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Original article

BACK MUSCLES STRENGTH DEVELOPMENT BY MEANS OF INCREASE AND DECREASE OF EFFORT LOAD DURING GIANT SETS IN BODYBUILDING FOR MASSES

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Abstract

The aim of the study is to highlight methodological issues on the back muscle strength development by combining methodological procedures in masses bodybuilding.

Methods. The study was conducted in three stages over a period of two months (March-April 2011), performing three workouts per week, monitoring the effective use of strength exercises to develop back muscles in the same muscle area by means of giant sets during workouts. In this context, we conducted a case study in "Tonik Fitness Club" in Bucharest, applied to two athletes of 28 and 34 years old. We recorded subjects' evolutions during the training session, using statistical and mathematical method and graphical representation method.

Results. The study content highlights the training programs depending on muscle zone and the specific methodological aspects, the weekly training program per muscle groups, the stages of study carrying out, the test and control trials applied in terms of anthropometric measurements and of back muscle strength development, and the application of the methodical procedure of effort load increase and decrease within the giant sets in a training micro-cycle.

Discussion. The study focused on the training programs over two months, monitoring statistically the development of back muscle strength through the application of the procedure of effort load increase and decrease during giant sets in bodybuilding for masses. From the analysis of training programs content we noticed that three giant sets of exercises were used, performed in four series; each exercise within the giant sets was applied by means of the procedure of increasing and decreasing effort load. Study results emphasize the anthropometric measurement results: the study subjects have the age mean of 24.75, with a size of 175.2 cm and a weight of 83.75 kg at initial testing and a decrease by 2.12 kg in final testing. Regarding the chest perimeter, the inspiration is averaging 89.5 in initial testing and an increase of 2.25 cm in final testing; the expiration is averaging 85.25 cm in initial testing and an increase of 1.75 cm in final testing, while the amplitude has an average of 4.25 cm at initial testing and an increase of 1.0 cm at final testing. As for arms perimeter, at the initial testing of the right arm they had an average of 38.25 cm and 0.65 cm increase in final testing, the left arm - an average of 38.88 cm at initial testing and an increase by 0.12 cm in final testing. From the analysis of back muscle strength, it was noticed an increase by 4.5 reps in "pull-downs" final testing, an increase by 16kg of the load in "cable machine chest pull-downs", with an average of 84kg at initial testing and 100 kg in final testing, performed with 13 reps at initial testing and a decrease by 4 reps in final testing. In "seated rowing at machine" there is an increase of the average by 16 kg of load, with an average of 92kg at initial testing and an average of 108kg in final testing, with 11 reps performed in initial testing and a decrease by 2 reps in final testing.

Conclusions. The study results show that the regular exercising leads to a decrease of body weight, an increase of thoracic amplitude, of arms perimeters and last, but not least, to strength development per different muscle groups.

The study highlights methodological issues on the back muscles strength development by combining methodological procedures in bodybuilding for masses, by increasing and decreasing effort load during giant sets. And the effective use of strength exercises for back on the same muscle area by means of giant sets during a training session helps to improve muscle endurance and to increase strength at different machines. Also the division of back muscles areas during each training micro-cycle emphasizes the dynamics of muscle strength and the possibility to combine muscle groups together during a training mezzo-cycle.

Keywords: bodybuilding, strength, giant sets, muscle groups and performance.

Introduction

Bodybuilding separated as an independent discipline. It can be practiced as a performance sport, but its various available means make it very popular and we can identify it in the lesson of physical education, in the sports training specific to branches requiring the development of motor skill, strength, alone and/or in relation with others, in kinetotherapy too. Bodybuilding is the sport in which

practitioners seek to develop a proportional body, with massive and symmetrical muscles, but also trying to reduce as much as possible the fat layer under the skin (Hitru, 2002).

To this end there are used exercises with dumbbells, barbells, cable machines or other types, but also aerobic exercising such as cycling, jogging, swimming, etc. Nutrition also is very important for a bodybuilder training because it must serve a double purpose: to provide the necessary basis for the increase of muscle mass, but in the same time to

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reduce the fat layer (Voicu, 1995).

