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## Effect of exercise of diversity of resistance to exchange muscle work on some indicators of bioenergy metabolism of young weightlifters

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### Abstract

Objective of the search to prepare exercises in which the resistances vary, to exchange the work of the muscle groups of young weightlifters, and to identify their effect on some of their vital energy indicators. (2020) who are officially registered within the youth category in the Iraqi Central Federation for Heavy Weight Lifting, who are (12) lifters, and approved the (Fitmatepro) and (Treadmills) device in measuring energy metabolism (RMR) during rest, the time of emergence of the anaerobic threshold, and the rate of calorie expenditure during exercise, the researcher prepared the exercises To strengthen the muscles of the center of the body in the trunk to include the muscles of the abdomen and back of the lifters and arms It is performed with movements characterized by the production of force by using the diversity between the rowing device and pulling with the bar by investing the body weight and pulling the fixed ropes with the multigam device and pulling the rubber ropes with a degree of resistance (3), and it was applied for (8) consecutive weeks during the special preparation period, and after completing this experiment and collecting the data of the tests Before and after the data were processed using (SPSS) system to be extracts and applications in that the exercises of the diversity of resistance to exchange muscle work help to increase the level of energy metabolism (RMR) during rest, delay and time the emergence of the anaerobic threshold and increase the level of volitional rate of calorie expenditure during effort Young weightlifters, and it is necessary not to exaggerate the diversity of resistances to exchange muscle work when training young lifters and take into account the similarity with the trend in the muscular work of lifters, and the need to equip the training rooms with their diversity and not be satisfied with only fixed weights for this sport.

**Keywords:** Diversity of resistance, exchange of muscle work, metabolism of vital energy

### Introductions

To help weight trainers to reach the young lifters of the World Olympics, it is necessary to inform them about the cellular metabolism of these lifters and the effect of training loads aimed at developing muscle strength related to improving the achievement that throws the burdens of training on the biochemical processes related to supplying working, fixed and opposite muscles with vital energy to avoid problems or injuries The biochemical effects of the illogically high rise in metabolic rates that may occur due to poor planning of training loads, given that the increase in metabolic rate is a normal condition when facing exercises and is directly proportional to the increase in training loads, but within the health conditions of the weightlifter, and thus the goal when training working muscles Specifically, it is not reduced to the development of desired improvements in the amount of force produced by these muscles in lifting weights, but rather extends to the biochemical improvements of this metabolism accompanying the development in the level of muscle strength, which is known as "The ability to overcome or confront external resistance, as it is defined as the maximum amount of force that a muscle can perform in one maximum muscle contraction, and there are three types of muscle strength, which are maximum strength, strength characterized by speed, and endurance of force." (Syed, 2019) [25] The factors affecting the production of muscle strength are determined by the number of excited muscle fibers, the cross-section of the muscle or muscles participating in the performance, the formation of muscle fibers, the angle of muscle force production, the length and relaxation of the muscle or muscle before contraction, the length of time spent in muscle contraction, and the degree of compatibility Muscles involved in performance, the emotional state of the athlete before and during the production of muscle strength, age, gender, and warm - up. (Salman *et al.*, 2010) [21], as "the term (resistance training) is sometimes used as an alternative to strength training,

