

## THE INFLUENCE OF RESISTIVE TRAINING BY DE LORM WATKINS METHOD ON STRENGTH INCREASE OF SELECTED MUSCLE GROUPS PERSON NOT TRAINEES PROFESSIONALLY

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### Keywords:

- training
- muscle strength
- adaptation

### Abstract:

**Introduction:** Systematically repeated static weight training leads to the increase of mass and muscle strength. The increase of muscle strength is noticed much more often.

**The aim of the work:** The aim of the study was to examine the influence of a four-week training with the De Lorme Watkins method on the increase of strength of skeletal muscles in a 30-person group of respondents who differed in structural and morpho-physiological traits of organism. **The material and the methodology:** The study involved 30 men (aged 20-24 years old). The respondents performed the same weight trainings in accordance with the ascribed to them rule of De Lorme Watkins method. This method is based on 30 repetitions of training, 10 per each series. In the series only resistance changes. (50%, 75%, 100% CM10) Training was conducted 4 times a week during 4 weeks. Apart from initial and final measurements, partial measurements were conducted after a two-week period of practice. **Results:** In the all analyzed cases the observed differences between mean values of parameters are statistically insignificant. **Conclusions:** Four-week resistive training with the De Lorme Watkins method does not achieve the effect of strength increase of skeletal muscles at the level of statistically significant differences. With reference to the results one can assume that there is growing tendency of parameter.

## INTRODUCTION

Systematically repeated static weight training leads to the increase of mass and muscle strength. In weight training a very important aspect is: the rule of gradual burden, a number of repetitions, breaks between series, rhythm, regularity, accuracy and initial position in conducting exercises. Muscle strength is shaped along with ontogenetic development and has a direct relation with body dimensions and biological maturity. The strength level mostly depends on age, sex and motor activity. Many young people start weight trainings without a proper preparation and knowledge of that subject, which might lead to injury or even overtraining. Research studies determining a scheme of conducting weight training seem to be

significant in order to minimize its negative aspects and obtain as accurately expected goal as possible. There are many methods improving strength and mass of muscles; they differ in methodology of performing exercises, sometimes in duration of training and selection of burden. Of the three types of skeletal muscle contractions: concentric, isometric and eccentric, eccentric contractions cause rapidly progressive during the adaptive changes. In eccentric contraction of the muscle lengthens under load, created a series of micro-injuries to stimulate compensation and supercompensation. While all forms of exercise can induce adaptive changes, it is not always clear which method is best for the maximum, the expected benefits of adaptation and how long they acted in time [9]. The result of resistance training is a series of adaptive changes in muscles. According to Donatelli, these changes include hypertrophy in the first seven weeks, damage miofilaments, the growth of tissue adjacent to the muscle fibrils, changes in the endocrine system and neuromuscular changes [3]. International studies conducted in recent years the temperature exchange as a factor determining the possibility of muscle strength. Muscle without warm-up is lower in elasticity, shrinkage, and sensitivity to energy substrates. This confirms how important is to warm up before exercise. Developing muscle strength also depends on the ratio of muscle fibers. Those characterized by a greater number of fibrils fast-twitch (FT fast twitch white) achieve greater strength gains than the people who have the advantage of fibrils slow-twitch (ST-twitch slow, red) [15]. Changes in the activation of motor units are connected with increased muscle strength. There has been a disproportionate increase in strength and an increase in cross-section of muscle in the first stage of training. The increase in muscle strength in the first stage of training is associated with a greater mobilization of motor units, increased conduction velocity in motor neurons which confirms imaging electromyography (EMG). Adaptation of the nervous system to resistance training is performed depends on the types of muscle contractions and volume of work. The increase in strength as a dimension adaptation to the training depends on whether the use is eccentric contractions, concentric or isometric workout regimen, and which has been implemented. It is well known that exercise can cause changes in cortical activity of the central nervous system. These changes can be measured using electroencephalography (EEG) and neuroimaging techniques. The application of these methods has shown that the changes in cortical activation patterns are dependent on the type of exercise and intensity. Because greater maximum force can be released during maximal eccentric contractions compared to the concentric or isometric contractions, training using eccentric contractions may be the most effective for increasing muscle strength [9]. The De Lorme Watkins method was used in the studies. Many authors discuss the subject of the increase of muscle strength and mass as a result of conducting resistive exercises. At an initial stage of the training attention is paid to a significant tendency of strength increase and to a lesser extent to muscle mass. Significance of neurological factors at an early stage of weight training is emphasized. Despite numerous research studies a number of issues connected with the influence of nervous system on contraction of skeletal muscles, development of muscle strength as well as activation of motor units is still unexplained [2,4,6].

