DETERMINATION OF POSSIBILITIES OF THE USE OF HIGH-INTENSIVE TRAININGS FACILITIES ON LESSONS HEALTH AEROBICS

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Annotation. The purpose of experiment was an exposure of reaction of heart rate of students on the increase of rate of musical accompaniment. 89 students of the first course took part in experimental employments. Height of step platform 15-20 centimetre. The large reaction of heart rate is exposed considerably on the increase of height of step platform (on 18,3 %), what at growth of music rate (on 8,5 %). Also appeared, that 14 from 89 students have weak functional preparedness: already at the rate of music of 138-142 shots in a minute and height of step platform 15 centimetre, heart rate for them attained an age-dependent maximum (on the average 207 shots in a minute). It is recommended to utillize in employments the increase of intensity only in the limited volume: increase of music rate to 142-45 shots in a minute or heights of step platform to 20 centimetre.
Keywords: aerobics, heart rate, students, health.

Introduction.

To day we are the witnesses of health improving aerobics triumph. For 20 years, aerobics popularity has been being based on its distinctive features: efficiency, accessibility, emotional character and visual appeal. Opportunities for its application are great, range of exercises is large and under skillful guidance of pedagogue the exercises are powerful complex mean and method of influence both on health improving and educational development of a person's personality.

Aerobics training's influence on improvement of health level are described in the works by N.A. Bryuhanova [1-4], T. Lisitskaya [5], O.A. Medvedeva [6], D'abundo M.L. [11], Duncan L.R., Hall C.R., Wilson P.M. [12], Highstreet V.D. [13], Li C-L., Chang H-Y., Hsu C-C., Lu J.R., Fang H-L. [14], Sutherland R., Wilson J., Aitchison T., Grant S. [15]. Alongside with this, there are some peculiarities of aerobics training's organization and conduction, which depend on regional conditions, social-economical level, the trainees' age and initial health level and so on. All these, taken one with another, necessitate carrying out appropriate researches.

The work has been fulfilled as per plan of scientific & research works of Siberian Federal University.

Purpose, tasks of the work, material and methods.

The purpose of the work was to determine the extent of music tempo and step platforms (special boxes) height influence on heart rate (HR) and conditions for application of highly intensive training means at health improving aerobics trainings.

It was assumed that load intensity at aerobics trainings can be changed by variation of music tempo and stem platforms' height.

For this purpose four trainings were carried out; conditions of their aerobic part were the following:

1 – music tempo 138–142 beats p. min., step height 15 sm.;

2 - music tempo 142–145 beats p. min., step height 15 sm.;

3 - music tempo 138–142 beats p. min., step height 20 sm.;

4 - music tempo 142–145 beats p. min., step height 20 sm.;

Thus, the first training was conducted under usual conditions, the second - with only music tempo increased, the third – with increasing only steps' height, the forth – with increasing both: music tempo and steps' height (maximal intensity). Duration of aerobic part of training was 25 minutes. Then, as usual, 15 minutes for power exercises with music tempo 128-134 beats per minute.

Before the beginning of trainings HR was measured, with in the trainees' sitting position, in the rest, during 30 seconds after relaxation of 5 minutes duration. After aerobic part, HR was measured during 10 seconds immediately after finishing of exercises.

Then, analyzing experimental results we shall consider that, by intensity of the executed exercises, health improving aerobics is divided into three HR zones [N. Boychevskaya, Aerobics, Electronic resource, access: http://www.fizkult-ura.ru1, 5]:

150 beats p. min. and more energy supply of aerobic character (lower than anaerobic change threshold –ACT) – aerobics of low intensity;

151–170 beats p. min. – mixed aerobic-anaerobic character of energy supply (higher than ACT)- aerobics of medium intensity;

171 beats p. min. and more - mixed aerobic-anaerobic character of energy supply – highly intensive aerobics.

Also, it is important to remember that within 50-90% from maximal hear rate (HR max.), which is 220 beats p. min. minus age in years [7, 8], there was noted a linear dependence between HR and intensity of work (see fig. 1). With load's rising the linearity is upset, the curve flats and goes to horizontal plane, which equals to HR max.

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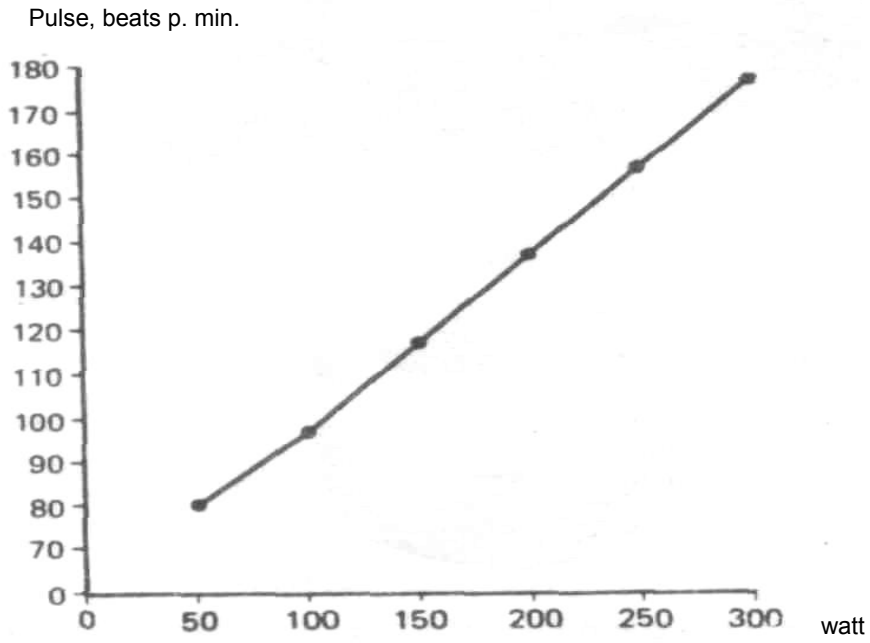

Fig.1 Linear HR dependence on the intensity of work (by R. Handmoney)

In total, 89 first year students (female) took part in experimental trainings. But at first training HR of 14 of them exceeded 180 beats p. min. and was, in average, 207 beats p. min., i.e. already reached HR max. (For the first year female students HR max: 220-17 =203 beats p. min. Further increase of load would cause, in the best case, non-linear HR increment and that is why these students were debarred from experimental trainings. For these 14 students even standard trainings were highly intensive aerobics with mixed, mainly anaerobic character of energy supply.