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Resistance exercises are used to develop muscular strength and increase the size of skeletal muscles, there are different methods of resistance training, the most common of which are gravitational forces, rubber and hydraulic resistances. These are common methods of training muscle strength. Where gravity works (ropes and weights discs and dumbbells) or hydraulic and rubber resistances against muscle contraction, and it is possible to train muscle strength without weights that hinder the movement of the hands through ligament exercises and free weights." (Faraj, 2012) <sup>[10]</sup> It is necessary to be familiar with the nature and direction of muscular work in order to help in directing the movement of contractions in varying resistances and diversifying muscular work according to the most common classifications in the physiology of sports training represented by isometric muscle contraction and muscle contraction. by lengthening (isotonic/eccentric), shortening (isotonic/ central), reverse plyometric, and isotonic (Malleh *et al.*, 2011) <sup>[16]</sup> so "The lack of supply of the energy currency in the body represented by the compound (ATP) may be the main cause of fatigue, and the weakness of the ability to produce this compound is determined by the biochemical mechanisms of the accumulated metabolites and the biological control within the cell system that cannot be isolated or placed in isolation from this." (Swartz & Other, 2017) <sup>[24]</sup> "The cellular metabolism that occurs according to the regular mechanisms of chemical reactions is one of the health indicators and an indication of the improvement in the work of organizations, enzymes and hormones within the normal curves, and the higher that cellular activity was, the more positive it was." (Ira, Judy 2008) <sup>[12]</sup> and "The process of The release of energy in the event of an increase in the acidity of the blood is temporarily difficult due to the decrease in the activity of the enzymes responsible for energy production" (Ali and Sajt, 2017) <sup>[2]</sup> Also, "to increase the possibility of chemical changes to the muscle fibers, the exercises should be of high intensity, and in this type of fast training they will be very active." (Rizk, 2003) <sup>[17]</sup> "The gradual increase in the training load is the basis for any player training planning and should be followed by all players who care about their level of achievement." (Al-Abdullah, 2018) <sup>[1]</sup> That is, "when the muscles train, they use carbohydrates as a primary source of energy, especially in high-intensity training, and this results in lactic acid as a waste of this work and then breaks down and turns directly into lactate and hydrogen ions and transfers the lactate from the muscles to the blood." (Al-Katt, 2013) <sup>[7]</sup> "One of the principles of specificity and cellular chemical changes is that working out with anaerobic system exercises and intensity increases anaerobic energy stores in cells." (Gayton, 2014) <sup>[11]</sup> as "the site of ATP ase) \_ Active across the bridge separates myosin from actin, thus disintegrating (ATP) to me (ADP) and the phosphorous ion, and that they provide the energy required to restore myosin to its active form as (cockeda <sup>TM</sup>) in the normal state, no need for energy stimulates the chain of contraction capacity coming across the bridge, while in the activated state, the myosin keeps the (ADP) And the phosphorous ion is attached to the myosin heads, now the myosin heads can bind to the other actin unit farther along the thin filament, and this bonding cycle needs electrical impulses from the brain to activate the process The myosin gliding capillaries are repeatedly detached and activated in this method and persist as long as calcium is present (in its

concentration from increasing). 10  $\mu$ M) \_ in the sarcoplasm, When calcium is returned to the calcium pump in the sarcoplasmic reticulum then ATPase) and (ATP) they re-block the tropomyosin to form the transient bridge and the muscle fibers relax." (Al-Ali and Hussein, 2013) <sup>[3]</sup>, and to make the work closer to the training and competitive reality, the indicators inferred on the good regulation of the biochemical processes responsible for them are the indicators of energy metabolism (RMR) during rest, and the time of rest. The emergence of the anaerobic threshold, and the rate of caloric expenditure indicate the efficiency of energy release processes, as " (RMR) is Metabolism, which is measured when the body is completely rest, without any relationship to the basic metabolism and its conditions, and it is measured before physiological performance and depends on external conditions, and it is more than (10-15%) of the basic metabolism. (Sport, 2008) <sup>[23]</sup>, as for "the anaerobic threshold in the field of physiological preparation to indicate a specific state of fatigue that the player reaches during physical performance, and the timing of its appearance varies among players according to their physical and functional condition that they have reached, and many scientists know it as an increase in the intensity of Physical load in which the rate of transfer of lactic acid from the muscles into the blood exceeds the rate of its elimination and has a direct connection with the lactic acid system (anaerobic capacity) and the system of consumption or oxygen (aerobic capacity). (Salama, 2000) <sup>[20]</sup> Through the work of the training and academic researcher in the physiology of sports training in the sport of weightlifting, he noticed two important aspects, which is that the exercises that weightlifters train with are carried out at the same pace in terms of the form and type of resistance, as well as relying on increasing training loads in order to achieve achievement and reach the World Olympics, and this The matter needs to stop to take into account the physiological specificity of the muscle contractions and the nature of the muscular work of the muscles involved in the production of force for the lifts, and the other thing that was noticed lies in the actual need to measure the vital energy indicators, which is one of the most important things that help in continuing the exercises considering the principle that there is no work My muscle is without energy by virtue of the physical reality, and this energy whenever it is optimally invested, the more it gives an indication of the adequacy of the exercises that these young lifters receive, which requires knowing the role of diversity in positive changes in the metabolism of vital energy, to work on providing an economic factor in the exchange of calories, The aim of this research is to prepare exercises in which the resistances vary, in order to exchange the work of the muscle groups for a lifter The researcher assumes that there are statistically significant differences between the results of energy metabolism tests (RMR) during rest, the time of emergence of the anaerobic threshold, and the pre and post caloric expenditure rate for the experimental and control groups, There are statistically significant differences between the post results of the experimental and control groups of RMR tests during rest, the time of emergence of the anaerobic threshold and the rate of calorie expenditure.

