

## DEVELOPMENT OF BACK MUSCLES STRENGTH BY ALTERNATING GRIPS DURING THE SAME EXERCISE IN PERFORMANCE BODYBUILDING

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### Abstract

**Purpose.** The main purpose of the study is to point out the back muscles strength development by using different grips during the same exercise in performance bodybuilding.

**Methods and procedures.** The study was conducted over a period of one mezzo-cycle of training (March 2010), in three stages, each one containing four training sessions a week applied on a subject 34 years old, former amateur bodybuilder, motivated to compete at local or even national level in the future. The athlete's progresses were monitored during the training session, by means of statistical-mathematical and plotting methods. For highlighting the subject's evolution in terms of pectoral muscles development, we have used control tests and trials of the anthropometrical data and trials for the assessment of back muscles strength. The methodical procedure of grips alternation during the same exercise was applied for the development of back muscles strength, using means for back development with different grips, at distance, close and in supination positions.

**Results.** The study results present the development of the anthropometric measurements of the somatic indicators involved in training. These ones emphasize the efficiency of strength exercises for the development of back muscles strength, by using different grips during the same exercise. In order to check up the back muscles strength development, control trials were applied, monitoring the number of reps depending on the load used both during the initial testing and the final one. For pointing out the dynamics of back muscles development, we showed the relationship of reps number and weights used for each exercise, depending on the grips used.

**Discussions.** In terms of contents of the means for development of back muscles strength, a program of exercises using different grips during the same exercise on different machines was exemplified in this study. Regarding the somatic development following up the application of the exercises program, the following matters have been noticed: a decrease of the body weight by 5kg and of the waist by 1.5cm; an increase of the thoracic amplitude by 2.5cm and an increase of arms perimeter by 0.5cm. As for the results of the control trials of back muscles strength, we noticed an increase by 3 reps at pull-ups and by 5 reps at pull-downs with a load of 80kg. The analysis of the results of back muscles strength during the employed program pointed out an increase of reps number, depending on the grip used, the loads used and the muscle groups involved in the exercise.

**Conclusions.** The alternation of grips during the same exercise for back muscles strength development during the bodybuilding workout leads to the increase of muscular strength and muscular mass.

The efficient use of methodical procedures through the variation of effort parameters during the back strength workouts contributes to the development of muscle strength and to the definition of the muscle groups involved in effort.

An optimum relationship of the reps number and the weights employed for each set by using various grips will highlight the level of development of back muscles strength along the same exercise.

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### Introduction

The bodybuilding is a very creative sport, in which the athlete and the coach handle the sets, reps and speed of the training in order to reach the highest level of exhaustion, followed by a period of rest and recovery (A. Muraru, 2008); it is the process of muscles development through a combination of weights workouts, increased calories consumption and rest. The achievement of sports performance would not be possible if the athlete does not „hold” in his genetic code a certain motor quantity and quality.

More than in other sports disciplines and branches, the bodybuilding highlights both human body aesthetic posture and motor skills.

The development of each individual's motor skills is a biological, morphological, physiological, biochemical progress, resulting in improvement of tissue structures and in increase of functional capacities of the cardiovascular, enzymatic systems, of the respiratory system, as all of them are carriers of oxygen at muscle tissue level. The human body expresses its strength by making efforts in which the mechanical work is present or not. The effort done is meant to win, maintain or surrender depending on the resistance that

must be overcome. It is necessary to distinguish between muscle strength and power. Strength is overcoming resistance without depending on time, while the power refers to the mechanical work done in unit time (C. Bota, B. Prodescu, 1997).

The mechanical work is proportional to the size of the strength that makes this work and to the length of the way on which is moved that body. Thus, if an athlete raises a barbell of 20kp, he performs a mechanical work two times higher than if he lifts a 10 kp barbell and vice versa. However, if the same athlete lifts a barbell up to 2 m high, he makes a mechanical work two times higher than if he lifts the barbell only 1 m high (D. Gavrilesu, 2010).

The volume, the amount of work done includes training duration, the number of kilograms or tons/ weights lifted in a session or training stage, also the number of reps and sets per exercise or training session. In strength training, the intensity is expressed as a percentage on weight or on a maximum rep (IRM). The intensity is a function of nervous stimuli strength used in the training session. The load must relate to the type of strength developed and, most importantly, to the specific combination of the sport, resulting from the amalgamation of strength and speed or of strength and endurance (T.O. Bompa, 2002).

