The relationship of Fatty mass to the rate of energy consumption and fat burning during physical effort for men

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Abstract:

This study aimed to identify the relationship of fat mass on rate of energy consumption and fat burning during physical effort for men by identifying the fat mass of The research sample by measuring body composition by a Body composition analyzer apparatus and to identify energy consumption and fat burning during physical effort by measuring use apparatus (ERGOSPIROMETRY ZAN 680), and test application (Polk and others) on the apparatus. Research used the descriptive method and the sample was selected among graduates of the faculty of physical education –mansoura university-Egypt and partitioners of physical activities (n=14) classified in two groups the first fat percentage 3-5% of weight and the second fat percentage >5% of weight. were analyzed the data statistically using the statistical program spss and calculate the averages, the average level, the total level, the value of Mann Whitney test and the pearson correlation significance. the results showed that no significant differences statistically significant between the two groups in most measures of research variables. The study recommended further studies on the communities different sports and larger samples in terms of number, and the need to make these measurements at the players different sports clubs.

Key word: fatty mass- Energy consumption- physical effort-Fat burning

Problem of research :

Idea of description bodies Preoccupied minds of scientists since ancient times, and everyone tries to find a better classifications that can description bodies, these classifications was depend mainly on components body, particularly muscle tissue and fat tissue, and divided the types of bodies accordingly to three types known (Ectomorphy- Mesomorphy - Endomorphy) also adopted the lists height and body weight in the description bodies and judgment on the degree of fitness and public health (Abdel Fattah & Sayed 2003) (2.(
However, the observed that the way body types or lists height and weight do not give real data about the nature of bodies in terms of the degree of obesity or thinness or muscle objectively, and by identifying body composition and estimate the proportion of components to each other can get real data that represent the physical fitness and health.

*The body composition considered among the basic components of fitness (Kamash & Saad 2011)(18.(
The configuration bodily includes body composition of fat, muscles, bones, fluids, minerals and other. Usually divided body composition to fat mass and other non-fatty include muscle, bone minerals, the connective tissues and cartilage. the body composition of human has significant effect on his health and physical performance (Hazza 2012) (14.(
Body usually consists of several different tissues mostly tissue bone, muscle and fat constitutes different body systems, and as the bone tissue is persistence almost under the effect of training, most of the focus is on muscle and fatty tissue because of their affected (increase or decrease) by human movement and activity. has been agreed that the body composition usually includes two basic components body fat, body mass without fat(Abdel

Fattah & Sayed 1994) (3.(
The fatty tissue of the body is considered a component of the basic body which constitute a percentage of body weight varies depending on age, sex, nutrition and the range of motion and activity, and the body has about 30 billion cell fatty and they provide the body by high energy as per gram of fat burning and generates 9 calories (Abdel Aal, 2000) (1.(
The fat used as one of the major energy sources and stores them body greater carbohydrates. stocks of carbohydrates in the liver and skeletal muscles valuable limits 2000 calories of energy while stocks fat overrides 70,000 calories of energy stored, energy consumption during physical effort varies depending on the size and type of effort and determined percentage consumption rate of oxygen consumption in a certain unit of time (Salama, 2000) (31.(
Measure body fat has become widespread in recent times, as you are rushing sports organizations of the colleges of physical education, fitness centers and health and others to use modern scientific methods to measure different body fat (Rushdie, 1997) (28.(
According (Salama, 1999) (30) to know the rate of fatty acid oxidation can be measured by the spread of glycerol in the blood, where it appears glycerol as a by-product of the burning fat process, immediately after the spread in the blood can not be re-installed again. This is because muscle tissue does not have a lot of it, but can be measured by some laboratory tests that measure the rate outside the boundaries of cells and through this process can be identified the rate of concentration.
Physical composition measurements is a important determinants of the motor performance and basic indicators which related to health and fitness level (Hencken, 2004, Lohman et al,2009, reilly et al, 2000) (15) (19) (27. (
Physical activity is defined as any bodily movement produced by skeletal muscle that result in increased energy expenditure (Ramiz,2012) (26.(
Percentage of fat is defined as the total amount of fat in the body based on the total weight of the body (Radwan, 1997) (24.(
Body composition defined as study the basic components that make up the human body (bones - muscles - fat) and the effect of environmental variables on this installation (physical effort, nutrition, ... etc.). (Heshmat, H and Shelby, N 2003) (16(
Technological advances over the past decade have provided software that can present detailed information not only regarding fat mass and percentage but also regarding estimates of fat free mass, muscle mass, total body water and bone mass device Body composition analyzer (TANITA),also provided software that can present detailed information for rat of energy consumption and fat burning during physical effort, device (ERGOSPIROMETRY ZAN 680.(
The researcher believes that the measurements body composition were still one of the most important research topics relating to area sports and develop ways to measure the most important priorities of researchers in the field of sports for that researcher wanted to take advantage of the devices of modern scientific and that helps to show accurate data and this is why the researcher conduct this study.

