

THE EFFECTS OF A FOUR-MONTH PROGRAM TRAINING FOR STRENGTH DEVELOPMENT IN ADOLESCENTS

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Abstract

The effectiveness of physical exercise has long been recognized for the treatment of multiple diseases as well as many positive metabolic effects such as improvements in lipid profile, reduced body fat and decreased blood glucose levels. Higher levels of physical activity and greater fitness are associated with a reduced incidence of hypertension and cardiovascular disease and mortality. Through this paper we want to observe the effects of the alternation of the two training methods (bulgarian methods in series and bulgarian method in the pyramid) meant to increase muscle strength.

Introduction

Strength training exercise offers many benefits for individuals of all ages and is perhaps critically important for the elderly (Nickols-Richardson, Miller, Wootten, Ramp, & Herbert, 2007).

The benefits associated with strength training are: 1) increase in lean body mass; 2) increase in metabolic rate; 3) increase in bone density; 4) decrease risk of injury; and 5) building back lost muscle tissue that commonly occurs with aging (Gleeson, Protas, LeBlanc, Schneider, & Evans, 1990), (Vainionpaa, Korpelainen, Leppaluoto, & Jamsa, 2005).

Strength training lead to muscle growth and strength gains. Strength training stabilizes bone and joints, lowers the risk of osteoporosis and accelerates the basal metabolic rate, consequently resulting in weight loss and optimized metabolism. The strength of the skeletal muscles in humans reaches their individual peak at approximately age 23. In women, these muscles make up about 30% of body weight and in men 40%. In physically inactive individuals, muscle mass decreases gradually up to the age of 55 and then at an accelerated pace, whereby the lower extremities are usually affected to a greater degree. By the age of 75, the overall muscle loss can reach 25-35% (Mathias, 2016).

Muscular strength is inversely and independently associated with death from all causes in men, even after adjusting for cardiorespiratory fitness and other potential confounders (Ruiz, și alții, 2008).

Strength determines a substantial part of physical working capacity, and improved muscular strength increases everyday activity level and energy expenditure. An average 20-year-old person can lift his/ her own body weight of external load in a half squat (down to 90 knee joint). Strength is on average reduced by 10% per decade from this age. A smaller part of the reduction of strength is due to the aging process whereas a larger part seems to be behavioral changes. Despite muscle strength reductions training responses seem to be similar between young and old, even very old, when expressed as % improvement (Hoff & Helgerud, 2012).

Research reports relating to loads and repetitions in strength training are stating that loads lower than 70% of 1RM gave no increase in strength, even if up to 150 contractions per day were used, while loads greater than 70% of 1RM with as few as ten repetitions per session increased maximal voluntary contraction from 0.2% to 2% per day. The increases in dynamic strength are greater when heavier loads are used. Seventy percent of 1RM is corresponding to being able to perform 15 repetitions. Loads that can be performed for more than 15 repetitions can thus not be characterized as strength training. Fewer repetitions and higher loads have shown more favorable training responses (Hoff & Helgerud, 2012).

The prevalent recommendation is to perform multiple sets (at least 3) of each exercise in order to elicit increases in muscular strength and hypertrophy. This recommendation appears at all levels in the scientific literature, including strength training reviews and exercise physiology textbooks. Multiple sets are superior to a single set (Atha, 1981), (Behm, 1995), (Clarke, 1973), (Fleck & Kraemer, 1988), (Lillegard & Terrio, 1994).

Methods

Four subjects between the ages of 17 and 21 were included in a four-month program designed to increase muscle strength, alternating Bulgarian methods in series, the Bulgarian method in the pyramid.