Different types of efforts are made in the course of bodybuilding exercises, which tend – as essential elements - to guide the practitioner in and to the proper competitive orientation. As the bodybuilding is a complex sports branch, the efforts of isometric type (isometric contractions - the muscle shortens under a passive stress) are combined with the isotonic ones (isotonic contractions – the muscle does not change its size, but only its stress status).

Strength is the human ability (biological and mental) to overcome an exterior resistance measured in kilograms, by means of weightlifting and dynamometry. From physiological and bio-chemical point of view, the exercising of muscle strength involves: the activity of a number as large as possible of motor units, the frequency of the associated nervous impulses, the degree of synchronization of different motor units and the bio-chemical and structural features of the muscles engaged in effort.

In the light of modern biochemistry and physiology data, reaching the functional muscle hypertrophy in athletes, throughout the strength workouts, requires the following elements (A. Demeter, 1981): intense biological excitant, adequate infusion of proteins and presence of endogenous anabolic hormones in the quantities needed.

For the major part of sports, the relative importance of strength related to the other factors does not represent safety. A sport is based on continuous observation and development of strength/power: at one extreme can be found the sports in which these factors have a major importance, at the other extreme are situated the sports that do not attach importance to these ones. Consequently, these sports can be named

limited power/strength sports or *dependent* sports, sports *associated* with strength/power and *independent* sports from the point of view of strength/power (\*\*\*) (2006).

Due to the accumulation of various theoretical data carried over the years of experience and testing, a group of specialists in the art of harmonious sculpturing of the body, headed by the renowned scientist Joe Weider, specialist of bodybuilding working technique, have laid the foundations of Weider work system, based on a set of training principles for developing both each muscle group separately and the whole body as well.

(D. Hîtru, 2002).

The work for strength development primarily supposes determining the type of strength involved by the competitive activity of the respective event or branch. After analyzing the competitive activity, the involved type of strength is established and then the methods to be used are determined. In all these methods is necessary to establish the basic parameters: *intensity, volume of work, breaks and tempo*.

The training for strength and the training for static contractions are designed to produce maximum possible overload to each targeted muscle or muscle groups. After years of experimentation and research it has been found that the most effective way to maximize overload is to use sets of partial strength exercises.

The use of the most powerful set for most of exercises means to use the "last centimeters of the grip" that you have. Thus, one can exercise with a maximum load without being exposed to injuries (\*\*\*) (2007)

*Methodological procedures for strength development* (A. Dragnea, S. Mate-Teodorescu, 2002):

1. Weights lifting procedure: it is achieved by progressive increase of the load, by increasing or decreasing weights, by increasing the load "step by step" and "in full swing".

2. Isometric procedure: it is the procedure used for developing the muscle mass; the contraction duration is 9-12 seconds; the pauses between reps are 90-120 seconds.

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

Depending on the number of exercises used in the circuit, we have:

- Short circuits – 6-7 exercises;

- Average circuits – 8-9 exercises;
- Long circuits - 10-12 exercises.

4. Procedure of rapid isotonic contractions – it is used for developing the explosive strength, namely strength under speed conditions (it is recommended for vascularity and for muscular 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 represents 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. 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 the execution of a group of exercises, the break is 3-5 minutes long.

**Purpose of the study:** highlighting the development of back muscles strength, by alternating different grips during the same exercise in performance bodybuilding.

**Study hypotheses:**

Alternative grips during the same exercise meant to develop the back muscles strength in bodybuilding workouts will lead to the increase of muscle strength and muscle mass.

The effective use of methodical procedures by varying the effort parameters during the back strength workouts will contribute to the development of muscle strength and to the definition of muscle groups involved in the effort.

An optimum relationship provided between the number of reps and the loads used for each set, by using different grips, will highlight the development of back muscles strength during the same exercise.

**Place of study conduct, subjects**

In order to point out the content of training means by grips alternation, for back strength development in performance bodybuilding, we have conducted a study of case in the sports club „Tonik Fitness Club” of Bucharest; the subject of the study is 34 years old, former amateur bodybuilder, motivated to participate in zonal or even national competitions in the future.