Bodybuilding is a very creative sport, in which athlete and coach decide upon sets, reps and training speed, in order to get the highest level of exhaustion, followed by a period of rest and recovery (Muraru, 2008). It is the process of muscle development by a combination of workouts with weights, increase of the number of burnt calories and rest. Sports performance achievement would not be possible if the athlete would not „hold” in its genetic code a certain motor quantity and quality. More than in the other sport branches and fields, bodybuilding highlights human body aesthetic aspect and motor skills as well.

By its specific nature, training in bodybuilding has a deeply formative character, much more as this one is its very purpose. This character is found mainly at somatic level, but due to duration and to high effort we can not neglect the mental aspects that bodybuilding exerts on its practitioners. Therefore, we shall also find in bodybuilding workouts some working principles that we have divided depending on the acting direction, on the level to which it applies and on their specific character as well (Chirazi, Ciorba, 2006).

The development of each individual’s motor skills is a progress of biological, morphological, physiological, biochemical type, which leads to the improvement of tissue structures and to the increase of functional capacities of the cardiovascular, enzymatic, respiratory systems, all carriers of oxygen to muscle tissues. Human body expresses its power by making efforts in which the mechanical work is present or not. This effort is meant to overcome, to maintain or to give up, depending on the resistance to be defeated. It is necessary to distinguish between muscle power and strength. Strength means to overcome resistance without time condition while power refers to the mechanical work done per unit time (Bota, Prodescu, 1997).

Mechanical work is proportional to the size of the force that performs it and the length of the way on which this body is moved. Thus, if an athlete lifts a barbell of 20kg f, he makes a mechanical work twice bigger than if he lifts a barbell of 10 kg f and vice versa. At the same time, if the same athlete lifts a barbell 2 m high, he makes a mechanical work twice bigger than if he lifts it up to 1 m only (Gavrilescu, 2010).

In the light of the modern biochemistry and physiology data, the achievement of athletes’ muscles functional hypertrophy, during strength workout, requires the following elements (Demeter, 1981): intense biological stimulant, proper contribution of proteins and presence of endogenous anabolic hormones, in necessary quantities.

For most sports, the relative importance of strength related to the other factors is not safe. A certain sport is based on the continuous observation and development of strength/power: to one extreme are placed the sports in which these factors are of major importance, to the other extreme are placed the sports in which these factors are not given their importance. Consequently, these sports can be called sports with

limited power/strength or *dependent* sports, *associated* sports with strength/power and *independent* sports in terms of strength / power (Sports Physiology Collection: Sport of High Performance, 2006).

In the course of bodybuilding exercises, different types of effort are made, which tend, as essential elements, to practitioner’s modeling in and on the proper competitive orientation.

As the bodybuilding is a complex sports branch, the isometric type efforts (isometric contractions – in which the muscle shortens under a passive tension) are combined with the isotonic efforts (isotonic contractions – in which the muscle does not change its dimensions, but only its tension status).

The volume, the amount of work done includes the preparation duration; the number of kilograms, or tons/weights lifted in a training session or a preparation stage, as well as the number of reps and sets per exercise or training session. In the strength training, the intensity is expressed as a percentage of the load or of a maximum repetition (Bompa, 2002).

Strength is human capacity (biological and psychological) to overcome external resistance measured in kilograms, using barbells and dynamometry. From physiological and biochemical point of view, muscle strength exercise includes: activating a large number of motor units, frequency of the associated nervous impulses, the degree of synchronization of different motor units and the biochemical and structural particularities of the muscles involved in the effort (Nicu, 1993).

The strength workout and the static contractions workout are designed to produce the maximum possible overload for each muscle or group of muscles targeted. After years of experiments and researches, it was found out that the most efficient method to maximize overload is to use sets of strength partial exercises. Using the most powerful set for most exercises means to utilize”the last centimeters of the grip” that you have. Thus, one can exercise with maximum load without being exposed to injury (Bodybuilding, 2007)

The bodybuilding workouts focus on the alternation of muscle efforts with rest, on a strict diet, on a really hygienic daily life. Thus, the bodybuilding has established itself as a social reality because its field is well defined, holding a great variety of exercises, with specific training methods and principles, and because it has a multiple utility, as it is accessible to all ages, it can be practiced by men and women as well and the physical effort can be very accurately and finely dosed.

