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Building a model of the thigh muscles in terms of muscle size, testosterone ratio and the percentage of its contribution to level of strength for freestyle wrestlers

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Abstract

The aim of the study is to build a model of the thigh muscles in terms of muscle size, testosterone ratio and the percentage of its contribution to level of strength for freestyle wrestlers. The researchers used the descriptive method by designing two homogeneous groups (age, weight and height) and with one-time tests in order to build a model of the thigh muscles. Subject of the study was divided according to the thigh circumference, which included two groups, the first group had a thigh circumference of 60-65 cm, and the second group had a thigh circumference of 55-59 cm. The subject was chosen randomly from the study community, and they are the players of the Middle Euphrates clubs, with a number of (30) players, divided into two groups each group included (15) players. The variables were as follows: thigh muscle strength, testosterone percentage, and thigh circumference). The tests were conducted in one phases and during (Wednesday) corresponding to (15/3/2023) for the measurements and tests used in the study, and the statistical bag (SPSS) was used to perform the required statistical operations. The most important conclusion of the study is the presence of two types of circumference of the thigh muscles of the wrestling players, which are 60-65 and 55-59 cm, according to the subject that was dealt with and the researcher concluded that the thigh muscles with a circumference of 60-65cm are less productive of muscle strength compared to muscles with a circumference of 55-59cm.

Keywords: Thigh muscles, strength, testosterone, muscle size, freestyle, wrestlers.

1. Introduction:

Muscle strength is one of the most requires in the freestyle wrestling. Implementation wrestling activities need to different actions, such as push, lift, and pull, which causes different physiological requirements for the players in this sport. However, building a model of the thigh muscles for wrestling players is one of the important requirements that contribute to their success and reaching the higher levels and achieving sporting achievements, because the player who has perfect thigh muscles in terms of size and some physiological variables helps him to overcome the opponent (Horswill, 1992). For example, in standing wrestling, the load on the legs may be higher than the other muscles especially during the pushing movement, and the quadriceps and hamstring muscles can have strength differences between players (Daneshjoo *et al*., 2013).

Even though the positive correlation between muscles size and thigh muscles strength has been well established (Rosenberg, 1997, Abe *et al*., 2006), it is not clear whether higher muscle size necessarily translates into greater muscle strength or whether gains in muscle strength cannot be achieved without corresponding gains in muscle size. Some other studies showed that muscle performance is developed according to the muscles appearance, and it has been stated that the trained leg muscles have a higher possible. Moreover, the studies showed that muscle strength is connected with muscle composition and volume (Van der *et al*., 2018). These results were confirmed by Strasser *et al* (2013) who informed a significant correlation between anatomical cross-sectional area and muscle thickness (MT), and several additional studies have stated that muscle volume and muscle cross-sectional area make a valuable basis for predicting the exerting force and muscle strength (Abe *et al*., 2014). However, most of previous studies which observed the muscle morphology, had targeted

only a few muscles. In addition, studies on the correlation between the morphological appearances of the muscles and strength in wrestling have been insufficient. Physiological variables contribute in improving strength, for example, testosterone can increase strength and muscle hypertrophy (Maimoun *et al*., 2003). Thinner body size helps increases energy and control weight, previous studies around low testosterone for men, showed that treatment can increase strength and muscle size and decrease fat mass (Yoon 2002, Maimoun *et al*., 2003, Seyed *et al*., 2014). Some men reported an increase in muscle size but no in strength (Selma *et al*., 2007,). The aim of present study is to build a model of the thigh muscles in terms of muscle size, testosterone ratio and the percentage of its contribution to level of strength for freestyle wrestlers, and the importance of our study is to know the effect of muscle size on strength and the relationship between testosterone and muscle size and then the strength.

2. Materials and Methods:

The researchers used a descriptive method by designing the two homogeneous groups (age, weight and height) and using one-time tests in order to build a model of the thigh muscles.

2.1 Participates:

The study sample was chosen randomly from the research community, and they are the players of the Middle Euphrates clubs, with a number of (40) players, 10 players were excluded for a number of reasons, including their lack of conformity with the research specifications and failure to attend for the purpose of carrying out the required tests and measurements, and thus the number of the research sample who dealt with them is (30) players from different governorates of the Middle Euphrates, they were divided into two groups each group included (15) players and to ensure that the sample is suitable for the current study, homogenization was made for them with some morphological variables, as shown in the table (1).