### **AIM OF STUDY**

The aim of the study was to examine the influence of a four-week training with the De Lorme Watkins method on the increase of strength of skeletal muscles in a 30-person group of respondents who differed in structural and morpho-physiological traits of organism.

### **MATERIAL AND METHODS**

30 people aged 20–24 were examined. These people are not practiced any sport in a high-performance, trained recreationally 1 to 3 times a week: team games (14 persons), jogging (7 persons), strength training (2 persons), swimming (1 person), skateboarding

(1 person), tennis (1 person), martial arts (2 persons) and cycling (2 persons) None of the respondents used supplements which could help in obtaining a better result during conducting exercises. The respondents were offered the same diet. Meals were consumed about 6–7 times a day. The diet was enriched with a larger amount of consumed protein and simple and complex carbohydrates. About two hours before start of the training complex carbohydrates were consumed, whereas simple carbohydrates immediately afterwards. About 30 minutes after the training protein was consumed in order to provide muscles with glycogen.

The respondents performed the same weight trainings in accordance with the ascribed to them rule of De Lorme Watkins method. The De Lorme Watkins method is based on 30 repetitions of training, 10 per each series. In the series only resistance changes.

- first series 50% of weight matched to each respondent so that he can lift it maximum 10 times only( CM10)
- second series 75% CM10
- third series 100% CM10

In this method burden is selected in such a way that in the last series (taking into account fatigue) it is possible to perform 10 repetitions of training. Training in this method is conducted 4 times a week with pauses after each series lasting two minutes [17]. .

Trainings were conducted four times a week at a gym in Mieroszków: on Mondays, Wednesdays, Fridays and Sundays. To each training day proper exercises were assigned which aim is to increase mass and strength of superficial chest muscles. Before each training a warm-up after training: ‘stretching’ was used. Warm-up consisted of three times the weight of defeat constituting 60% of the maximum resistance in three consecutive series.

The training included 6 different exercises for hypertrophy and muscle strengthening.

Every exercise, according to regulations, was repeated in three series with 10 repetitions each.

On Mondays and Fridays barbell bench press was used while lying on the back: horizontal, inclined at an angle of 45°, head upwards, inclined bench angle 45°, head downwards. On Wednesdays and Sundays horizontal curl was used as well as arm extension while lying on the back on a bench colloquially called ‘flies’. The exercises were performed in three positions: lying on the back on a bench: horizontal, inclined bench at an angle of 45°, head upwards, inclined bench, angle 45°, head downwards [18].

The studies were subjected to statistical analysis. Differences in mean values of examined parameters, depending on duration of training, were analyzed with the use of one-factor variance analysis.

