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CHANGE IN PHYSICAL ACTIVITY INDICES IN TERMS OF USING DIFFERENT MODELS OF TRAINING SESSIONS IN POWER FITNESS

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The paper presents the results of determining the peculiarities of changing the physical exercise parameters in power fitness in the conditions of prolonged usage of different intensity training models during training.

We examined 50 physically healthy, untrained young men aged 19 ± 1.1. Participants were divided into 2 experimental groups. Different training sessions ("A" and "B") were developed for representatives of groups 1 and 2. Training sessions differed from each other by the power load magnitude. We used an integral method of estimating the magnitude of the load to determine the peculiarities of changing the data indicators in the proposed conditions of muscle activity.

In the course of 3-month training, the indicators of maximum muscle strength (1 PM) in group 1 participants increased on average by 30.3% ($p < 0.05$), while the other group showed the increase by 49.3% ($p < 0,05$) compared with the initial data. The relevant significant difference was found during the control of the parameters of the projectile's working mass (m) during 3 months of power fitness occupation. Thus, in boys of group 2, this indicator increased by 23.5% ($p < 0.05$) compared to the positive results demonstrated by group 1 representatives for the same period of time. Despite the positive positive dynamics, the indicator of the volume of workload in the working network (Wn) in the group 2 representatives was almost 129.7% ($p < 0.05$) lower than the results of their opponents, both in the beginning and in the end of the study. The following factors were proved to contribute to the increase of the intensity of loads and significantly reduce the amount of training work in the process of the training: reduction of rest periods between the sets, the reduction of the number of repetitions in a separate set and the doubling of the duration of the concentric and eccentric phases of the movement.

Thus, the obtained results indicate that the use of training programs with high intensity loads in training processes contributes to more pronounced adaptive changes in the body of the examined participants in the process of power fitness training.

Keywords: load indices, power fitness, volume and intensity of loads, adaptive changes, programs of training sessions.

Research relation to the plans, programs and department themes. The article is a fragment of the planned scientific work "Development and implementation of innovative technologies and correction of the functional state of a man with physical activity in sports and rehabilitation", (state registration number 0117U007145).

Introduction. One of the main problems in the modern system of training in sports is the search for effective mechanisms for optimization of training loads and the development of progressive training programs, taking into account the functional capabilities of the human body, the level of training, and the set tasks [2, 5, 7, 8].

In power sports we must take into account the problem that the weight of the projectile increases with the level of training of athletes, both in terms of training and competitive activities. Such conditions of the training process and the risk of more frequent injuries during the workload negatively affect the performance and reduce the duration of their sports career [3, 6, 11].

In order to improve the training process in bodybuilding at various stages of multi-year training, comprehensive studies were conducted to determine the effect of training programs developed on the basis of the variability of physical activity components and their correction, depending on the conditions of muscle activity and the level of training of athletes [6, 9, 10, 11] However, the vast majority of studies dealt with peculiarities of influence of various usage of the value of projectile working mass indicators, the number of repetitions in a separate set, the amplitude of the movements implementation on the dynamics of body morphometric parameters and power capabilities of a man [2, 3, 5].

Studies on the effectiveness of using various indicators of rest periods between the sets and muscle tension in a separate set in power fitness were not conducted.during the development of models of training sessions on strength fitness. In scientific literature there are no results as to the influence of these indicators on the nature of the intensity and volume change of physical activity during the training process.

The purpose of the research is to develop programs of training sessions using different parameters of the rest periods between the sets and the time of muscle tension in a separate set, as well as studying the peculiarities of their effects on changes in the parameters of the volume of load and the dynamics of development of maximum muscular strength of people in terms of power fitness training.

Material and methods. We examined 50 physically healthy, untrained young men aged 19 ± 1.1 who formed two experimental groups. They did not have contraindications to power fitness training from the viewpoint of their physical health.