The study was conducted over a period of one training mezza-cycle (March 2010), four training sessions a week.

**Methods of research:**

-*Bibliographic study* – theoretical documentation of the book

-*Observation method* – observation of subjects' performances during training sessions;

-*Method of experimental study* – method for confirming or invalidating the study hypotheses

-*Statistical and mathematical method* – used for calculating the main statistical indices: X – arithmetical mean, Am – standard deviation, S – standard deviation; Cv% - coefficient of variability, r – coefficient of correlation and t – significance of correlation

- *Plotting method* – it contributed to a more efficient interpretation of study results.

**Control tests and trials:**

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

**B. Control trials:**

1. Cable machine pull-downs with large grip 80kg, assessed by maximum number of reps.

2. Bar pull-downs with alternated grips, assessed by number of reps with weights (10kg, 15kg, 20kg).

**Training program applied for back strength development**

For the development of back muscles strength, we have used the methodical procedure of grips alternation during the same exercise. This procedure is meant to increase the muscle mass.

**Exercises used during the workouts:**

**1. Exercises with large grip:**

- Bar pull-downs with large grip: 4 sets 8 reps, using weights (10kg, 15kg, 20kg);
- Cable-machine pull-downs with large grip: 4 sets 10 reps (40kg, 80kg, 104kg, 120kg);
- Seated row with large grip: 4 sets 25 reps (41kg, 57kg, 73kg, 89kg);
- „Smith” machine pull-downs with large grip: 3 sets 20, 40, 60 reps (73kg, 65kg, 56kg).
- Bar behind neck pull-downs with large grip: 4 sets 8 reps, using weights (10kg, 15kg, 20kg);
- Press behind neck pull-downs with large grip: 4 sets 10 reps (40kg, 56kg, 81kg, 96kg);
- Cable machine row in horizontal plane with large grip: 4 sets 25 reps (40kg, 48kg, 56kg, 64kg).



Figure no. 1. Bar and cable machine pull-downs with large grip

**2. Exercises with close grip**

- Chest bar pull-downs with close grip: 4 sets 8 reps, using weights (10kg, 15kg, 20kg);
- Handles cable machine pull-downs: 4 sets 10 reps (40kg, 80kg, 104kg, 120kg);
- „Smith” machine pull-downs with large parallel grip: 4 sets 10 reps (40kg, 56kg, 80kg, 96kg)
- Seated row with close grip: 4 sets 25 reps (41kg, 49kg, 57kg, 65kg);
- Handles cable machine row in horizontal plane: 3 sets 30, 60, 90 reps (64kg, 56kg, 48kg);



Figure no. 2. Bar and cable machine pull-downs with close grip

**3. Exercises with grip in supine position**

- Bar pull-downs with grip in supine position: 4 sets 8 reps, using weights (10kg, 15kg, 20kg);
- Cable machine pull-downs with grip in supine position: 4 sets 10 reps (40kg, 80kg, 104kg, 120kg);
- Seated row with grip in supine position: 4 sets 25 reps (41kg, 49kg, 57kg, 65kg);
- Cable machine row in horizontal plane with grip in supine position: 3 sets 30, 60, 90 reps (64kg, 56kg, 48kg);



Figure no. 3. Pull-downs with grip, in supine position

**RESULTS OF THE STUDY AND THEIR INTERPRETATION**

Table no. 1. Anthropometrical measurements

No.	Full name	Age (years)	Weight (kg)		Size (cm)	Waist (cm)	
			Initial	Final		Initial	Final
1	B.V.	35	80	75	166	89	87.5

Table no.2. Anthropometrical measurements - thoracic perimeter

No.	Full name	Thoracic perimeter (cm)						Arms perimeter (cm)			
		Expiration		Inspiration		Elasticity		Right		Left	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
1	R.V.	106	105	112	114.5	6	9.5	42	42.5	41.5	42

In tables no. 1, 2 and 3 are summarized the results of anthropometrical measurements, highlighting the following somatic indices: size, weight, waist, thoracic perimeter and arms perimeter.