In bodybuilding, the main objectives (muscle development and definition, muscle harmonization and strength development) are achieved by means of exercises with weights. When we talk about food intake (component of training in bodybuilding, subject matter of a special chapter) we refer to the actual food, to nutritional supplements, as well as body rebalancing with

minerals and vitamins. In other sports activities, food intake is part of the restoration and recovery means. In bodybuilding, because of the particular importance that food intake has in different moments of the competitive calendar (sometimes it is more important than the effort made during the training itself) we have considered it as a distinct side. The matters related to recovery in bodybuilding refer on rest, massage, restoration. When we talk about bodybuilding training principles, we shall detail some aspects of mental preparation.

Methodical procedures for strength development (Dragnea, Mate-Teodorescu, 2002):

1. Weightlifting procedure: it is achieved by load progressive increase, by weights increase and decrease, by load increase step by step and in full swing.

2. Isometric procedure – it is the procedure used for the development of muscular mass, the contraction duration is 9-12 seconds; the pause between reps is 90-120 seconds.

3. Circuit procedure – it is the most common methodical procedure of motor skills development, created for the development of main muscle groups strength, inclusively for the development of strength under endurance conditions. The exercises used in circuit must be known by the athlete, must be accessible in terms of volume, intensity and complexity of physical effort; the sequence of exercises must engage in effort the key muscle groups of human body. It is not recommended to make 2 successive exercises for the same muscle group. The difficulty of exercises must increase progressively. The dosage of physical effort in this type of exercises must be strictly individualized – individual sheets.

According to the number of exercises used in circuit we have:

- short circuits – 6-7 exercises;
- average circuits – 8-9 exercises;
- long circuits 10-12 exercises.

4. Isotonic and rapid contractions procedures – used for explosive strength development, namely for strength under speed conditions (recommended for vascularity and muscle definition).

5. Procedure of efforts repeated up to overflowing – it involves a large number of reps with average weights; the efficiency of this procedure is obvious after the installation of the real fatigue. It is a very good procedure for novice bodybuilders, as it is the foundation of muscle development.

6. Power-training procedure – is used to develop explosive strength; it is recommended for obtaining the competitive vascularity and muscle definition necessary for contest. It consists of 3 exercise groups:

- group 1 – exercises with average weights;
- group 2 – exercises with maximum weights;
- group 3 – aerobic exercises.

A work program includes 12 exercises divided into 3 groups, each one including 4 exercises. After running a group of exercises, the rest is 3-5 minutes.

The main **purpose** of the study is to emphasize the methodical issues regarding back muscles strength

development by a combination of the methodical procedures in bodybuilding for masses.

Study hypotheses:

We believe that an effective use of back strength exercises for the same muscle group by means of giant sets during a training session will help improve muscle strength and will increase strength at different machines.

Dividing back muscles areas during each training micro-cycle will highlight the dynamics of muscle strength and the possibility to combine muscle groups together throughout a training mezz-cycle.

Place of study conduct, subjects

To address these methodological aspects of the back muscle strength development, we conducted a case study in the Sports Club „Tonik Fitness Club” of Bucharest.

The subjects of the study were 2 athletes, aged 28 and 34, respectively, practitioners of fitness for masses till the present moment.

Duration and stages of study conduct

The study was conducted over a 2 months period (March – April 2011), four times a week.

Stages of study carrying out:

1. *Initial stage* (6.-11.III.2011), initial testing of measurements and control trials.
2. *Fundamental stage* (13.III-20.IV.2011), applying the training programs.
3. *Final stage* (23.-27.IV.2011) final testing of control measurements and trials.

Methods

- *Bibliographic study* - theoretical documentation of the paper

- *Observation method* – observation of subjects’ performances during preparation;

- *Method of experimental study* – method in which the study hypotheses were confirmed or invalidated.

- *Statistical-mathematical method* – meant to calculate the main statistical indices (KyPlot).

- *Method of graphical representation* – it contributed to a more efficient interpretation of study results.