We developed the training programs "A" and "B" for the representatives of groups 1 and 2. The programs were almost identical in strength exercises, the total amount of training sessions and the sequence of using them for a particular muscle group. At the same time, the proposed programs differed from each other in terms of the intensity of training load, which was almost doubled in group 2 in comparison with similar indicators in group 1. Thus, the duration of work in a separate set was 60 s in group 1, and 36 s in group 2; the representatives of group 1 used 10 repetitions in one set, and group 2 – 4 repetitions; the duration of rest between sets in group 1 was 1 min, and in group 2 this period lasted up to 40 s; the speed of the concentric and eccentric motion in group 2 was 9 s, while in group 1 it was 6 s.

Training exercises were performed with a barbell, dumbbells and simulators, following the technology that we had set. The duration of one training session was no more than 40 minutes regardless of the characteristics of muscle activity. In a separate training session 2 basic and 2 isolating power exercises were performed. Training was repeated with a frequency of 3 classes per week.

All persons who participated in the research, had previously undergone a complete medical examination and integrated laboratory control (9 indicators). The examination results proved that the participants did not have medical contraindications to power fitness training.

Taking into account the conventional technique we determined the maximum encumbrance weight (1 MP), which a person can overcome during the exercise, by means of the control test method [9].

Using the integral method of assessing the power load in fitness we determined the magnitude of such parameters: load factor (Ra), an indicator that reflects the features of the load regime, which sportsmen use in fitness, depending on the orientation of the training process and the specified conditions of motor activity; the projectile working mass (m, kg) which can be raised by the athlete in each repetition, the number of which will depend on the characteristics of the load regime; the amount of workload in the working system (Wn, kg); the total projectile mass raised by an athlete while using the specified mode with the maximum number of repetitions in the working system until a complete muscle fatigue.

The statistical processing of the study results was conducted using the statistical software package IBM*SPSS*Statistics 22. We determined the arithmetic mean and the mean error. Nonparametric criteria (Wilcoxon criterion) were used to check the validity of the difference.

Research results and their discussion. To fulfill the tasks of the study we corrected the structure of training sessions for power fitness in order to change the parameters of the load. Proposed programs of training sessions for power fitness completely differently influenced the level of indicators of intensity, the amount of training work and the growth rate of maximum muscle strength of the examined contingent. The results of the dynamics of the studied physical activity indices revealed during the training exercises in a separate training session during 3 months are presented in **Tables 1-4.**

Table 1 – The value of power load parameters in a separate training session during the exercise of "bench press" used by the representatives of group 1 and 2 during 3 months, (n = 50)

Indices	group	Control terms		
		Basal data	after 45 days of training	after 3 months of training
R_a, c.u. (load factor)	1	0,60±0,01	0,60±0,01	0,60±0,01
	2	0,68±0,01	0,68±0,01	0,68±0,01
1 PM, kg (maximum muscle strength)	1	60,80±2,52	68,40±2,41*	80,80±2,89*
	2	52,00±2,73	64,40±3,05*	83,68±2,62*
m, kg (projectile working mass)	1	36,48±1,37	41,04±1,22*	48,48±1,16*
	2	35,36±1,23	43,79±1,36*	56,90±1,66*
Wn, кг. (the amount of workload)	1	328,32±3,43	369,36±3,02*	436,32±3,84*
	2	141,44±2,93	175,16±3,53*	227,60±3,54*

Note: * - the difference compared with the results of the previous month is reliable according to the Wilcoxon criterion (-r <0,05).

The study results showed that group 1 representatives' indicators of maximum muscle strength (1 PM) and performance parameters during doing the basic exercise "bench press" increased by 32.9% ($p < 0.05$) throughout the study period, compared with the basal data. In turn, the use of the training sessions with a high intensity level (Ra = 68) by group 2 representatives during, contributed to the growth of control indicators by 60.9% ($p < 0.05$). However, the amount of workload (Wn) studied in these conditions of muscle activity was almost 131.9% ($p < 0.05$) lower in boys of group 2 of than in the 1st one (**Table 1**).