Research Methodology: The experimental research method has been adopted, which is defined as "objective observation of a specific phenomenon that occurs in a situation characterized by tight control and includes one or

more variables (factors), while other variables (factors) are proven.” (Allawi and Ratib, 2017) [5] The experimental design with two experimental and control groups was also adopted Equivalent to the exact pre-arranged.

Research community and sample: The limits of the research community are represented by the youth weightlifters of Maysan Club in the sports label (2020) who are officially registered within the youth category in the Iraqi Central Federation for Heavy Weight Lifting, numbering (12) lifters, they were selected by a comprehensive inventory method, all of them by (100%) from their community, then They were randomly divided into two groups, an experimental and a control group.

Measurement, tests and research procedures: Relying on the technology of modern physiology laboratories at the global level, a device was used (Fitmatepro) Type (COSMED) with the transmitter (Bluetooth), to measure (RMR) during rest in one calorie unit, the time of emergence of the anaerobic threshold in the second unit and its parts, and the calorie expenditure rate during effort by running at a speed of (7) km/hour for (5) minutes on a treadmill (Treadmills) Life Fitness 97 Ti With a capacity of (9500), the researcher promised the exercises To strengthen the muscles of the center of the body in the trunk to include the muscles of the abdomen, back and arms of the young lifters according to the determinants of these exercises so that the central stability (Core ability) is performed Few repetitions, and

intensely Low or medium gradient with load resistors In order to achieve self-stability and neuromuscular control in the center muscles, core strength exercises it performs B is more dynamic and uses external resistances at all levels, Core power exercises \_ \_ It is performed with movements characterized by the production of force by using the diversity between the rowing device and pulling with the pulley by investing the body weight and pulling the fixed ropes with the moulting device and pulling the rubber ropes with a degree of resistance (3), it applied \_ Exercises to diversify the resistances of the exchange of muscle work by (3) times a week, For a period of (8) consecutive weeks during the special preparation period, the number of training units does not become (24) training units, The severity has been graded from (85% up to 100%) by the method of high intensity interval training and repetitive training, with a rest rate between exercises of (5-2) minutes, and the exchange between the work of muscle groups to include once the muscles of the limbs and once the muscles of the trunk alternately in each training unit, and after completing this experiment and collecting test data Tribal and dimensional for each weightlifter from the two research groups, his data was processed using the SPSS system to extract the values of percentage, mean, standard deviation, t-test for uncorrelated samples, and t-test for correlated samples.