Table no. 3. Results of control trials for back muscles strength

Full name	Bar pull-downs (max no of reps)		Cable pull-downs with 80kg (max no of reps)	
	Initial	Final	Initial	Final
B.V.	21	24	31	36

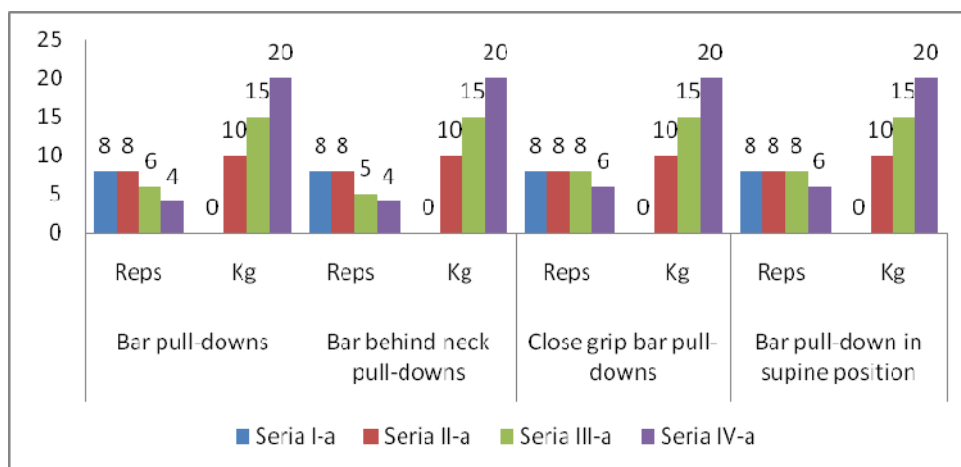
In table no. 3 are summarized the results of control trials meant to evaluate the back muscles strength.

Table no. 4. Results of back strength (bar pull-downs exercise)

	Bar pull-downs		Bar behind neck pull-downs		Close grip bar pull-downs		Bar pull-down in supine position	
	Reps	Kg	Reps	Kg	Reps	Kg	Reps	Kg
1 <sup>st</sup> set	8	-	8	-	8	-	8	-
2 <sup>nd</sup> set	8	10	8	10	8	10	8	10
3 <sup>rd</sup> set	6	15	5	15	8	15	8	15
4 <sup>th</sup> set	4	20	4	20	6	20	6	20
Statist. indices								
Mean	6.5	15	6.25	15	7.5	15	7.5	15
SEM	0.95	2.8	1.03	2.88	0.5	2.88	0.5	2.88
SD	1.91	5	2.06	5	1	5	1	5
Variance	3.6	25	4.25	25	1	25	1	25
Coeff. Var	0.29	0.3	0.32	0.33	0.13	0.33	0.33	0.33

In table no. 4. and graph no. 1 are listed the results of back muscles strength at bar pull-downs exercise, showing the number of pull-downs and the weights used during sets.

In table no. 5 and graph no. 2 are summarized the results of back muscles strength during the cable machine pull-downs exercise, using large grips; they show the number of reps and the weights applied in each set and exercise.

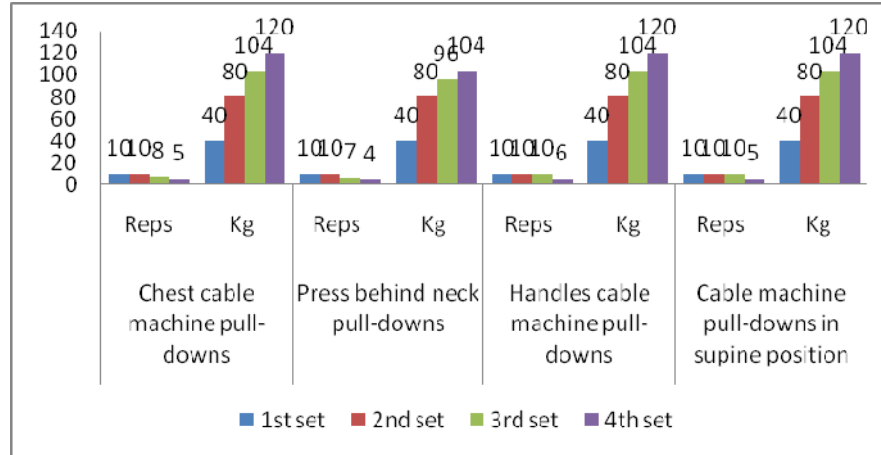


Graph no.1. Results of back strength (bar pull-downs exercise)