Table 2 shows the results of the change of the studied parameters in the conditions of performing the exercise "breeding dumbbells on a bench" used by representatives of the studied groups in conditions of different training programs within 3 months.

Using programs of the training sessions with high intensity workloads (Ra = 68) contributed to more pronounced adaptive changes in the body (growth of power capabilities) of boys of this age group, both during the performance of basic ("bench press") and insulating exercises ("breeding dumbbells on a bench") compared to the results observed when using another training program. At the same time, the volume of work performed by representatives of group 1 was more than 2 times higher compared with the results of group 2 while performing isolated strength exercises.

The corresponding changes in the studied parameters of training load and the dynamics of increasing the parameters of maximum muscle strength of the participants of both experimental groups were revealed during the basic exercise "hammers" (**Table 3**) and isolated exercise "dumbbell biceps" (**Table 4**) used in the training of two-headed shoulder muscles.

The results analysis shows that the reduction of rest between the sets (from 1 min to 40 s) and the elimination of work duration in a separate session (from 1.2 min to 36 s), not only increased the projectile working mass parameters by 20% in group 2, but also reduced the number of repetitions in a separate session (from 12 to 4) and the workload volume by 75-85%. Corresponding changes in the value of load factors will, in the first place, contribute to reducing the level of injury, by reducing the loads on the human musculoskeletal system and the energy supply system, which will increase the level of athlete's performance without threatening his health, which is the main purpose of training in power fitness.

The obtained results indicate that the developed training program for group 2 more effectively influenced the body adaptive changes in conditions of given strength loads compared with another program, which indicators are most often used during the construction of the training process in bodybuilding and powerlifting [11, 12].

The features of changes in the parameters of the maximum muscle strength of the examined contingent and the volume of workload, depending on the

Table 2 – The value of power load parameters in a separate training session during the exercise of "breeding dumbbell on a bench" used by the representatives of group 1 and 2 during 3 months, (n = 50)

Indices	group	Control terms		
		Basal data	after 45 days of training	after 3 months of training
Ra, c.u. (load factor)	1	0,60±0,01	0,60±0,01	0,60±0,01
	2	0,68±0,01	0,68±0,01	0,68±0,01
1 PM, kg (maximum muscle strength)	1	22,32±0,92	24,72±1,45*	34,16±1,57*
	2	18,80±0,89	24,24±1,02*	32,24±1,07*
m, kg (projectile working mass)	1	13,39±0,58	14,83±0,62*	20,49±0,96*
	2	12,78±0,98	16,48±0,68*	21,92±0,66*
Wn, кkg (the amount of workload)	1	120,51±2,78	133,48±2,13*	184,46±2,33*
	2	51,12±1,31	65,92±1,93*	87,68±2,13*

Note: * - the difference compared with the results of the previous month and reliable according to the Wilcoxon criterion (-r <0,05).

Table 3 – The value of power load parameters in a separate training session during the exercise of "hammers" used by the representatives of group 1 and 2 during 3 months, (n = 50)

Indices	group	Control terms		
		Basal data	after 45 days of training	after 3 months of training
Ra, c.u. (load factor)	1	0,60±0,01	0,60±0,01	0,60±0,01
	2	0,68±0,01	0,68±0,01	0,68±0,01
1 PM, kg (maximum muscle strength)	1	18,40±0,34	20,48±0,17*	22,40±0,34*
	2	16,80±0,83	19,76±0,73*	23,36±0,45*
m, kg (projectile working mass)	1	11,04±0,66	12,28±0,52*	13,44±0,77*
	2	11,42±0,76	13,43±0,56*	15,88±0,86*
Wn, kg (the amount of workload)	1	99,36±2,02	110,52±2,02*	120,96±1,82*
	2	45,68±1,32	53,72±1,62*	63,52±1,42*

Note: * - the difference compared with the results of the previous month and reliable according to the Wilcoxon criterion (-r <0,05).

conditions of the training activity confirmed and supplemented the results of the studies in bodybuilding [4, 8, 12], with regard to establishing effective ways to optimize the training process due to variation in the use of training load indices (the number of repetitions in a separate set, exercises in the training session, the projectile working mass).