Table (1) Shows the homogenization of participates

Variables	Measure unit	Mean	Stander Deviation	Mediator	Skewness
Length	Cm	174.53	1.04	175.00	-0.095-
Weight	Kg	74.93	1.25	75.00	-0.312-
Age	Year	25.33	0.95	25.00	0.261
Training age	Month	34.86	0.73	35.00	0.214

Table (1) shows the values of the arithmetic mean, standard deviations, median, and skewness coefficient values for the homogeneity of the participates. All skewness coefficient values were less than (-1 to +1), which indicates that the distribution was moderate and the sample was homogenous.

2.2 Procedures:

The tests and measurements were done on March 2023 as descriptive bellow:

2.2.1 Maximum Strength Testing:

Before executing the test, the researcher teaches the players how to conduct the test, and then the maximum strength of the thigh muscles is measured at 100% intensity by sitting the player on the push-up machine and according to what he deems appropriate from a distance of his legs from the base of the feet, and the back is straight and the arms are next to the body and they are not used to support the body The process of pushing the machine, as in Figure (1), and then the player starts pushing the machine with maximum force and for one time.

Figure (1) shows maximum strength testing

2.2.2 Muscle Size Testing:

Muscle size was measured by depending on O'Sullivan *et al*., (2009) procedure, where the player stands upright and the thigh is uncovered, and the researcher measures the circumference of the thigh from the middle by using a tape as in figure (2).

Figure (2) shows muscle size measurement

2.2.3 Testosterone Measurement:

Vedas device was used to measure testosterone ratio in blood and the procedure of testing was used as descriptive by Yuesong Wang *et al*., (2014), blood was drawn from the vein of the left hand, according to the strength of the vein, after performing the physical effort directly using the push-up machine (dumbis) with an intensity of 70% and a number of repetitions until fatigue and for one time.

2.3 Statistical analysis:

Data are presented as mean ± standard deviation (SD), skewness, and correlation. Data analysis was performed using SPSS (23 Amonk, NY: IBM Corp). An independent-samples t-test measures analysis was used to compare measures (strength muscle, muscle size, and testosterone ratio) between pre and post tests for one group.

3. Results and Discussion:

Table (2) showed a correlation between the variables of present study which included muscle size, testosterone ratio, and strength muscle for first group.

Table (2) shows mean, standard deviations, correlation coefficient, and the level of significance of the variables studied for the first group

Variables		Unit M	Mean	SD	Correlation	Sig	Significant
Strength	Muscle size	Cm	64.13	1.30	0.65	0.004	S
	Testosterone	nmol/L	11.60	1.35	0.85	0.000	S

The mean of the muscle size is (64.13), and the correlation coefficient with strength is (0.65) and the level of the sign is (0.004), which is less than the level of significance (0.05) at a degree of freedom (14), which confirms the significant correlation between the level of strength and muscle size. Moreover, the mean of testosterone ratio is (11.60) and the level of correlation is (0.85) and the level of sign is (0.000), which is less than the level of significance (0.05) at degrees of freedom (14), which confirms the significant correlation between the level of strength and testosterone ratio.

Table (3) showed a correlation between the variables of present study which included muscle size, testosterone ratio, and strength muscle for second group.

Table (3) shows mean, standard deviations, correlation coefficient, and the level of significance of the variables studied for the second group

Variables		Unit M	Mean	SD	Correlation	Sig	Significant
Strength	Muscle size	Cm	57.00	2.47	0.70	0.002	S
	Testosterone	nmol/L	19.13	1.55	0.91	0.000	S

The mean of the muscle size is (57.00), and the correlation coefficient with strength is (0.70) and the level of the sign is (0.002), which is less than the level of significance (0.05) at a degree of freedom (14), which confirms the significant correlation between the level of strength and muscle size. However, the mean of testosterone ratio is (19.13) and the level of correlation is (0.91) and the level of sign is (0.000), which is less than the level of significance (0.05) at degrees of freedom (14), which confirms the significant correlation between the level of strength and testosterone ratio.

The results of first and second group showed in tables (2,3) which found that there are significant correlations between the independent variables (muscle size, and testosterone) and the dependent variable which included (strength). Most of the previous studies interested in knowing the effect of exercise on the aforementioned variables, but no one tried to build a model of the thigh muscles that are suitable for wrestlers to have the ideal weight that they should reach.

