Martin Pach*

INFLUENCE OF BODYBUILDING EXERCISES ON MOTOR AND BODY DEVELOPMENT OF YOUTH

VPLIV VADBE BODYBUILDINGA NA GIBALNI IN TELESNI RAZVOJ MLADOSTNIKOV

Abstract

The presented experiment was to verify whether bodybuilding exercises are appropriate physical activity for adolescents. During the seven months of the experiment, we studied the effect of bodybuilding exercises combined with compensatory exercises. Their influence upon physical and motor development of the studied group of adolescents has been assessed by anthropometric measurements, tests of motor performance, tests of flexibility and joint mobility on the experimental and control group. The comparison of anthropometric outcomes of both groups has not rendered to express more explicit conclusions. Only a slight manifestation in physical development of experimental group occurred. The increase in motor performance was recorded in both groups. However, the improvement of the experimental group showed a distinctively higher rate: out of seven tests, higher gains were recorded in six, while flexibility and joint mobility maintained on the same level.

Key words: pubescent age, bodybuilding exercises, stretching exercises, motor performance, joint mobility, flexibility.

Corresponding author:
Faculty of Physical Education and Sport UK, Bratislava
Nábr. L. Svobodu 9, 814 69 Bratislava, Slovakia
Tel.: 00421 903 468 746
E-mail: matopach@skregina.sk

Izvleček

S predstavljenim poskusom smo želeli ugotoviti, ali je vadba bodybuildinga ustrezna telesna dejavnost za mladostnike. V sedemmesečnem eksperimentu smo preučevali učinek vaje bodybuildinga, ki smo jih kombinirali s kompenzacijskimi vajami. Učinek vadbe na telesni in gibalni razvoj skupine adolescentov smo preverjali z antropometrijskimi meritvami, gibalnimi testi in testi gibljivosti na eksperimentalni in kontrolni skupini. Primerjava antropometrijskih sprememb ni pokazala razlik med kontrolno in eksperimentalno skupino, na podlagi katerih bi lahko prišli do jasnih zaključkov. Zaznati je bilo le rahlo intenzivnejšo spremembo v telesnem razvoju pri eksperimentalni skupini. Napredek v gibalnem razvoju smo zaznali pri obeh skupinah, pri čemer pa je eksperimentalna skupina napredovala precej bolj, saj smo zaznali večji napredek v šestih izmed sedem gibalnih testov, medtem ko sta splošna gibljivost in gibljivost sklepov ostala na isti ravni.

Ključne besede: doba odraščanja, vadba bodybuildinga, raztezne vaje, gibalna učinkovitost, gibljivost sklepov, gibljivost.

INTRODUCTION

A lack of the physical activity practised under experienced supervision is common in the present way of life of young people, especially adolescents. This can be compensated with organized sports activities as a part of extra-curricular activity in sports groups. Bodybuilding exercises are attractive for this age category and are a possible solution for this problem of inactivity.

This interest, however, evokes certain embarrassment that derives from different attitudes towards bodybuilding, particularly towards bodybuilding practised by the mentioned age group. The particularities of this age period must be seriously considered. Positive results can be achieved with a systematic selection of the bodybuilding exercises and by the application of compensatory exercises.

The selection has to be based on the studies on how the power training affects the human body. The influence of the bodybuilding exercises combined with compensatory exercises upon physical and motor development and on the flexibility and joint mobility of adolescents is the object of our research; the empirical part of this contribution refers to the results.

To find a response to the questions of how to arrange power training particularly the adolescents and how to positively use bodybuilding exercises, we were guided by studies dealing with power training for youth; specifically studies that refer to the response to physical stress. These studies have been chosen from the works related directly to the development of the strength abilities and their effect on physical, physiological and mental aspects of adolescent (Faigenbaum, 1997; Hamar 1998; Keidel, 1973; Mach, 1986; Hrčka, 1998; Graus, 1977; Major, 1985; Hatfield, 1995; Pastyřík, 1994; Reeves, 1998).

What is the influence of bodybuilding on the physical development of the youth? This is an issue to be faced due to general worries concerning potential negative impact. That is the main reason for negative attitudes towards strength activities carried out by youth. It is closely associated with growing acceleration and intensive development of bones. Some of the stated authors pay attention to bodybuilding and, especially, to the development of long bones. The results of their research negate worries about the negative impact of bodybuilding on body growth. There are suggestions (Faigenbaum, 1997; Hamar, 1998) that an appropriate load may positively influence the growth of epiphyseal bones.

Keidel (1973) described physiological process of bodybuilding's influence on growth. Strength load increased the density of hormones. Bodybuilding is a significant impulse for the production of hormones. The less positive approach is limited a standpoint of caution. Some experts suggest avoiding exceeding loads that may lead to growth malfunctions, or even injuries like an aseptic necrosis. In general, the majority of authors support strength training in the youth, under the conditions of appropriate equipment expert coaching.