Table 1. Subjects baseline characteristics

Age (years)	18.5±1.29
Weight (kg)	73.75±9.94
Height (cm)	179±3.36

Note: Mean ± SD values of group

As tests, I used the 1RM (maximum repeat test) for horizontal bench press, seated leg press, Scott bench biceps curls and cable triceps. In the first month and in the third month I used the Bulgarian method in series, and in the second and fourth months I used the Bulgarian method in the pyramid. The subjects followed the training program twice a week with a duration of 60 minutes each training session. Prior to each training, the subjects underwent a 10-minute general warm-up (walking and treadmill running followed by a warm-up series before each exercise with a 40% load of 1RM).

Horizontal bench press. The person performing the exercise lies on their back on a bench with a weight grasped in both hands. They push the weight upwards until their arms are extended, not allowing the elbows to lock. They then lower the weight to chest level. This is one repetition.

Seated leg press. The subject placed on the specific device (press) places the feet on the presser's surface. In this position, the lower limbs of the subject are in the triple flexion position (flexion of the joints of the hips, knees, and ankles), and in the next stage the subject pushes into the defeated resistance, reaching the final position of the triple extension (extension from the joints hips, knees and ankles)

Scott bench biceps curls. The subject sitting at the Scott bench with his arms on the special pad for positioning the arms. From this position, the subject grasps the bar with the socket in the supination and performs the forearm flexion.

Cable triceps extension. The subject grabs the ropes or the bar attached to the helmet, with the arms bent on the arms, and from this position the subject performs the extension of the forearms. It is recommended that during the movement, the subject's body does not move, in order not to create inertia that would result in a "tricked" execution.

Table 2. Training program

Exercise	Sets	Reps	Rest	Weight	Weeks	Training day
Horizontal bench press	9	6 x 70% + 6 x 50%	120 sec.	70%, 50%	1 – 4 9 - 12	Monday
Seated leg press	9	6 x 70% + 6 x 50%	120 sec.	70%, 50%	1 – 4 9 - 12	Monday
Scott Bench biceps curls	9	6 x 70% + 6 x 50%	120 sec.	70%, 50%	1 – 4 9 - 12	Thursday
Cable triceps extension	9	6 x 70% + 6 x 50%	120 sec.	70%, 50%	1 – 4 9 - 12	Thursday
Horizontal bench press	9	12 reps. in a set as follow: 3 x 50% 2 x 60% 1 x 70% 2x 60% 3 x 50%	120 sec.	50%, 60%, 70%	5 – 8 13 - 16	Monday
Seated leg press	9	idem	120 sec.	50%, 60%, 70%	5 – 8 13 - 16	Monday
Scott Bench biceps curls	9	idem	120 sec.	50%, 60%, 70%	5 – 8 13 - 16	Thursday
Cable triceps extension	9	idem	120 sec.	50%, 60%, 70%	5 – 8 13 - 16	Thursday

After each month, the subjects resumed the 1RM test for the next month to calculate the intensities with which they will work according to the 1RM test preceding the current month.

Results and discussions

The results are presented in table 3 and in chart 1.

Table 3. Iniatial and final results

	Baseline	Intermediar 1	Intermediar 2	Intermediar 3	End of program
1RM horizonta l bench press	37.5±10. 40	42.25±13.9 3	45.25±15.2 8	47.25±15.8 6	49.5±15.92
1RM seated leg press	112.5±6 4.48	123.75±70. 16	129.25±73. 20	133±74.47	140.5±74.7 5
1RM Scott Bench biceps curls	16.25±7. 5	19±8.71	21±8.36	22.5±8.88	24±8.71
1RM cable triceps extension	14±7.65	17±8.71	18.5±9.25	19.75±8.99	21.75±8.30

Note: Data were expressed as Mean ± SD

After the first training month, muscle strength in the chest increased by 12% compared to baseline. At the end of the second month of training, strength at the same level increased by 7.1% compared to the previous month and at the end of the third month, the strength at the level of the chest muscles increased by 4.4% compared with the second month. In the fourth month, force at the same level increased by 4.7% compared to the third month.