Table no. 5. Results of back strength (cable machine pull-downs exercise)

	Chest cable machine pull-downs		Press behind neck pull-downs		Handles cable machine pull-downs		Cable machine pull-downs in supine position	
	Reps	Kg	Reps	Kg	Reps	Kg	Reps	Kg
1 <sup>st</sup> set	10	40	10	40	10	40	10	40
2 <sup>nd</sup> set	10	80	10	80	10	80	10	80
3 <sup>rd</sup> set	8	104	7	96	10	104	10	104
4 <sup>th</sup> set	5	120	4	104	6	120	5	120
Statist. indices								
Mean	8.25	86	7.75	80	9	86	8.75	86
SEM	1.18	17.3	1.43	14.2	1	17.4	1.25	17.3
SD	2.36	34.7	2.87	28.4	2	34.7	2.5	34.7
Variance	5.58	1210.6	8.25	810.6	4	1210.6	6.25	1210.6

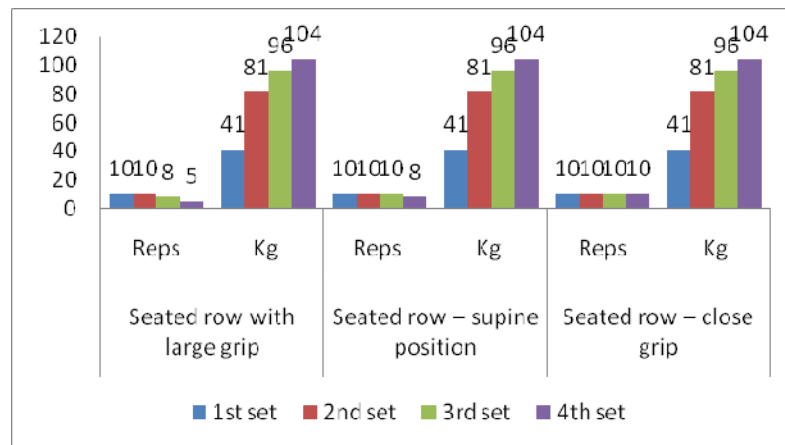
Coeff. Var	0.28	0.41	0.37	0.35	0.22	0.41	0.28	0.41
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Graph no. 2. Results of back strength (cable machine pull-downs exercise)

Table no. 6. Results of back strength (seated row exercise)

	Seated row with large grip		Seated row – supine position		Seated row – close grip	
	Reps	Kg	Reps	Kg	Reps	Kg
1 <sup>st</sup> set	10	41	10	41	10	41
2 <sup>nd</sup> set	10	81	10	81	10	81
3 <sup>rd</sup> set	8	96	10	96	10	96
4 <sup>th</sup> set	5	104	8	104	10	104
Statist. indices						
Mean	8.25	80.5	9.5	80.5	10.0	80.5
SEM	1.18	14.0	0.5	14.0	0.0	14.0
SD	2.36	28.0	1.0	28.0	0.0	28.0
Variance	5.58	784.3	1.0	784.3	0.0	784.3
Coeff. Var	28.6	34.7	10.5	34.7	0.0	34.7

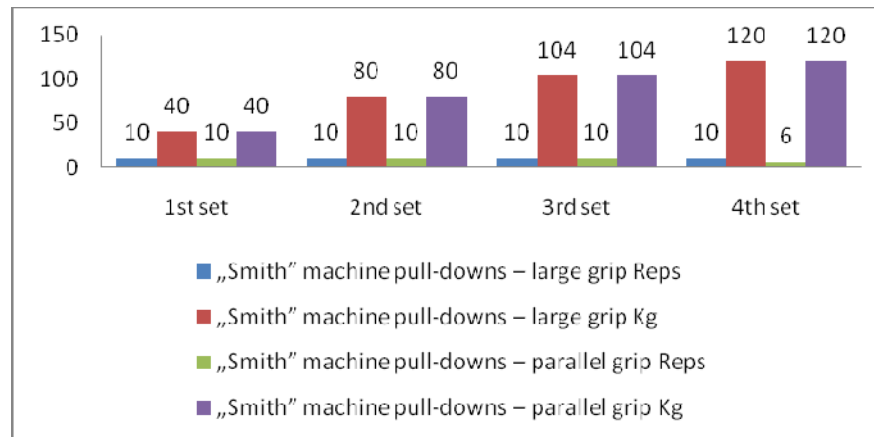


Graph no. 3. Results of back strength (seated row exercise)

In table no. 6 and graph no. 3 are summarized the results of back muscles strength during seated row exercise, using various grips; it shows the number of reps and the weights applied for each set and exercise.