Problems with muscle imbalance as well as problems with flexibility and joint mobility are often associated with the power training. The responses on how to solve these problems can be found in the works of Janda et al. (1994), Štulrajter (1985), Ruscher (1994), Crist (1994).

Insubstantial motor loads, chronic muscle overloading and asymmetric loads are the main reasons for muscle imbalance. Limited extension of motion in joints is frequently caused by muscle shortening. This dynamic process is initially reversible. It is preceded by increased muscular tone; this state may gradually stabilize. To avoid this situation during strength workouts, compensatory

exercises should be exploited. Stretching is one of the most efficient ways of achieving this; the physiological basis of which is described in detail by Štulrajter (1985).

On the basis of an analysis of the presented studies, the goal for the pedagogical experiment was determined: to verify the influence of bodybuilding exercises combined with stretching upon the physical and motor development of adolescents. It was assumed that the physical activity in which the above-mentioned means would be used would increase or at least maintain the gains at physical development, increase the gains at motor performance and flexibility and that joint mobility would be maintained. That hypothesis has been verified by solution of following tasks:

1. To form an experimental and control group consisting of students of the 8th and 9th years of elementary schools.
2. By two measurements, at seven-month intervals over the course of the experiment, to determine the levels of physical development, motor performance, flexibility and joint mobility.
3. To compare the difference of the first (entrance) and second (outcome) measurements in each group.
4. To use the achieved results to establish conclusions on how the observed means affect physical and motor development, flexibility and joint mobility.

METHODS

The pedagogical experiment started in October and it finished in April, next year.

Participants

Experimental and control groups were formed by 14 – 15 year-old students; each included 12 participants.

Instruments

The experimental factor was an application of the motor regime in an extracurricular sports group.

The content of the group activity was a complex bodybuilding programme, modified for the age of participants and realized at the elementary school conditions.

The main component of the routine was power training and a set of special compensatory exercises.

The main power training characteristics:

Extent and frequency of the training session: 2 x weekly (Mondays and Thursdays).

The volume of the training session: 20 – 30 sets.

The means of the training session: basic exercises for the complete workout of the main muscle groups.

The rest pause between the sets: depending on selected means 1 – 3 min.

The total time of the power training: 80 – 90 min.

The rank of compensatory exercises in the training session:

1. As a part of the special warm-up: common stretching exercises in an introductory part of the session.

2. In the main part of the workout: between the sets, special stretching exercises for muscle groups that show a tendency to be shortened just after loading.
3. General stretching exercises after the final part of the session aimed at improving muscle coordination and aerobic performance (games) –.

Procedure

Both the number of repetitions and the selection of methods depend on the session period and selected exercises during the workout.

The total time of the complete training session: 100 – 110 min.

The anthropometric examinations were carried out with the use of standard anthropometric procedures.

The basic strength abilities were evaluated by EUROFIT reduced test battery (Moravec et al., 1996):

– standing broad jump – (explosive strength of the legs)
– bent arm hang (static strength of spinal muscles)
– sit-up 30 s – (dynamic strength of abdominal muscles).

To determine the explosive strength of the trunk and arms, the medicine-ball throw was used, according to Kasa (1984).

To determine special strength abilities, the bench press test with maximum weight (max. dynamic strength), and the repeated bench press with 60 % of maximum performance (submax. strength endurance) were used. To measure the maximum dynamic strength of the forearm flexors, a modified biceps barbell curl with the back against the wall was used.

The flexibility and joint mobility levels were examined by functional muscle tests to obtain following parameters with the use of these methods:

– tightness of m. erector spinae: sit and reach test as described by Moravec et al. (1996) as a part of EUROFIT system,
– tightness of pectoral muscles of right and left side of the body: by lying with the stretched arms sideways slightly out on the test board with the use of SFTR method (Russe & Gerhard, 1975).
– a special testing device where a movable lever was used; the vertical distance of the right and left epicondyle from the surface of the testing board at above-mentioned position of the upper arm was measured with 0.1 cm accuracy,
– hamstring tightness was determined by standard straight leg raising (SLR) test according to Janda et al. (1994) goniometrically in degrees.

RESULTS

The results of the empiric research are represented by arithmetical mean of the observed groups in entrance and outcome measurements in all selected parameters and differences between the entrance and outcome measurement in each parameter arranged according to the groups (Table 1, 2, 3).

Table 1: Arithmetical mean values of anthropometric parameters in observed groups in entrance and outcome measurement and parameter differences between the values in entrance and outcome measurement arranged according to the groups.

	Exp. group		Control group		Difference "Outcome – Entrance"	
	Entrance	Outcome	Entrance	Outcome	Exp. group	Control group
Body height (cm)	173.8	176.7	172.5	175.7	2.9	3.2
Body weight (kg)	66.2	68.8	62	64.7	2.6	2.7
Biceps circumference (cm)	29.9	31	27.2	28.2	1.1	1
Chest circumference (cm)	87.9	91.8	84.9	87	3.9	2.1
Thigh circumference (cm)	54.4	54.8	51.1	52.9	0.4	1.8

Table 2: Arithmetical mean values of motor performance parameters in observed groups in entrance and outcome measurement and parameter differences between the values in entrance and outcome measurement arranged according to the groups.