Literature Review
Many researchers and specialists in the field of sports have many studies linking physical activity and body composition and these studies concluded to many results.
.The main results of (Al maslamy, 2006) (6) study which entitled health culture and its relationship to the physical composition among secondary schoolgirls in Sharkeya Governorate stated that presence a correlation statistically significant between the percentage of fat and hubs health culture (Personal Health - Nutrition - first aid - Sports and Health) and the presence of correlation statistically significant between the weight of the fat, and body

weight without fat and all of a pivotal sports nutrition and health.

The results of(fawzi 2005) (12) which entitled The relationship between the body composition and some indications of health and level record to 800 meters rannar showed that presence of statistically significant differences between the body composition and measurements level record, as well as a statistically significant relationship between the body composition and some indications of health such as vital capacity and maximum oxygen consumption to 800 meters runners

Study (Alamin, 2011) (5). entitled effect training program and diet on some variables metabolism and body composition of the tennis players, The main results show that the proposed training program food a positive effect in body composition variables for tennis players and of the deficiency of (weight - the weight of fat - fat trunk area - BMI) and increased muscle weight and calories resulting from the effort exerted

Study of (Danielle R. et al 2017) (10) which entitled Association Between Muscle Mass, Leg Strength, and Fat Mass With Physical Function in Older Adults: Influence of Age and Sex The,. Results: A single relevant pattern emerged that included leg strength and fat mass as predictors of the 7 physical function variables. The leg strength loading was significantly greater than the fat mass loading in men and women aged 55-64 and ≥75, and differed between sexes .

Study of (Ulivieri et al 2005) (35) which entitled High-intensity exercise in female athletes: effects on bone mass and body composition, indicated that Presence Significantly higher femoral and total body bone masses were found in active women compared to sedentary women. A significantly lower calcium intake was registered in active women. Oral contraceptive use appeared to significantly increase femoral bone density. Physical activity increased bone mass in young active women, and this effect seemed to be superior to that of dietary calcium intake.

Study of (Fernando, G et al 2009) (13) which entitled Body Mass Index Is Associated with Increased Creatinine Clearance by a Mechanism Independent of Body Fat Distribution the main Results: Creatinine clearance was positively correlated with BMI (r_0.429; P_0.001), fasting glucose (r_0.198; P_0.001), and insulin levels (r_0.125; P_0.042), as well as IAF (r_0.239; P_0.001), SCF (r_0.281; P_0.001), and lean thigh (r_0.353; P_0.001) areas. The association between creatinine clearance and BMI remained significant after adjustments for IAF, SCF areas, and fasting insulin levels (r _ 0.337; P _ 0.001); whereas IAF and SCF areas were not independently associated with creatinine clearance after adjusting for BMI. Creatinine clearance increased with increasing BMI after adjustingfor fasting insulin, fasting glucose, IAF and SCF areas in subjects with normal glucose tolerance (r _0.432; P _ 0.001) and impaired glucose metabolism.