Lei Chen *et al*., (2013) confirmed that there is a relationship between muscle circumference, and the strength produced, if the muscles are healthy and have little fat, we get great strength. Dr. Katie Kissane (2018) stated that muscles are the most adaptive tissues in the human body, and the muscle size and strength are not the same. Muscle size can affect strength, but muscle strength does not always predict size. This means that a person who has larger muscles may not necessarily be able to lift more weight than a person with smaller muscles, there are a lot of factors that contribute to strength beyond muscle mass and size, and these factors (the size and type of muscle fibers and nerves that activate them, the speed of muscle contraction, the testosterone hormone.

Previous studies have confirmed that testosterone helps maintain muscle mass, strength, fat distribution, and bone density in men. However, when its amount decreases in the body, it may lead to physical changes in men, such as a decrease in muscle size and strength, an increase in body fat, and a decrease in bone density, so this is not good for any athlete. Studies have also shown that an increase in body mass contributes to the development of strength, in addition to speed and agility, while additional body fat can limit stamina, balance and mobility, and all this will contribute to a decrease in the level of athletic performance (www.sixstarpro.com). Philippe and his colleagues (2012) also confirmed these conclusions that wrestlers need to produce high muscle strength during competition, and this strength depends on the level of testosterone in the blood, and they also mentioned that muscles cannot improve their work unless there are sufficient levels of testosterone.

Through the foregoing, the researchers believe that there is a correlation between the independent and dependent variables in the current study, and this correlation contributes significantly to improving the level of strength.

Table (4) showed that all the values of the signal level of the tests are smaller than the level of statistical significance (0.05), and this means that there are significant differences between the first and second group in all the variables studied.

Table (4) shows the differences between means, SD and the T-test value of the independent samples for the first and second group

Variables	First G		Second G		T-test	Sig	Significant
	Mean	SD	Mean	SD			
Muscle Size	64.13	1.30	57.00	2.47	9.86	0.000	S
Strength	96.66	5.87	111.00	3.87	-7.88-	0.000	S
Testosterone	11.60	1.35	19.13	1.55	-14.17-	0.000	S

Table (4) showed a significant differences between the first group whose circumference is (60-65) and the second group whose circumference is (55-59) in favor of the second group, and these results confirm an important fact that not every obese person is stronger than weak, but the obesity affects the level of physical performance. Moreover, if the circumference is muscular and does not contain excess fat, then the strength of the muscle produced will be greater, and this means that building a muscle model for the thigh muscles depends on the external and internal shape of the muscle, and this is what the results of the current study reached.

Some previous studies found the same our results, Ryotaakagi *et al*, (2009) discovered if the muscle size is increased results in increasing the strength production. It is also mentioned that

improving muscle size leads to improving physiological variables. Other studies found different results that muscle size has nothing to do with strength production (Akagi *et al*., 2008).

The researcher also believes that testosterone hormones has a role in increasing strength and improving the performance level of players, because this hormone contributes to the production of strength and does not depend on the size of the muscle in the production of strength. Buckinx *et al*., (2016) and Snyder *et al*., (2016) confirmed that lowing of testosterone ratio leads to a decrease in human physical function and muscle strength.

Whereas, You-Seon Nam *et al*., (2018) agreed with previous conclusions that muscle strength and physical function decrease after low testosterone, and the effect of testosterone by replacement therapy on muscle strength and physical function is still inconclusive or clear. While other studies have concluded that strength training leads to an increase in testosterone levels and an improvement in the electrical signals of the muscles. Therefore, these studies agree with the researcher's opinion that the player does not depend on the circumference of the muscles, but on the extent of his training of the muscles, which results in great muscle strength due to the improvement in the level of testosterone (Aleksandar *et al*., 2013). In addition, Matthew *et al*., (2010) confirmed that a decrease in testosterone levels leads to a loss of lower extremity strength, body composition, and level of physical function.

4. Conclusion:

Our investigation showed that there is a correlation between muscle size, testosterone ratio, and muscle strength. But the muscle size does not mean the player has to be fat. More research will be needed to determine the effect of physiological and morphological variables, such as electrical signals for muscle, cholesterol ratio, skin fat, and length of muscle. However, physical training is the most effective component of strength and testosterone.

The findings of this study, there is two types of circumference of the thigh muscles of the wrestling players, which range from 60-65 and 55-59 cm, according to the sample that was dealt with, moreover, there is a percentage contribution between muscle size and strength production and the researcher concluded that the femoral muscles with a circumference of 60-65 cm are less productive of muscle strength compared to muscles with a circumference of 55-59 cm.

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