**The results and their discussion**

**Table 1:** Shows the results of the tribal tests between the two groups in dependent variables

Test and group		The number	Arithmetic mean	Standard deviation	Levine contrast smoothing	(Sig)	(T)	(Sig)	The meaning of the difference
(RMR)	Experimental	6	2118.83	10.167	0.214	0.653	0.562	0.586	not significant
	the officer	6	2115	13,251					
(Anaerobic Threshold)	Experimental	6	172	4.817	0.022	0.884	1.652	0.13	not significant
	the officer	6	167.83	3.869					
(Calories)	Experimental	6	640.5	23.931	0.289	0.603	0.266	0.796	not significant
	the officer	6	643.83	19.198					

The degree of freedom n- 2 = (10), not significant if (Sig) < (0.05) at the level of significance (0.05).

**Table 2:** It shows the results of the pre and post tests for the two groups in dependent variables

The test	Group and number	Comparison	Arithmetic mean	Standard deviation	Average differences	The test	Group and number	Comparison	Arithmetic mean
(RMR)	Experimental (6)	Tribal	2116.83	10.666	288.5	12.896	54.799	0.000	D
		after me	2405.33	3.882					
	Female officer (6)	Tribal	2115	13,251	227.833	45,556	12.25	0.000	D
		after me	2342.83	37.36					
(Anaerobic Threshold)	Experimental (6)	Tribal	172	4.817	24,833	8.232	7.389	0.001	D
		after me	196.83	3.869					
	The officer (6)	Tribal	167.83	3.869	18	7.376	5.978	0.002	D
		after me	185.83	6.178					
(Calories)	Experimental (6)	Tribal	640.5	23.931	85.667	29,419	7.133	0.001	D
		after me	554.83	11.197					
	Female officer (6)	Tribal	643.83	19.198	56	23.715	5.784	0.002	D
		after me	587.83	11.053					

Significance of difference (Sig) ≥ (0.05), degree of freedom (n) - (1) for each group, level of significance (0.05)

**Table 3:** Shows the results of the post-tests between the two groups in dependent variables

Test and group		The number	Arithmetic mean	Standard deviation	(T)	(Sig)	The meaning of the difference
(RMR)	Experimental	6	2405.33	3.882	4.076	0.002	D
	the officer	6	2342.83	37.36			
(Anaerobic Threshold)	Experimental	6	196.83	3.869	3.696	0.004	D
	the officer	6	185.83	6.178			
(Calories)	Experimental	6	554.83	11.197	5.138	0.000	D
	the officer	6	587.83	11.053			

The degree of freedom n- 2 = (10), not significant if (Sig) < (0.05) at the level of significance (0.05)

From a review of the development of vital energy metabolism indicators for each of the energy metabolism (RMR) during rest and the time of emergence of the anaerobic threshold and the pre and post caloric expenditure rate for young lifters in each of the experimental and control groups presented in Table (2), which shows that they all improved in the results of the post tests. For these indicators about what they were in the tribal tests, and from reviewing the results of Table (3) it is clear that the lifters of the experimental group were superior to the improvement of each of them over the lifters of the control group, and the researcher attributes this development and superiority of the lifters of the experimental group to the positive effect of the exercises of the diversity of the resistances of the exchange of muscle work. The suitability of her exercises to them, which helped reduce the viscosity of the muscles that contract in a spiral, and for each of the working, auxiliary and opposite muscles, which reduced their internal resistance, and the lower the resistance, the greater the gain of vital energy. On trimming unnecessary contractions, which thus helped to increase the gain of vital energy, which appeared clearly in delaying the time of emergence. The anaerobic difference threshold, which indicates an improvement in the training level as a result of the physiological factors that indicate the improvement of the bioenergy production processes and the delay in the transformation time of the aerobic system, and this is what was helped by the rest periods between exercises. The economics of exchanging calories during effort and increasing the level of energy metabolism (RMR) at rest time "as resistance training leads to physiological changes that include the body's organs, and the level of athletic performance progresses whenever these changes are positive in order to achieve the physiological adaptation of the body's organs and then to the physical load." (Salama, 2018)<sup>[19]</sup>, "and that the auxiliary training tools for each type of resistance enable both the player and the coach to reduce many of the efforts made in sports training, provided that they are appropriate for the game or the specialized event, and that they are appropriate for the players' age, gender and age training". (Duane, 2017) as that Muscular strength development exercises make the player better able to deal with the requirements of the game specialization." (patience, 2010) The metabolic rate (RMR) is affected by the type of sport, the intensity of the exercise and the daily training time. (Shafiq, 2010)<sup>[22]</sup>, "and that the anaerobic threshold is related to the determinants of the chemical reactions of the intermediate compound lactic acid, which begins to appear in the first energy system after (16) s of high voltage. The ratios cause an imbalance that leads to the stress of the vital organizations that work on the continuation of the tide of energy and the beginning of the emergence of the anaerobic threshold." (lauralee, 2004)<sup>[15]</sup> Because the anaerobic threshold is the turning point between the energy systems on which the athlete depends, which is determined according to the training intensity and performance time, and they are the important physiological indicators in evaluating the training status of the athlete. It is one of the modern exercises in the world of sports training that has been researched by many." (Chad, 2005)<sup>[8]</sup> as "the innate level or natural readiness for abilities, especially the ability of the body to respond to training, and improve skill performance are the main keys to success in sports, as all sports activities include muscle activity, and each of us has an upper limit for his ability to

