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Correlation of Muscle Mass and Fat with Leg Power of 16 Senior Highschool Basketball Athlete

Original Article

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Abstract
Basketball coach must learn the effective way to train their athlete to reach winning in the competition, but in the school section there's much club that only train the technique and physique without knowing the effective way to reach the optimal condition of every player. Example is when the basketball player has tall and thin body, maybe he can jump high, but what if the trainer knows about the correlation of muscle mass and jump, he can jump higher. The goal is train with knowledge of composition, can make optimal condition of player that getting higher chance to competition. The club can do body composition test for getting information about body composition of every player and vertical jump test to getting information about power that player make in current body condition.

Keywords: *muscle, fat, power, body composition, vertical jump*

INTRODUCTION

The research delves into the intricate interplay between muscle mass, fat composition, and lower limb power in basketball athletes, particularly at SMA N 16 Jakarta Barat. Motivated by the observed decline in performance at the Beltrus Club, the study aims to bridge the gap between idealized and actual physical conditions, offering insights into tailored training strategies for enhanced individual and team performance. The research introduces innovative elements, including a holistic analysis of the interconnectedness of muscle mass, fat, and power. Unlike conventional studies, it extends its focus beyond team analysis, striving to provide practical contributions at the individual level (1).

The research also holds promise for revolutionizing training strategies, offering valuable insights for team management and recruitment decisions. The primary goal is to explore and comprehend the relationships between muscle mass, fat, and lower limb power. Specific objectives include assessing the individual impacts of muscle mass and fat on lower limb power and examining their combined influence (2,3).

Formulated hypotheses posit a positive correlation between muscle mass and lower limb power, a negative relationship between fat and power, and an overall combined effect of muscle mass and fat on lower limb power. The study builds on a robust conceptual framework integrating principles of muscle contraction, metabolic processes, and biomechanics. Drawing on contemporary literature, it establishes a foundation to explore the nuanced relationships within the triad of muscle mass, fat, and power.

The review highlights key insights, emphasizing the role of muscles in power generation, the impact of body fat on physical activity, and the synergy of strength and speed in defining power (4). It also underscores the relevance of advanced body composition measurement tools in understanding athlete conditions. This research holds significance in addressing the decline in basketball performance and contributes a more comprehensive understanding of physical factors influencing power. The findings aim to inform targeted training strategies, thereby enhancing individual athlete development and overall team performance at SMA N 16 Jakarta Barat.

By weaving together innovative approaches, clear objectives, and a comprehensive conceptual framework, this research endeavours to unravel the complexities of body composition and power in basketball athletes. It aspires to be a beacon in the field, guiding future strategies for athlete development, training, and team management.

MATERIAL AND METHODS

The subjects in this study are male students from Jakarta 16 Senior Highschool that train on the basketball club at least 3 months. The experiment condition has a clear, not too hot, or cold. The time of measurement is at 16.30 – 17.30 local time.

The instrument that used in this experiment for measuring body composition is Omron Body Impedance Analyzer (HBF 375). Measuring the body composition of every sample and write the result. The measurement results (muscle mass total, fat total) are used for this experiment (7).

The measurement of vertical jump by using the conventional methods from TKSI Kemdikbud (3 meters height wall, paint, and measuring device for measuring jump height). Subjects were advised to have a warming up before vertical jump. Subjects with standing position with one arm raise and the position of the body perpendicular from the wall and measure standing position from the highest part of the body and lowest part of the body. Record the result after that in centimetres. After measuring standing position, sample can start to do vertical jump, the first position is stand up straight, doing vertical jump, tap the wall and repeat for 2 times. Record the highest trail from paint (5,6).

RESULTS

The fat distribution, the muscle mass distribution, and the leg power (vertical jump) distribution can be seen in figure 1, figure 2, and figure 3. More than quarter (26,70%) of the total subject having low fat, which is good, 53,30% are classified into average categories, and 20% of subjects having high fat. Only 20% of subjects having low muscle mass, and this number is the same with the subjects who has high muscle mass, and the remaining 60% of subjects having average muscle mass. Eighty-seven percent of subjects having average leg power, and only 6,7% of subjects having good, very good respectively.