**RESULTS**

**Table 1.** Measurement of the strength of respondents prior to the training.

Item no.	Barbell press (kg)		Dumbbell flyes (kg)	
	CM1	CM10	CM1	CM10
1	140	108	38	28
2	60	48	20	15
3	68	56	22	17
4	78	61	25	19
5	64	53	21	15
6	80	64	26	20
7	72	56	22	17
8	76	55	21	16
9	64	51	20	16
10	78	62	25	19
11	60	42	18	15
12	62	42	18	14
13	63	38	15	12
14	83	65	25	20
15	68	56	21	17
16	67	51	19	15
17	88	70	27	22
18	70	55	22	17
19	100	81	31	25
20	63	50	18	14
21	70	53	20	15
22	65	48	17	14
23	68	54	21	16
24	78	62	25	19
25	52	40	17	14
26	86	65	26.	21
27	74	61	24	20
28	70	55	22	17
29	62	46	19	15
30	70	55	22	17

CM1 - this is the maximum weight adjusted for each subject so that he could pick it up only once,  
 CM10 - this is the maximum weight adjusted for each subject so that he could pick it up only 10 times

Partial measurements are control measurements which were conducted in the middle of the studies. after two-week period of trainings (Table 2).

**Table 2.** Measurement of partial muscle at the end of two weeks of weight training

Item no.	Dumbbell flyes (kg)		Dumbbell flyes (kg)	
	CM1	CM10	CM1	CM10
1	140	108	38	28
2	62	52	21	16
3	72	58	22	16
4	82	61	25	19
5	64	53	21	15
6	85	64	28	22
7	70	50	24	18.5
8	80	57	24	18
9	64	51	20	16
10	80	62	26	20
11	62	42	18	15
12	64	42	18	14
13	68	40	17	13.5
14	83	68	28	22
15	72	56	22	17
16	72	51	19	15
17	90	70	29	22
18	70	55	22	17
19	104	81	32	25
20	63	50	20	14
21	70	53	20	15
22	65	48	17	14
23	72	54	21	16
24	78	62	25	19
25	56	42	18.5	14
26	90	65	26	21
27	78	61	24	20
28	70	58	22	17
29	62	46	19	15
30	75	58	24	19

CM1 - this is the maximum weight adjusted for each subject so that he could pick it up only once,  
 CM10 - this is the maximum weight adjusted for each subject so that he could pick it up only 10 times

Final study measurements conducted after a four-week period of trainings (Table 3).

**Table 3.** Measurements Final muscle strength after the four-week period of strength exercises

Item no.	Barbell press(kg)		Dumbbell flyes(kg)	
	CM1	CM10	CM1	CM10
1	142	108	39	28
2	65	52	21	16
3	72	60	22	16
4	84	64	27	21
5	72	55	21	16
6	90	70	28	22
7	76	58	25	20
8	80	62	24	18
9	68	53	22	17,5
10	85	66	26	20
11	62	48	20	16
12	64	50	20	14.5
13	68	52	17	13.5
14	88	70	30	24
15	72	56	22	17
16	75	60	19	16
17	94	74	29	23
18	78	60	22	17
19	104	85	34	26
20	68	54	20	14
21	72	55	21	16
22	68	48	17	15
23	75	58	23	16
24	85	66	25	19
25	60	45	18.5	14
26	95	72	26	21
27	80	64	24	19
28	70	58	24	19
29	66	50	19	15
30	80	64	24	19

CM1 - this is the maximum weight adjusted for each subject so that he could pick it up only once,  
 CM10 - this is the maximum weight adjusted for each subject so that he could pick it up only 10 times

**Table. 4** Descriptive statistics for the parameters shaping muscle strength in 30 patients

	mean	Standard deviation
barbell CM1-0	73,3	16
barbell - CM1 - 2	75,4	16
barbell - CM1 - 4	78,6	16
barbell CM10 - 0	56,8	13,3
barbell - CM10 - 2	57,3	13,2
barbell - CM10 - 4	61,2	12,5
dumbbells - CM1 - 0	22,2	4,6
dumbbells - CM1 - 2	23	4,7
dumbbells CM1 - 4	23,7	4,9
dumbbells CM10 - 0	17,4	3,5
dumbbells - CM10 - 2	17,8	3,5
dumbbells CM10 - 4	18,3	3,6