Control tests and trials applied

To point out subjects’ evolution regarding the development of back muscles, we used the control tests and trials below:

A. Anthropometric measurements: Size (cm); Weight (kg); Thoracic perimeter (cm): inspiration, expiration and thoracic amplitude; Arms perimeter (cm): right and left

B. Control tests applied:

1. Bar pull-downs with large grip, assessed by maximum number of reps;

2. Cable machine chest pull-downs, assessed by number of reps with maximum weight;

3. Seated row with large grip, assessed by number of reps with maximum weight.

Content of training program

Back width is one that proclaims you a true bodybuilder. We believe that referees too notice you initially on stage, even if you are relaxed, if they see you have a very broad back. Bodybuilders with broad back and shoulders and a small waist draw attention wherever they are (Bodybuilding and Fitness, 2011).

To highlight the methodological aspects of back muscles strength development by *progressive increase of effort load throughout giant sets* in performance bodybuilding, we shall introduce training programs

depending on muscle area and the specific methodical aspects. Modern training technique in the workout with weights involves working with sets of reps, in which weight is managed so as the muscle receives continuously the proper request (Ş. Damian, in "Giant sets" presents that training methodical procedure that enables the performance of two or more different exercises, without any pause between them, addressing the same muscle group (Oprea, 2009).

Weekly training program:

- Monday : back + triceps + abdomen + cardio
- Wednesday: shoulders + legs + abdomen
- Friday: chest + biceps + abdomen + cardio

Example: a training model:

MONDAY: BACK + TRICEPS

1. Exercise with giant sets: Bar chest pull-downs with large grip + Cable machine pull-downs with large grip

Exercises		Set I	Set II	Set III	Set IV
Bar pull-downs	no. of reps	10	10	10	10
Cable machine pull-downs	kg	41	49	57	65
	reps	10	10	10	10

2. Exercise with giant sets: Bar chest pull-downs with large grip + Cable machine pull-downs with large grip + Machine seated row

Exercises		Set I	Set II	Set III	Set IV
Bar pull-downs	no. of reps	8	8	8	8
Cable machine pull-downs	kg	73	81	89	97
	reps	10	10	10	6
Seated row	kg	40	48	56	64
	reps	10	10	10	10

3. Exercise with giant sets: Bar chest pull-downs with large grip + Cable machine pull-downs with large grip + Machine seated row + "Smith" machine pull-downs

		Set I	Set II	Set III	Set IV
Bar pull-downs	no. of reps	8	8	8	8
Cable machine pull-downs	kg	89	81	73	65
	reps	10	10	10	6
Seated row	kg	72	80	88	96
	reps	10	8	6	3
"Smith" machine pull-downs	kg	64	72	80	88
	reps	10	10	10	10

TRICEPS:

1. Forehead „Z” bar extensions from supine position on bench + push-ups at parallel bars

		Set I	Set II	Set III	Set IV
Forehead „Z” bar extensions from supine position on bench	reps	10	10	10	10
	kg	33	41	49	57
Parallel bars push-ups	reps	10	10	10	10

2. Forehead „Z” bar extensions from supine position on bench + push-ups at parallel bars + string extensions at cable machine

		Set I	Set II	Set III	Set IV
Forehead „Z” bar	reps	10	10	10	6

extensions from supine position on bench	kg	65	73	81	89
Parallel bars push-ups	reps	10	10	10	10
String extensions at cable machine	reps	10	10	10	10
	kg	20	25	33	41

3. Forehead „Z” bar extensions from supine position on bench + push-ups at parallel bars + string extensions at cable machine + „Z” bar extensions with supine grip

		Set I	Set II	Set III	Set IV
Forehead „Z” bar extensions from supine position on bench	reps	10	10	10	6
Parallel bars push-ups	reps	10	10	10	10
String extensions at cable machine	reps	10	8	10	10
„Z” bar extensions with supine grip	kg	49	57	49	41
	reps	33	41	49	56
	kg	10	10	10	10

Results

Table no.1. Anthropometric measurements

No.	Full name	Age (years)	Weight (kg)		Size (cm)
			Initial	Final	
1	C.A.	29	85	83	176
2	P.V.	34	71	69.5	168
Statistical indices					
Mean		31.5	78	76.25	172
S.E.M.		2.5	7	6.75	4
S.D.		3.53	9.8	9.54	5.65
Variance		12.5	98	91.12	32
Coef. Var.		0.11	0.12	0.125	0.03
Sum		63	156	152.5	344

Analyzing the results of anthropometric measurements, the subjects of the study have an average *age* of 24.75 with a *size* of 175.2 cm, while the *weight* at initial testing is 83.75kg and a decrease by 2.12kg at final testing, showing a high homogeneity and significant differences between tests (table no. 1).