perform any A task involving muscular effort however (energy metabolism) remains a vital component of successful performance." (Arthur, 2019)<sup>[6]</sup>, "As sports scientists, coaches and players are constantly searching for methods, techniques and exercises in modern training with the aim of improving physical abilities and athletic performance." (Isabel, 2014)<sup>[13]</sup> "One of the principles of specificity and cellular chemical changes is that working with anaerobic system exercises and its intensity increases anaerobic energy stores in cells." (Gayton, 2014)<sup>[11]</sup> As "the gradual increase in the training load is the basis for any player training planning and must be followed by all players who care about his level of achievement." (Al-Abdullah, 2018)<sup>[1]</sup> "The anaerobic changes in the muscle include increasing the efficiency of anaerobic energy production with the (ATP-Pc) system." Increasing muscle stock from anaerobic energy sources (ATP) and creatine phosphate, increasing the activity of coenzymes on anaerobic energy, and increasing the muscle's ability to use glycogen to produce energy in the absence of oxygen. (Allawi and Abdel-Fattah, 2000)<sup>[4]</sup> " Since all the player's physical activities lead to many physical changes, but when these activities are on the body according to the regular scientific rules, then it leads to improved achievement." (beautiful, 2010) "When the athlete becomes more efficient in training, the energy requirement during training decreases or decreases compared to the athlete with little sufficient capacity." (Salama, 2000)<sup>[20]</sup>.

### Applications

1. Diversity exercise in resistance to exchange muscle action helps to increase the level of energy metabolism (RMR) during rest, delay and time the emergence of the anaerobic threshold and increase the level of volitional caloric expenditure rate during exercise in young weightlifters.
2. It is necessary not to exaggerate the diversity of resistances to the exchange of muscle work when training young lifters and to take into account the similarity with the trend in the muscular work of the lifts, and the need to equip the training rooms with their diversity and not be satisfied with only the fixed weights of this sport.

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**Annex 1:** Illustrates a sample of the details of the legalization of the load of exercises, the diversity of resistances, the exchange of muscle work

Transitional rest time	Rest time between sets	Number of groups	Rest time between repetitions	Repetition	Exercise time	intensity	Exercise number
270 sec	120 sec	3	10 sec	3	10 sec	85%	(1)
254 sec	130 sec	4	15 seconds	2	8 th	90%	(2)
175 sec	150 sec	5	-	1	5 sec	95%	(3)
254 sec	130 sec	4	15 seconds	2	8 th	90%	(4)
270 sec	120 sec	3	10 sec	3	10 sec	85%	(5)
1.233 sec	Total						
Minutes 20,383	The total time for the exercises in the main section of the training unit is (90) minutes						