	Exp. group		Control group		Difference "Outcome – Entrance"	
	Entrance	Outcome	Entrance	Outcome	Exp. group	Control group
Bench press max. (kg)	45	52.7	39.7	42.3	7.7	2.6
Bench press 60 % max. (rep.)	23.7	25.2	20	21.2	1.5	1.2
Biceps curl (kg)	27.9	30.2	24.6	27.1	2.3	2.5
Standing broad jump	171.4	180.5	182.2	187.9	9.1	5.7
Bent arm hang (s)	32.8	40	10.9	12.6	7.2	1.7
Medicine ball throw (cm)	671.8	765.4	741	793.2	93.6	52.2
Sit-ups / 30 s (rep.)	22.2	25.9	25.8	26.4	3.7	0.6

Table 3: Arithmetical mean values of joint mobility and flexibility in observed groups in entrance and outcome measurement and differences between the entrance and outcome measurement in each parameter arranged according to the groups.

	Exp. group		Control group		Difference "Outcome – Entrance"	
	Entrance	Outcome	Entrance	Outcome	Exp. group	Control group
Sit and reach (cm)	19	20.7	16.7	17.2	1.7	0.5
Strait leg raise R (degree)	69.1	72	64.8	65.9	0.9	1.1
Strait leg raise L (degree)	74.2	77.5	70,1	70	3.3	0.1
Stretch arms R (cm)	– 2.6	– 4.2	– 4.8	– 4.5	– 1.6	+ 0.3
Stretch arms L (cm)	– 1.7	– 3.8	– 4.2	– 4	– 2.1	+ 0.2

DISCUSSION

Five physical development parameters of the research participants have been observed (Table 1). In the basic parameters, body height and body weight that serve as a characteristics of the

category, both groups differed slightly at the entrance measurement. During the seven-month period of the observation, the body height and weight were rising at nearly the same rate. An experimental factor, thus, did not evoke the gains that would differ in these basic anthropometric parameters. In the third anthropometric parameter (the circumference of biceps) the gains were only slightly higher in experimental group. From the next two anthropometric parameters, in the first (circumference of the thigh) a slightly higher gain was obtained in the control group; in the other (the circumference of the chest) the gain of experimental group was distinctly higher.

In summary, it can be stated that by comparison of the anthropometric parameters in both groups, Moreno further explicit conclusions can be made. The higher gains in the thigh circumference in the control group could be explained by gains of fat tissue on this segment. Because the gains of the chest circumference were obviously higher in the experimental group, as well as the gains in biceps circumference (even though not significant), it can be assumed that experimental group has manifested a certain indication of the higher growth of this anthropometric parameter category.

From among seven tests of the motor performance, the experimental group achieved better results in four of them when it entered the experiment.

We regard it to be significant that during the experiment the experimental group achieved higher gains in six parameters out of seven.

An evidently higher gain was achieved in dynamic strength in the bench press with maximum load. The significance of this gain is even higher because this group achieved higher levels when it entered the experiment. The same relation has been determined in submaximal strength endurance (repeated bench press with 60 % of maximum performance), although the difference in the level of the groups and difference in the gains has been lower. In the third parameter of special strength abilities, the maximum dynamic strength of forearm flexors (biceps curl), the experimental group again achieved higher performance at the beginning of the experiment; the gains during the experiment were lower however. In spite of this fact, the gains in both groups were slight.

In the following test, the experimental group achieved distinctivly higher gains:

– the test of the explosive strength of the legs – standing broad jump,

– the test of the static spinal strength – bent arm hang,

– the test of the explosive strength of the trunk and upper limbs – medicine ball throw and

– the test the dynamic strength of the abdominal muscles – repeated sit ups

The flexibility and joint mobility level of observed groups are characterized by arithmetical means in three tests; two out of them were used to test both upper and lower limbs (Table 3).

Flexibility and contemporary possible tightness of m. erector spinae were tested by the sit and reach test.

The experimental group achieved better results in this test at the beginning and also achieved higher gains.

In the parameter where joint mobility of the lumbar joint was measured goniometrically (degrees), the experimental group achieved improvements with both legs while the control group only with the right leg.

The range of motion of the shoulder joint (which can be limited by the tightness of the pectoral muscles of both sides of the body as the result of their being strengthened) was improved during the experiment in the experimental group. The worse outcomes were recorded in the control group.

Recommendations:

From the achieved results, we have developed recommendations that are concerned with the status of bodybuilding exercises with regards to the motor activity adolescents:

1. Bodybuilding exercises are appropriate exercises for youth at the age of puberty.
2. Bodybuilding exercises need to be combined with compensatory exercises.
3. When using such a routine at the mentioned age, it is necessary to strictly keep principles that relate to setting the volume and intensity of the exercises as is presented here.

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