Table. 4 Descriptive statistics for the parameters shaping muscle strength in 30 patients. 0 - initial value; 2 - after 2 weeks of training; 4 - after 4 weeks of training. CM1 - this is the maximum weight adjusted for each subject so that he could pick it up only once, CM10 - this is the maximum weight adjusted for each subject so that he could pick it up only 10 times

**Table.5** Differences in the average values of the parameters studied, depending on the duration of the training

	p
barbell CM1	0,4
barbell CM10	0,4
dumbbells CM1	0,5
dumbbells CM10	0,6

Table.5 differences in the average values of the parameters studied, depending on the duration of the training. Determining the level of statistical significance. CM1 - this is the maximum weight adjusted for each subject so that he could pick it up only once, CM10 - this is the maximum weight adjusted for each subject so that he could pick it up only 10 times

In the all analyzed cases the noted differences between mean values of parameters are statistically insignificant; therefore, with reference to the results, one can only speak of growing tendency of parameter. (table 5) Since there is no statistically significant differences between the initial measurements and measurements after four weeks of training, it did not include a comparison of pre and after two weeks of training. It was assumed that physical activity performed sporadically at the recreation of a working oxygen - anaerobic or aerobic work superiority had no significant meaning in shaping forces using the method of De Lorm Watkins [7].

## DISCUSSION

Strength training causes a number of changes in the human body. There are modifications at the structural level muscles, tendons or ligaments and neurophysiological level. The concept of adaptability allows the selection and arrangement of training, which as much as possible influences the development of mass and muscular strength [14].

There are three main ways of gaining strength and strength endurance:

- 1) short of the maximum efforts submaximal resistance or a low number of repetitions of the time intervals between each of up to a few minutes.
- 2) exercises performed to limit fatigue.



- 3) repeated exercises performed with the same intensity and specific time intervals between them.

The first method is preferred for strength development and the other two shaping strength endurance [17]. The best results the increase in strength is obtained by using resistance exceeding 90% and up to 100% of the maximum weight. Performed the 2-3 repeat with full concentration and maximum engagement force. They are full break at 3-5 series an exercise. Optimum adaptation of the training for strength increase is achieved after approximately 6-8 weeks of work 3-4 with a frequency of workouts per week. It is the most popular variant of progressively increasing intensity. Other types of training, for example training in record time - strength will increase the level of forces in the movements performed at a high speed. An example might be a form of a station. Training endurance - strength does not lead to a significant increase in muscle mass, but increases the strength endurance. An example might be circuit training. Training using only static example. Isometric exercises very quickly leads to stabilization of the level achieved in muscle strength. While coordination nervously - muscular exercises with isometric, concentric and eccentric is different [10]. Farthing and Chilibeck found that eight-week eccentric resistance training resulted in a greater increase in muscle size and strength than training based on concentric contractions [9]. Despite the proven efficacy of resistance training associated with the increase in muscle strength, there is still uncertainty as to the most effective training and time adaptive changes. The study of many authors confirm that the method of De Lorm Watkins and Oxfordzka a very efficient method of efficiently developing strength. Conducted a nine-week training three times a week, he stresses that both methods improve the strength of equivalent effectiveness, both in women and men [5]. Resistance training should be adjusted individually. It is important to individually selected magnitude of the resistance and systematic training program in the first stage should be fixed, while another should be modified to achieve the most efficient Filmaster gain strength [12,13].

According to a study by three groups of American scientists from the University of Ohio it shows that the best results can perform 5-10 repeats with a weight of close to 60-80% of the maximum weight at intervals of not longer than 1.5 minutes [15]. Gonzalez while the most preferred practice considered in the development of strength training involving a series of 3-6 repetitions 8-12 moderate-intensity below 85% of maximum load plus one repetition of the maximum load. This training has rest periods between sets of 30-90 seconds [7].