Aim of Research :

•Identify fat mass of body composition in a sample search

•Identifying the relationship between fat mass and the rate of energy consumption and fat burning during physical effort in a sample search

Questions of Research:

•What is the amount of fat mass in a sample search؟

•What is the relationship between fat mass and the rate of energy consumption and fat burning during physical effort in a sample search؟

Procedures of Research:

Method: Researcher used the descriptive method.

Sample: sample was selected among graduates of the faculty of physical education – mansoura university-Egypt and partitioners of physical activities (n=14) classified in two groups the first group fat percentage 3-5 % of weight (N=7), and the second group fat percentage > 5% of weight (N=7.(

Measure the variables:

The researcher used the Polk and others test (Bullock et al) Citing (Radwan, 1998) (25) was applied on apparatus (ERGOSPIROMETRY ZAN 680) to measure energy consumption and fat burning during physical effort and the test as follows:

.١The type of pregnancy: ongoing pregnancy.
.٢The case of the laboratory: trained player.
.٣Warm-up: walking or running for 5 min before the performance.
.٤Start: Physical load (speed at 5.8 miles/ hour for 3 min, degree of miles 0%.(
.٥Test time: 13 min connected
.٦Speed: start of 5.8 miles / hour and continue until well as stress.
.٧Degree miles of apparatus: it starts by zero % for 3 min, then increase by 2.5% every 2min.

Measurements conducted in laboratory of Sports Physiology, Faculty of Physical Education - Mansoura University, Egypt.

Measurements conducted in the period from
.٢٠١٩/٣/٣-٢

Analysis: Statistical analysis was performed using the SPSS package for Windows, version 17.0 The statistical significance of variables between the two groups was evaluated by an non parametric tests 2 related sample (mann- whitney) The relationship among variables was evaluated by Pearson's correlation coefficient test.

Results:

Table (1): Descriptive characteristics (mean ± sd) of Group 1 (n = 7) and Group 2 (n = 7) subjects.

	Age (year)	Height (cm)	Weight	Fat mass (kg)	FAT%
Group 1	٥,٧ ± ٢٧,٤	١٠,٠٧ ± ١٨٢,٥	٤,٣٦ ± ٧٠,٢٧	٠,٥٢ ± ٣,٤٥	٠,٧٠ ± ٤,٤٥
Group 2	٦,٦ ± ٢٦,٨	٩,٧٦ ± ١٧٩,٨	٦,٨٦ ± ٨١,٩٨	٣,٧ ± ١١,٤	٣,٦٨ ± ١٢,٨٦

Figure (1): Shows the mean of the two groups in the variables fat mass and fat%

Table (2): The significant differences between groups in variables.

Variable	Stage of p.effort	M. Unit	number		Mean		Mean Rank	Sum of rank	Z	p. value
			G1	G2	G1	G2	G1	G2				
Fat mass	-------	Kg	٧	٧	٣,٤٥	١١,٤	٣,٥	٩,٥	٢١	٥٧	-٢,٨٦٣	*٠,٠٠٣
Fat %	-------	%	٧	٧	٤,٤٥	١٢,٨٦	٣,٥	٩,٥	٢١	٥٧	-٢,٨٦٣	*٠,٠٠٣
Energy consumption	Recovery	Kcal/h	٧	٧	٦١٣,٨	٧٧٤,٥	٥,٨٣	٧,١٧	٣٥	٤٣	-٠,٦٤١	٠,٥٢٢
	Basic 1 Endurance	Kcal/h	٧	٧	٨٥٥,٣	١٠٧٤,٢	٥,٧٥	٧,٢٥	٣٤,٥	٤٣,٥	-٠,٧٢٢	٠,٤٧٠
	Basic 2 Endurance	Kcal/h	٧	٧	٨٧٥,٣	١١٦٩	٤,٧٥	٨,٢٥	٢٨,٥	٤٩,٥	-١,٦٨٧	٠,٠٩٢
	Develop Range	Kcal/h	٧	٧	٨٨٧,٦	١١٧٣	٨٥,٣٣	٧,٦٧	٣٢	٤٦	-١,١٢١	٠,٢٦٢
	Top Range	Kcal/h	٧	٧	٩٤٥	١٢٠٨,٨٥	٨	٣٠	٤٨		-١,٤٤١	٠,١٥٠
Fat burning	Recovery	Kcal/24h	٧	٧	٥٠٣,٣	٦٠٣,٢	٥,٦٧	٧,٣٣	٣٤	٤٤	-٠,٨٠١	٠,٤٢٣