In the 1RM seated leg press test, after the first month of training strength increased by 8.8% compared to the initial values, in the second month strength increased by 4.4% compared to the first month and at the end of the third month, muscles strength increased by 2.9% compared to the second month. In the last month, the strength increased by 5.6% compared to the third month.

At flexor forearm muscle strength, the strength increased by 16.9% after the first month of training compared to baseline, by 10.5% after the second month versus the first month and by 7.1% in the third month compared to the second month. At the end of the fourth month there was a 6.6% increase in strength compared with end-of-month results.

At extensor forearm muscle strength, the strength increased by 21.4% after the first month of training compared to baseline, 8.8% after the second month versus the first month and 6.7% in the third month compared to the second month. At the end of the fourth month there was a 10% increase in strength compared with end-of-month results.

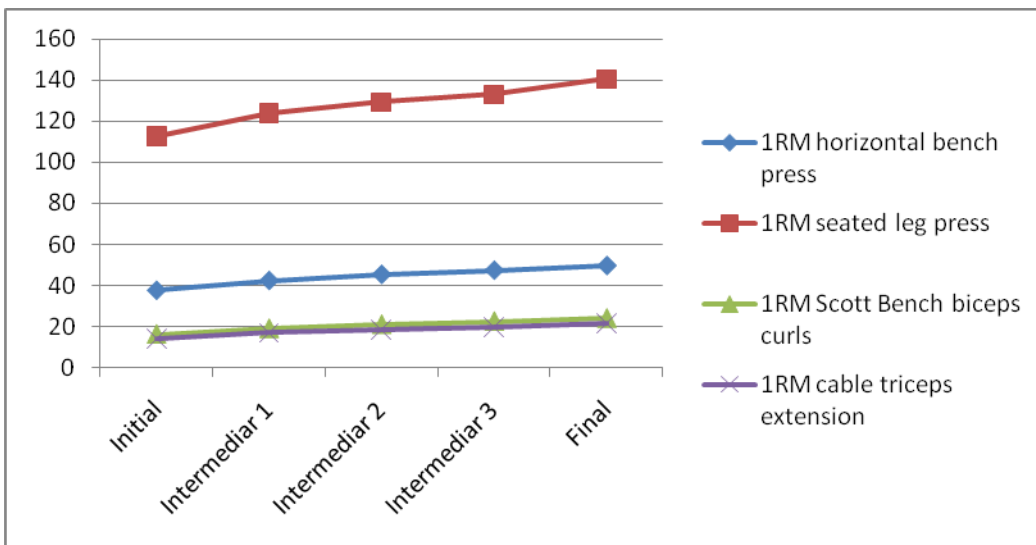


Chart 1. Iniatial and final results

Conclusions

As shown in the table, at the end of the four months of workouts using the training program shown in Table 3, a 32% increase in the strength of the 1RM horizontal bench press test compared to the initial results was noted. Lower extremity muscle strength increased by 24%, forearm flexors strength increased by 47%, and forearm extensor strength increased by 55% compared to baseline results.

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**EPECTELE UNUI PROGRAM DE ANTRENAMENT PE
DURATA A PATRU LUNI PENTRU DEZVOLTAREA FORȚEI
LA ADOLESCENȚI**

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Cuvinte cheie: exercițiu fizic, forță, antrenament

Rezumat

Eficacitatea exercițiilor fizice a fost recunoscută de mult timp pentru tratamentul bolilor multiple, precum și pentru numeroasele efecte metabolice pozitive, cum ar fi îmbunătățirea profilului lipidic, scăderea grăsimii corporale și scăderea nivelului de glucoză din sânge. Nivelurile mai mari ale activității și capacității fizice sunt asociate cu o incidență redusă a hipertensiunii și a bolilor cardiovasculare și a mortalității. Prin această lucrare vrem să observăm efectele alternării celor două metode de antrenament (metode bulgare în serie și metoda bulgară în piramidă) menite să crească puterea musculară.