Muscle strength depends on the amount of activated fibers, which constitute the motor units. Then the more fibers involved in practice, we have greater increase in strength. The plan aims to provide the strength to perform a few repetitions with a relatively large load [8]. Trained bodybuilders decide surpassing the limit of 100% of the maximum weight. Preparing a nervous system to increase charges, involving the maximum number of fibers [21]. Picked strength training first adaptation on changes in the nervous system. Early increase in muscle strength induced by resistance training owes itself largely a reorganization of nervous. Kowaluk and Sacharuk say that it was a nervous factors allow progress in the first four weeks of training, and after six weeks, a marked process of hypertrophy, or enlargement volume of muscle fibers. However, the training lasts longer than 12 weeks reduces the level of hypertrophy, thus leading to a reduction of muscle growth. And the secondary Filmaster muscle development is visible between 6 and 12 months of exercise. Running resistance training reduces the ability of any antagonistic muscle tension and increase the synchronization of muscle fibers after the workout ended. It shows also the correlation between the amount of training conducted, and the increase neuromuscular junctions [11]. There are many studies that indicate the effect of the increase in strength after the application of resistance training. Gotshalk et all. have shown that resistance exercise of high power



causes a significant increase in strength in both young and older men after 10 weeks of regular training [8]. Newton and Kraemer say that the increase in strength can be seen already after four weeks of resistance training conducted regularly twice a week [16]. Similar reports confirmed by Beyer et al. [1]. In contrast, Walker and Hakkinen significant increase in strength after the application of resistance training observed after the 10-week training conducted regularly twice a week [20]. The main difference in this study, the above-mentioned authors relied on the use of different methods of resistance training. De Lorm Watkins method by which a study has been conducted on a group of 30 people, made it possible to determine the direction of the changes that have arisen within the selected portion of the muscular system during the 4-week effort strength. There are many methods for improving strength and muscle mass, they differ in methodology of exercise, duration of training and selection of load like. De Lorm method Watkins, Mc Queena program Oxford, circuit training, endurance-strength, whether the method hard – athletic [4,17, 18]. Based on the results it can be assumed that there is a tendency to increase the force of skeletal muscle undergoing training, but training must be a load of larger volume than the one that has been tested. You would probably have to be extended in time. Then it is believed that differences in the strength increase of the trained muscle would be statistically significant. Then clearly you could tell from training increase muscle strength [14,18]. Based on the work of other authors we know that there is a significant share of the neurological structures in the formation of muscle strength and increase muscle mass, it is only visible after 8 weeks of training. The increase in muscle strength recorded much earlier. The immediate confirmation of the influence of the nervous system to the formation of muscle EMG records are performed technique surface. In the image is visible increase in the amplitude of the EMG signal, even though there is a change in the size of the muscle. Further proof of the significant influence of muscle control system by the nervous system is to reduce the amplitude of the EMG signal recorded during maximum exertion, when the test was preceded by a period of immobilization One explanation for this phenomenon is the weakening of the presidency from the CNS to muscle. Research confirms that the pattern of activation of the motor unit is just as important for improving muscle strength, as the number of activated motor neurons. In the initial phase of weight training during maximal contraction of skeletal muscle stimulates not 100% muscle motor units. This number can be increased as a result of properly conducted weight training. Research some authors show that after a week of resistance training is observed not only increase muscle strength, but also increase the frequency of beats muscle motor unit under test during maximal voluntary contraction. It is stressed that the strength of skeletal muscle increases in the early stages of training. But it still remains to be clarified a number of issues concerning how quickly this process occurs and how and the extent to which additional features or factors play in the process of growth force a decisive role. Especially in the early stages of training [5,19,21].

## **CONCLUSIONS**

- 1) Four-week resistive training with the De Lorme Watkins method does not achieve the effect of strength increase of skeletal muscles at the level of statistically significant differences.
- 2) With reference to the results one can assume that there is growing tendency of parameter.

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