Table no.2. Anthropometric measurements

No.	Full name	Thoracic perimeter (cm)						Arms perimeter (cm)			
		Inspiration		Expiration		Amplitude		Right		Left	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
1	C.A.	111	112	108	110	3	4	41	41.5	40.5	41
2	P.V.	112	114	108	110	4	4	42	42.5	42.5	43
Statistical indices											
Mean		11.5	113	108	110	3.5	4	41.5	42	41.5	42
S.E.M.		0.5	1.0	0	0	0.5	0	0.5	0.5	1.0	1.0
S.D.		0.71	1.41	0	0	0.71	0	0.71	0.71	1.41	1.41
Variance		0.5	2.0	0	0	0.5	0	0.5	0.5	2.0	2.0
Coef. Var.		0.01	0.01	0	0	0.2	0	0.02	0.01	0.03	0.03
Sum		223	226	216	220	7	8	83	84	83	84

The thoracic perimeter, at *inspiration* shows an average of 89.5 at initial testing and an increase by 2.25cm at final testing, at *expiration* the average is 85.25cm at initial testing and an increase by 1.75cm at final testing, while the *amplitude* is 4.25cm at initial testing and an increase by 1.0 cm at final testing, having a high

homogeneity in all cases and significant differences between tests at inspiration and expiration and *insignificant differences* between tests in terms of thoracic amplitude (table no. 2).

Arms perimeter – at initial testing, *right arm* has an average of 38.25cm and an increase by 0.65cm at final testing, *left arm* has an average of 38.88cm at

initial testing and an increase by 0.12cm at final testing, with high homogeneity at both tests and significant

differences between tests (table no. 2).

Table no.3. Results of control trials

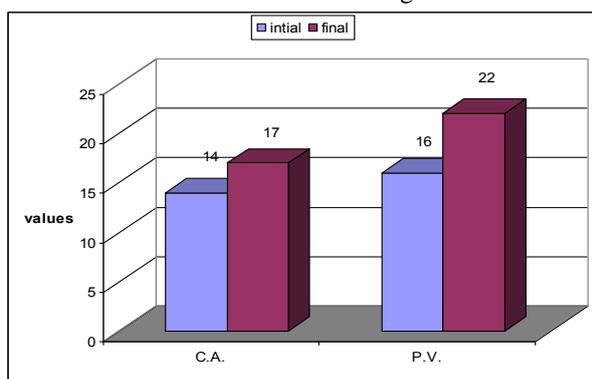
No.	Full name	Bar pull-downs, reps no.		Cable machine chest pull-downs, kg/ reps no.				Machine seated row, kg/ reps no.			
		Initial	Final	Initial		Final		Initial		Final	
				Kg	reps	Kg	reps	Kg	reps	Kg	reps
1	C.A.	14	17	80	12	96	8	88	12	96	10
2	P.V.	16	22	88	14	104	10	96	10	120	8
Statistical indices											
Mean		15	19,5	84	13	100	9	92	11	108	9
S.E.M.		1	1	4	1	4	1	4	1	12	1
S.D.		1.41	2.5	5.6	1.4	5.6	1.4	5.65	1,41	16.9	1.4
Variance		2	3.53	32	2	32	2	32	2	288	2
Coeff. Var.		9.42	18.1	6.7	10.8	5.6	15.7	6.14	12,8	15.7	15.7
Sum		30	39	168	26	200	18	184	2	216	18

1. **Bar pull-downs**, assessed by maximum number of reps, at initial testing - 15 reps, at final testing – 19.5 reps (table no. 3, fig.1a and graph 1).

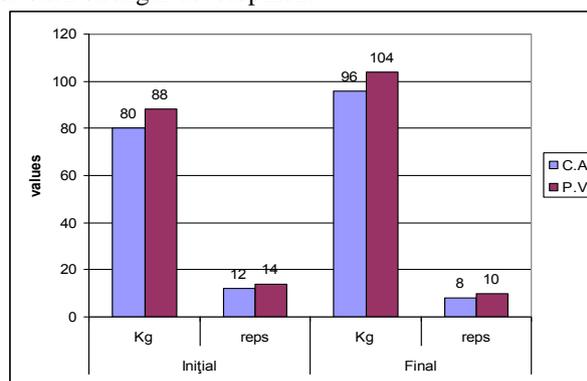
2. **Cable machine chest pull-downs**, assessed by number of reps with maximum weight, estimated by maximum number of reps at initial testing with an average of 84kg with 13.0 reps, and an average of de 100kg with 9.0 reps at final test (table no. 3, fig.1b and graph no. 2).