Table no. 7. Results of back strength („Smith” machine traction exercise)

	„Smith” machine pull-downs – large grip		„Smith” machine pull-downs – parallel grip	
	Reps	Kg	Reps	Kg
1 <sup>st</sup> set	10	40	10	40
2 <sup>nd</sup> set	10	80	10	80
3 <sup>rd</sup> set	10	104	10	104
4 <sup>th</sup> set	10	120	6	120
Statist. indices				
Mean	10	86	9	86
SEM	0	17.4	1	17.4
SD	0	34.7	2	34.7
Variance	0	1210.6	4	1210.6
Coeff. Var	0	0.41	0.22	0.41



Graph no. 4. Results of back strength („Smith” machine pull-downs exercise)

In table no. 7 and graph no. 4 are presented the results of back muscles strength in Smith machine pull-downs exercise, by means of various grips, emphasizing the number of reps and the weights applied in each set and exercise.

### Discussions

To highlight the content of training means by alternating grips for back strength development in performance bodybuilding, a case study was conducted in the sports club "Tonik Fitness Club" of Bucharest, applied to an athlete aged 34, practitioner of amateur bodybuilding for the last 4 years.

Regarding the development of back muscle strength, the methodical procedure of grip alternations during the same exercise has been used to increase muscle mass.

Analyzing the training program during workouts, it was noticed that the alternation of grips throughout the same exercise was used in the case of: bar pull-downs, cable machine pull-downs, seated row and „Smith” machine pull-downs.

To check the development of back muscle strength, control trials have been applied, paying

attention to the number of reps depending on the load used both during the initial test and final test.

In terms of anthropometric measurements results, we notice a weight of 80kg at initial testing and a decrease by 5 kg at the final testing; the waist is 89cm at initial testing and a decrease by 1.5cm at final testing, with a size of 166cm.

Regarding the control tests results on the development of back muscles strength, it can be noticed that in the case of bar pull-downs were performed 21 repetitions at initial testing with an increase by 3 pull-downs in final testing; in the case of cable machine pull-downs with 80kg load, 31 reps were performed at the initial testing with an increase of five reps in the final testing.

The analysis of the means used during workouts showed that 4 sets have been executed at

each exercise, at *bar pull-downs* there were used weights of 10kg, 15kg and 20kg; depending on the grip applied, the number of reps increased or decreased, and their average ranged from 6.25 to 7.5 reps per exercise with a load of 15kg.

As for the results of back muscles strength at the *cable machine pull-downs exercise*, we noticed that 4 sets of 10 reps/ set were executed, using a gradually increasing load of 40kg, 80kg, 104kg and 120kg; depending on the grip applied, the number of reps increased or decreased, their average ranging from 7.75 to 9.0 reps per exercise, with a load of 80-86kg.

Concerning the results of back strength at *chair seated row exercise*, it was noticed that three grips were used (large, supine and close), performing 4 sets of 10 reps / set; depending on the grip applied, the number of reps ranged from 8.25 to 10 per exercise, with a load of 85kg.

As for the results of back strength at "*Smith*" *machine pull-downs exercise*, the average of reps number was 10 reps and a load of 86kg per exercise.

#### Conclusions

The study highlights the development of back muscle strength by using different grips in the same exercise in performance bodybuilding.

The alternation of grips during the same exercise meant to develop the back muscles strength in bodybuilding workouts will lead to the increase of muscle strength and muscle mass.

The increase or the decrease of reps number depending on the grip and weight used, the effective use of methodical procedures by varying the effort parameters during the back strength workouts will contribute to muscle strength development and to the definition of muscle groups involved in the effort.

An optimum relationship provided between the number of reps and the loads used for each set, by using different grips, will highlight the development of back muscle strength during the same exercise.

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