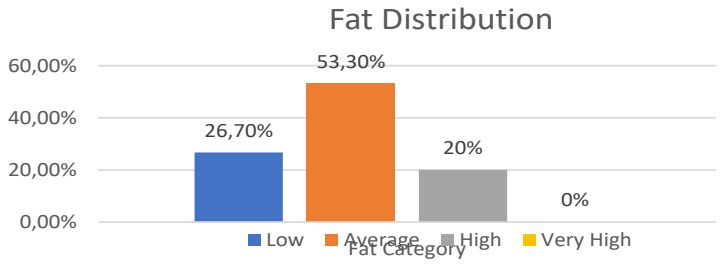

Figure 1. Fat Distribution Histogram

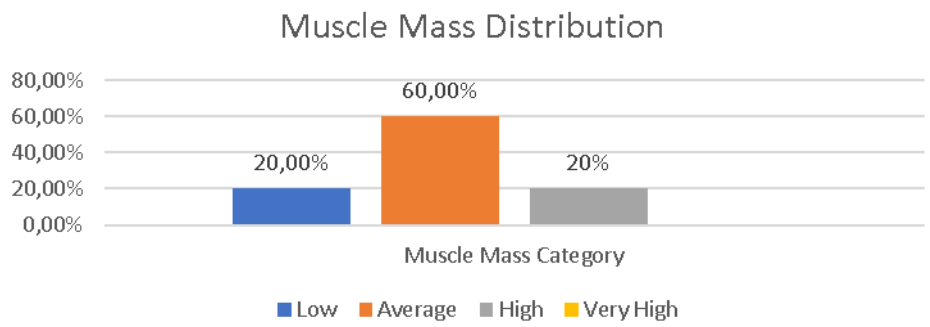

Figure 2. Muscle Mass Distribution Histogram

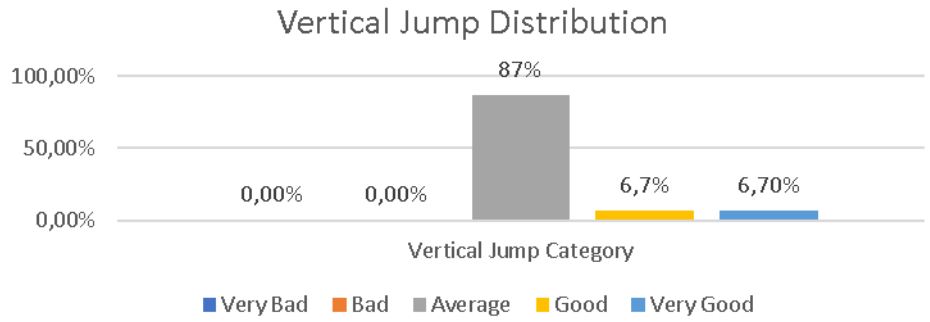

Figure 3. Vertical Jump Distribution Histogram

The correlation of muscle mass and fat with leg power have significancy and non-significancy result according to p value but the R value which is the correlation score have excellent score is above 8. The significancy result is when muscle mass only with power without fat into it (Table 1). Fat only with power have significancy result with multiple R score is >0,5 (Table 2). Muscle mass and fat with power have two results according to p value but the R value that mean correlational score is above 8 that means have excellent correlations from muscle mass and fat with power (Table 3).

Tabel 1. Muscle Mass with Power Result Table

Experiment Result, Muscle Mass with Power	Description
Multiple R	0,851
Adjusted R Square	0,703
F Significance	0,0000567
Intercept	-28,941
Muscle Mass Coefficient	2,202
T Count	5,851
T Table	2,160
P Value	0,0000567

Tabel 2. Fat With Power Result Table

Experiment Result Fat with Power	Description
Multiple R	0,793
Adjusted R Square	0,600
F Significance	0,000418
Intercept	68,413
Fat Coefficient	-1,128
T Count	-4,695
T Table	2,160
P Value	0,000418

Tabel 3. Muscle Mass and Fat with Power Result Table

Experiment Result Muscle Mass and Fat with Power	Description
Multiple R	0,865
Adjusted R Square	0,707
F Significance	0,000250
Intercept	-105,863
Muscle Mass Coefficient	3,912
Fat Coefficient	0,966
Muscle Mass T Count	2,394
Fat T Count	1,075
T Table	2,65
Muscle Mass P Value	0,0338
Fat P Value	0,303

DISCUSSION

The result of current study is in line with another research with same focus (we take it as a confirmation). The large number of active muscles will produce large muscle strength, and low-fat content has significant influence on smash ability in badminton (8, 9, 10). However, the research showed that muscle strength increases after being given push – up training, which shows that the muscle must be trained to produce good smash ability, this show there is similarity in the influence of high or low muscle mass and high or low-fat content on the power that will be produced.

CONCLUSION

The muscle and fat can affect power but as big the muscle can bring weight of the body. More training in specific part can make more power.

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CONFLICTS OF INTEREST

Conflict of interest : Authors state no conflict of interest.

Disclosure statement : No author has any financial interest or received any financial benefit from this research.

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