Table 4 – The value of power load parameters in a separate training session during the exercise of " dumbbell biceps " used by the representatives of group 1 and 2 during 3 months, (n = 50)

Indices	group	Control terms		
		Basal data	after 45 days of training	after 3 months of training
Ra, c.u. (load factor)	1	0,60±0,01	0,60±0,01	0,60±0,01
	2	0,68±0,01	0,68±0,01	0,68±0,01
1 PM, kg (maximum muscle strength)	1	17,92±0,40	19,92±0,29*	20,40±0,34*
	2	15,36±0,45	18,32±0,54*	20,88±0,46*
m, kg (projectile working mass)	1	10,75±0,47	11,95±0,43*	12,24±0,34
	2	10,44±0,32	12,44±0,43*	14,19±0,49*
Wn, kg (the amount of workload)	1	96,75±1,96	110,59±1,84*	110,16±2,04
	2	41,76±1,54	49,76±1,34*	56,76±1,34*

Note: * - the difference compared with the results of the previous month and reliable according to the Wilcoxon criterion (-r <0,05).

Conclusions

1. The study proved that in the course of 3-month training, the indicators of maximum muscle strength (1 PM) in group 1 representatives, who used a training program of high intensity load, increased on average by 30.3% (p <0.05), and in the other group – by 49.3% (p <0.05) compared with the basal data. The relevant significant difference was found during the control of the projectile's working mass (m) parameters during 3-month training. Thus, in boys of group 2, this indicator increased by 23.5% (p <0.05), compared to the positive results demonstrated by representatives of group 1 for the same period of time.
2. Despite the positive dynamics during 3 months of training the amount of workload in a working session (Wn) in the representatives of the 2nd group was almost 129.7% (p <0.05) lower than the results in the 1st group, both at the beginning and at the end of the study. It is the reduction of the duration of rest between the sets, the reduction of the number of repetitions in a separate set and the doubling of the duration of the concentric and eccentric phases of the movement, which promoted an increase in the intensity of workloads and significantly reduced the amount of training work in the training process.
3. The obtained results testify that using training programs with high intensity loads contributes to more pronounced adaptive body changes of the examined group representatives in the process of power fitness training.

Prospects for further research. Modern requirements for optimization of the training process in power fitness require the use of more informative comprehensive diagnostic methods for determining the adaptive body changes in people of all ages and sex in conditions of intense muscular activity of different nature and orientation. The application of complex physiological and biochemical methods of diagnosing the adaptive body changes in young men while studying the influence of anaerobic and strength orientation loads will make it possible to more clearly state the effectiveness of proposed training programs, especially in the process of training load indices correction.

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ЗМІНА ПОКАЗНИКІВ ФІЗИЧНОГО НАВАНТАЖЕННЯ В УМОВАХ ВИКОРИСТАННЯ РІЗНИХ МОДЕЛЕЙ ТРЕНУВАЛЬНИХ ЗАНЯТЬ В СИЛОВОМУ ФІТНЕСІ

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Резюме. В роботі представлено результати дослідження щодо визначення особливостей змін параметрів фізичного навантаження в силовому фітнесі в умовах тривалого використання різних за інтенсивністю моделей тренувальних занять.

Обстежено 50 фізично здорових, нетренованих юнаків віком 19±1,1 років. Учасники були розділені на 2 дослідні групи. Для представників 1 та 2 групи було розроблено досить різні програми тренувальних занять («А» та «Б»), які відрізнялись один від одного величиною показників силового навантаження. Для визначення особливостей зміни даних показників в запропонованих умовах м'язової діяльності використовували інтегральний метод оцінки величини навантаження.