Basic Endurance 1	Kcal/24h	٧	٧	٥١٩,٢	٦٠٨,٦٧٥,٥	٧,٥	٣٣	٤٥ -٠,٩٦١ ٠,٣٣٧
Basic Endurance 2	Kcal/24h	٧	٧	٥٥٨	٦٧٦,٨	٥,٥	٧,٥	٣٣ ٤٥ -٠,٩٦١ ٠,٣٣٧
Develop Range	Kcal/24h	٧	٧	٥٨٠,٨	٧٢٣,٦	٤,٦٧	٨,٣٣	٢٨ ٥٠ -١,٧٦١ ٠,٠٧٨
Top Range	Kcal/24h	٧	٧	٥٨٦,٣	٧٥٨,٨	٥,١٧	٧,٨٣	٣١ ٤٧ -١,٢٨١ ٠,٢٠٠

Abbreviations: p. effort, physical effort; Develop Range, Development Range; M. unit, measurement unit (z) value / 0.05 = ± 1.96

Figure (2): Shows the mean of the two groups in the variables of Energy consumption during physical effort stages. Figure (3): Shows the mean of the two groups in the variables of fat burning during physical effort stages.

Table (3): correlation between fat mass and energy consumption during stages of physical effort.

	Recovery	Basic Endurance 1	Basic Endurance 2	Development Range	Top Range
Fat mass (G1)	-٠,٠٠٨	٠,١٧٥	٠,٣٤٢	٠,٤٣٢	٠,٦٦٢
Fat mass (G2)	-٠,٢٠٥	٠,٤٤١	٠,٥٥١	٠,٦٩١	٠,٦٢٣

Table 4: correlation between fat mass and fat burning during stages of physical effort.

	Recovery	Basic Endurance 1	Basic Endurance 2	Development Range	Top Range
Fat mass (G1)	-٠,٣١٢	٠,١٤٨-	٠,٢٧٦-	٠,٢٢٦-	٠,١١٤-
Fat mass (G2)	-٠,٢٦٢	٠,٣٩٦-	٠,٠٨٢-	٠,٢٤١-	٠,١٧٩-

Table (1) shows that the average of fat mass for first Group of sample amounted to 3.35 kg which represents 4.45% of body weight, while the average of fat mass for the second Group of sample amounted to 11.4 kg which represents 12.86% of body weight.

According to (Louise, B ; Greg, C 2010) (21) We require a certain minimum level of body fat to remain healthy. For men this is approximately 3–5 per cent of body weight, and for women about 10–15 percent. Of course, most people carry considerably more body fat than this minimum. In terms of sports performance, extra body fat can improve flotation, provide insulation against the cold, and protect body organs from damage during contact sports. However, these benefits must be balanced against the increased effort required to move additional body weight. Being heavier increases the energy cost of movement. In particular.

the percentage of body fat is the amount of body fat stock relative to the total weight of the body and increase the rate of about 25% for men, 30% for women leads to severe damage (Fathi, Z. 2001) (11). Lack Percentage of fat about 3% of men, 12% of women also leads to severe damage (Elsaid, A. 2003) (32.(

And consists of free fatty acids (FFA) from the decomposition of fat as a result of digestive processes that take place in the gut, and that the purpose of producing a lot of energy oxidized during physical effort (Salama, B 1999) (30.(

