, it can be seen that the energy adequacy level of PSIS soccer athletes is fulfilled through the portion of food consumed by athletes every day. In this case, it can be seen from the energy adequacy standard of PSIS football athletes which are included in the sufficient category. This is very supportive in the maximum ability in participating in training and matches.

Table 2. Nutritional status

BMI	n	%
Overweight	9	8.6%
Normal	70	66.7%
Underweight	25	23,8%
Total	104	100

Based on the results of the data that has been obtained, it can be seen that the energy adequacy level of PSIS athletes is fulfilled through the portion of food consumed by athletes every day. In this case, it can be seen from the energy adequacy standard of PSIS football athletes which are included in the sufficient category. This is very supportive in the maximum ability in participating in training and matches.

Table 3. Nutritional status based on Body fat percentage

Fat percentage	n	%
Overweight	17	17,2%
Normal	71	67,6%
Underweight	16	15,2%
Total	104	100%

Table 3 shows the nutritional status of PSIS athletes is divided into 3 categories based on BMI, namely the majority of them have adequate nutritional status, the rest are overweight (excess). Based on table 3 the percentage of body fat is

divided into 3 categories, namely the majority of normal status, the rest is excess.

Table 4. Correlation between energy adequacy levels with BMI and percent body fat.

Variable	p	Correlation
Energy adequacy level with BMI	0,387	86%
Energy adequacy level to fat percentage	0,56	19%

The research correlation test analysis stated that there is no significant relationship between the level of energy adequacy and nutritional status based on BMI ($p=0.387$) but had strong correlation strength ($r=86\%$). This is not in line with previous research which states that there is a relationship between energy adequacy and nutritional status.⁽¹⁵⁾ In this study BMI results are mostly normal. Maintenance of body weight is an indication of being in a state of energy balance where energy intake equals energy expenditure.⁽¹⁶⁾

The result showed energy adequacy level is not related to body fat percentage of football athletes. The results of the relationship test analysis stated that there is no significant relationship between the level of energy adequacy and the percentage of fat ($p=0.56$) and had a weak correlation strength ($r=19\%$). The results of this study are in line with previous research in Semarang which stated that there is no relationship of energy consumption level with body fat percentage with $p=0.528$ ($p>0.05$).⁽¹⁷⁾

DISCUSSION

Football athletes can maintain health, achieve ideal body composition and accomplish their performance goals by adopting good dietary habits. It is important to analyze nutritional status and their dietary habits. Energy intake is simple to measure but there are only limited number of studies on the energy intake of athletes has been attempted. Dietary habit is changing with time especially in sport because of specific nutritional strategies.

There is currently no gold standard for measuring energy intake, by far the most common dietary assessment method that is applied in sport nutrition research is the food recall. This study was aimed to probe whether any relationship between energy adequacy levels and the nutritional status of PSIS athletes. The results obtained from this study,



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most of athletes have moderate energy adequacy level, normal nutritional status and less body fat percentage. In other words, athletes diet intake and adequate energy intake must be supported by energy needs according to high activity carried out daily for good physical condition.⁽¹⁸⁾

CONCLUSION

Within the limits and limitations of the study, it is concluded that there was significant relationship between energy sufficiency level and fat percentage of football athlete in PSIS. Energy sufficiency level is not significantly related to football athlete's BMI in PSIS. Future research should consider improving the accuracy of self-reporting techniques in athlete and encouraging to record all food on daily basis. Therefore, it is recommended that dietary habit should be planned to improve the performance in sport fields. We also recommend that nutritional knowledge within the Indonesian football athletes in order to improve nutritional goals and performance outcomes.

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ETHICAL APPROVAL

This research was approved by the Clinical Research Ethical Committee of Universitas Diponegoro No.297/EC/KEPK/FK-Undip/VIII/2021.

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CONFLICT OF INTEREST

The authors declare that there is no conflicts of interest regarding this study.

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