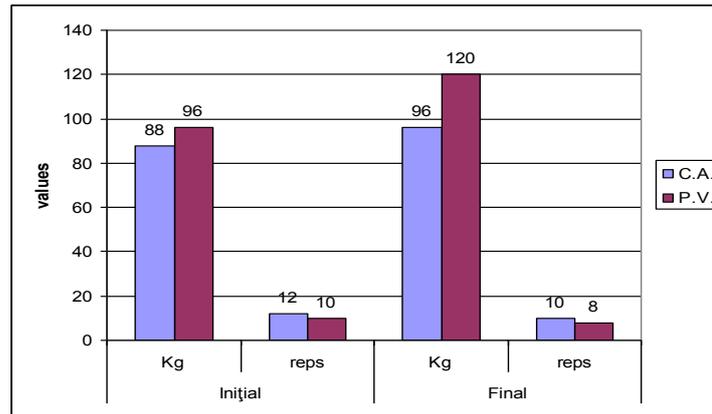
Figure 1. Exercises for back strength development



Graph no. 1. Bar pull-downs



Graph no. 2. Cable machine chest pull-downs



Graph no. 3. Machine seated row

3. Machine seated row for shoulders strength, assessed by maximum number of reps at initial testing, with an average of 92kg with 11.0 reps, while at final

Discussions
 The study focused on preparation programs, throughout two months, monitoring statistically the development of back muscles strength by applying the procedure of increase and decrease of effort load during the giant sets in the bodybuilding for masses.

The analysis of the content of training programs means showed that three sets of giant exercises were used, performed in 4 series, each exercise of the giant sets was applied by means of effort load increase and decrease procedure.

Study results highlight the results of anthropometric measurements: the subjects of the study have an average age of 24.75, a size of 175.2 cm, and the weight at initial testing was 83.75kg with a decrease by 2.12kg at final testing. In terms of thoracic perimeter, at inspiration there is an average of 89.5 at initial testing and an increase by 2.25cm at final testing, at expiration the average is 85.25cm at initial testing and an increase by 1.75cm at final testing, while the amplitude – an average of 4.25cm at initial testing and an increase by 1.0 cm at final testing. As for arms perimeter, at initial testing the right arm has an average of 38.25cm and an increase by 0.65cm at final testing, the left arm – an average of 38.88cm at initial testing and an increase by 0.12cm at final testing.

From the analysis of back muscles strength testing, we noticed an increase by 4.5 reps at final testing at „bar pull-downs”, an increase by 16kg of the load at „cable machine chest pull-downs”, with an average of 84kg at initial testing and 100 kg at final testing, performed with 13 reps at initial testing and a decrease by 4 reps at final testing. As for „machine seated row” we notice an increase of the load average by 16 kg, with an average of 92kg at initial testing and an average of 108kg at final testing, performed with 11 reps at initial testing and a decrease by 2 reps at final testing.

Conclusions

To highlight the methodological aspects of back muscle strength development in bodybuilding for masses, we conducted a case study in the Sports Club

test it was recorded an average of 108kg with 9.0 reps, (table no. 3, fig.1c and graph no. 3).

„Tonik Fitness Club” of Bucharest; during this methodical approach, we have applied control tests and trials.

The study results show that the regular exercising leads to a decrease of body weight, an increase of thoracic amplitude, of arms perimeters and last, but not least, to strength development per different muscle groups.

In the end of the paper we can conclude the following matters:

- the study highlights methodological issues on the back muscles strength development by combining methodological procedures in bodybuilding, by increasing and decreasing effort load during giant sets.

- the effective use of strength exercises for back on the same muscle area by means of giant sets during a training session helps to improve muscle endurance and to increase strength at different machines.

- the division of back muscles areas during each training micro-cycle emphasizes the dynamics of muscle strength and the possibility to combine muscle groups together during a training mezzo-cycle.

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