Встановлено, що в процесі 3 місяців тренувань показники максимальної м'язової сили (1 ПМ) у осіб 1 групи зросли в середньому на 30,3% ($p<0,05$), а у обстежених іншої групи – на 49,3% ($p<0,05$) порівняно з вихідними даними. Відповідну суттєву різницю виявлено під час контролю за параметрами робочої маси снаряду (m) протягом 3 місяців занять. Так, у юнаків 2 групи даний показник підвищився на 23,5% ($p<0,05$) порівняно з позитивними результатами, які продемонстрували представники 1 групи за аналогічний період часу. При цьому, показник обсягу навантаження в робочому сеті (Wn), незважаючи на достовірну позитивну динаміку, у представників 2 групи майже на 129,7% ($p<0,05$) нижчий порівняно з результатами виявленими серед опонентів, як на початку, так і в кінці дослідження. Виявлено, що саме зниження тривалості відпочинку між сетами, зменшення кількості повторень в окремому сеті та збільшення вдвічі тривалості концентричної та ексцентричної фаз руху сприяють підвищенню рівня інтенсивності навантажень та суттєво зменшують обсяг тренувальної роботи в процесі тренувань.

Таким чином, отримані результати свідчать про те, що використання під час занять тренувальних програм з навантаженнями високої інтенсивності сприяють більш вираженим адаптаційним змінам в організмі обстеженого контингенту в процесі занять силовим фітнесом.

Ключові слова: показники навантаження, силовий фітнес, обсяг та інтенсивність навантажень, адаптаційні зміни, програми тренувальних занять.

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ИЗМЕНЕНИЕ ПОКАЗАТЕЛЕЙ ФИЗИЧЕСКОЙ НАГРУЗКИ В УСЛОВИЯХ ИСПОЛЬЗОВАНИЯ РАЗЛИЧНЫХ МОДЕЛЕЙ ТРЕНИРОВОЧНЫХ ЗАНЯТИЙ В СИЛОВОМ ФИТНЕСЕ

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Резюме. В работе представлены результаты исследования по определению особенностей изменения параметров физической нагрузки в силовом фитнесе в условиях длительного использования различных по интенсивности моделей тренировочных занятий.

Обследовано 50 физически здоровых нетренированных юношей в возрасте 19±1,1. Участники были разделены на 2 исследовательские группы. Для представителей 1 и 2 группы было разработано достаточно разные программы тренировочных занятий («А» и «Б»), которые отличались друг от друга по величине показателей силовой нагрузки. Для определения особенностей изменения данных показателей в предложенных условиях мышечной деятельности, использовали интегральный метод оценки величины нагрузки.

Установлено, что в процессе 3-х месячных тренировок показатели максимальной мышечной силы (1 ПМ) у лиц 1 группы выросли в среднем на 30,3% (p <0,05), а у обследованных другой группы – на 49,3% (p <0,05) по сравнению с исходными данными. Существенную разницу обнаружено при контроле параметров рабочей массы снаряда (m) в течение 3 месяцев занятий. Так у юношей 2 группы данный показатель повысился на 23,5% (p <0,05) по сравнению с положительными результатами, которые продемонстрировали представители 1 группы за аналогичный период времени. При этом показатель объема нагрузки в рабочем сете (Wn), несмотря на достоверную положительную динамику, у представителей 2 группы почти на 129,7% (p <0,05) ниже по сравнению с результатами выявленными среди оппонентов, как в начале, так и в конце исследования. Выявлено, что именно снижение продолжительности отдыха между сетами, уменьшение количества повторений в отдельном сете и увеличение в два раза продолжительности концентрической и эксцентрической фаз движения способствуют повышению уровня интенсивности нагрузок и существенно уменьшают объем тренировочной работы в процессе тренировок.

Полученные результаты свидетельствуют о том, что использование тренировочных программ с нагрузками высокой интенсивности способствуют более выраженным адаптационным изменениям в организме обследованного контингента в процессе занятий силовым фитнесом.

Ключевые слова: показатели нагрузки, силовой фитнес, объем и интенсивность нагрузок, адаптационные изменения, программы тренировочных занятий.

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