)Salama, B 2002) (29) confirms that the deposition of fat in the cells start since early embryonic development and this process will continue along life and could increase the size of the fatty cell at any age from birth to death

evidenced by Table (2) and there were statistically significant differences between the first and second groups of variables fat mass and percentage of fat relative to body weight and the presence of non-statistically significant differences in other variables

The researcher attributed the presence of statistically significant differences between the two groups in the variables, fat weight and percentage of fat relative to body weight to the difference in the amount and size of fat cells in the body components sample of research and this is what makes the researcher classified the sample in to two groups on the basis of these ratios

It is clear also from Table (2) that the average rate of energy consumption and fat burning increases from one stage to another, Which indicates that the more physical effort increased energy consumption and fat burning. And the second group rate of energy consumption and fat burning more than the first group rates. This is consistent with what was said (Salama, B 1999) (30) that the rate of fat or burned blocks in muscle tissue increases with continued physical effort.

Also consistent with (lori,A ; Mary, B. 2016) (20) that During exercise, muscles use more energy than at rest. Yet, even at rest, muscle cells require more energy than fat cells do.

The process of organizing energy metabolism depend on the intensity and duration of physical load and increases by increase the intensity of physical load (Abdel-Fattah, A, 2003) (4.(

Physical activity increases energy expenditure and the contribution of fat oxidation to energy expenditure is most pronounced during low and moderately intense activities. Differences in duration, frequency and intensity of physical activities may create considerable variations in Total daily energy expenditure (Marleen A. van Baak 2000) (22.(

This study investigated the relationship between fat mass and energy consumption during stages of physical effort (Table 3) and found a negative relation ship in stage of recovery for two group and appositive relationship in stages Basic endurance 1,Basic endurance 2, Development Range and Top Range for two group, However this relationship was not significant and this consistent with the result of (Ramiz, 2012) (26) which found appositive relationship between energy intake and daily number of steps .

Also this study investigated the relationship between fat mass and fat burning during stages of physical effort and found a negative relationship in all stages of physical effort for two group. However, this relationship was not significant .

Several studies have investigated the relationship between physical activity and body composition a majority of these studies stressed that was a negative relationship between physical activity and body fat percentage (Ramiz, 2012; Amisola, 2003; Nooritajer, 2010) (26) (7) (23) Also There are several known correlates of impaired physical function, including body composition (Stuck et al., 1999) (33). Research examining the relationship between body composition and physical function has focused on two main body composition components—fat mass and muscle mass. A high fat mass has consistently been associated with impaired physical function (Bouchard, Beliaeff, Dionne, & Brochu, 2007; Sternfeld, Ngo, Satariano, & Tager, 2002) (9) (34). On the other hand, some studies have found that low muscle mass is a predictor of physical function (Baumgartner et al., 1998; Janssen, Heymsfield, & Ross, 2002) (8) (17). while others have reported no association (Bouchard et al., 2007; Visser et al., 1998, 2000) (9) (36) (37.(

Conclusions:

Through research objectives, the limits of the sample used, the procedures and the results of statistical analysis, the researcher reached the following conclusions:

.١The level of fat mass (sample) diversity between two groups the first less than 10% of body weight and the second greater than 10% of body weight .

.٢There are statistically significant differences between the two groups in the variables fat mass, fat mass ratio of the weight for the second Group, and the presence of non-statistically significant differences in the variables of energy consumption and fat burning for the second Group .

.٣Increasing the rate of energy consumption and fat burning with the continuation of physical effort .

Recommendations

Through statistical analysis and the resulting outcomes researcher recommended the following:

-١Dependence on the results of the current study, when conduct studies related.

-٢The need to conduct studies related to different sports activities.

-٣the need to conduct studies related and using different intensity physical loads.

-٤Necessity Interest with conduct body composition measurements for athletes practicing for sports activities and non-practicing individuals because of their importance for human health.

-٥Preparation register for players includes physical, physiological, body composition measurements and health status would be the basis for the construction of any programs for players.

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