Results of the researches.

At SPU health improving aerobics is very popular among female students. There is special gym of 140 sq. m. and all necessary equipment for training.

Academic trainings are conducted as per classic structure: warming up, main and final parts. Total duration of training is 60 minutes. Main part of the training consists of two blocks: aerobic (25 minutes) and power (15 minutes). Aerobic block includes complex of exercises of basic aerobic movements, which are continuously executed to music (music tempo 138-142 impulses p. min.). Power block includes power exercises with loads (body bars or dumbbells) and exercises in low position (music tempo 128-134 impulses p. min.). Special methodological literature is available for students [1, 2, 3, 4].

75 female students, who were selected for participation in experiment, had average HR in rest 79 beats p. min. before the first training; before the second training they have HR -76 , before the third – 75, before the forth – 74 beats p. min. Such HR values are physiologically normal for 17 years old girls. Little increase of HR at the first training can be connected with excitement, which appeared, when coach declared the beginning of experiment.

HR values after aerobic part of training are of the greatest interest (see table 1).

Table

HR values after aerobic part of training

No. of training	$\overline{X} \pm \sigma$	V, %	*m*	HR change, comparing with the 1st training, %	Student's criterion, with p=0,05	
					table	calculated
1	152,7±20,7	13,6	2,4	-	-	-
2	165,5±24,2	14,6	2,8	8,5	1,98	3,46
3	180,9±29,1	15,5	3,4	18,3	1,98	6,71
4	189,8±28,1	14,3	3,2	24,2	1,98	9,28

Average HR of 75 female students after aerobic part of the first training was 152.7 beats p. min.. By energy supply character such pulse value relates to the beginning of mixed zone of moderately intensive aerobics 150- 170 beats p. min. As it was established by us earlier [9], HR of the second year female students in rest and after load reduces (by 5.6 and 14.2 beats p. min. correspondingly). I.e. typical academic training for the participants of the conducted experiment would be the training, relating to zone of low intensive aerobics with pulse not more than 150 beats p. min. and this is just required for health improving physical exercises of youth.

At the second training, with increasing of exercises' execution rate by (143.5 -140): 140 = 2.5%, average HR was 165.5 beats p. min., i.e. increased by 12.8 beats p. min. or by 8.5%. With this, load intensity still related to mixed aerobic-anaerobic zone of energy supply.

After finishing of the third training's aerobic part, with increasing of steps' height from 15 to 20 sm., HR increased up to 180.9 beats p. min. and got to zone of highly intensive aerobics with mixed anaerobic – aerobic energy supply character. In comparison with the first training HR increased by 28.2 beats p. min. or by 18.3%. With increasing of steps' height by 3 sm. or by 33%, HR increment more than two times exceeded the same indicator, obtained with rising of music tempo and it was quite expectable.

The last, fourth training was the most intensive: with increased music tempo and steps' height. HR was 189.8 beats p. min., and it means, it was increased by 37.1 beats p. min. or by 24.2% comparing with the first training. With strictly linear dependence of pulse value on the intensity of executed work, at the fourth training, HR would have increased by 8.5+18.3=26.8%. But in connection with approaching maximal, possible for this age, HR, the value of 189.8 beats p. min. reaches the part of HR- intensity dependence diagram, where it gradually flats and reaches to horizontal plane, equal to HR max.

In the table the most widespread indicators with statistical processing of measurements' results are also presented: average quadratic deviation σ and coefficient of variation V, which characterize dispersion of sample size.

From theory of statistics [10 et al.] it is known that for the curve of normal dispersion, 68.7 % of values reach interval $\overline{x} \pm \sigma$, 95.45% reach interval $\overline{x} \pm 2\sigma$ and 99.73% reach interval $\overline{x} \pm 3\sigma$. Thus, knowing value σ, we can understand the degree of dispersion of the studied attribute. As it follows from the table, σ grow, following the increase of load and arithmetical mean $\overline{x}$, that is quire expectable.

Relatively large sample size $n = 75$ permitted us to build HR variation curves after load (diagrams 1 and 2), in which female students' HR dispersion changes are obviously reflected, which occur with increasing of movements' intensity. The value of range was selected equal to 20 beats p. min. In central range we calculated the quantity of cases within the range $\overline{x} \pm 10$ beats p. min., in the next – from $\overline{x}$ +10 до $\overline{x}$ + 30 and $\overline{x}$ –10 $\overline{x}$ –30 beats p. min. and etc.

On variation curve of the first training we see the highest (32 cases) and the most acute peak of diagram. Most of values are within the range $\overline{x} \pm 30$ beats p. min. At next trainings diagram peak reduces and become smooth; still more HR values exceed limits $\overline{x} \pm 30$ beat p. min., i.e. dispersion of HR values increases with rising of exercises' intensity. In spite of the same age and invariable membership of group, functional preparedness and the girls' response to highly intensive exercises are rather different.

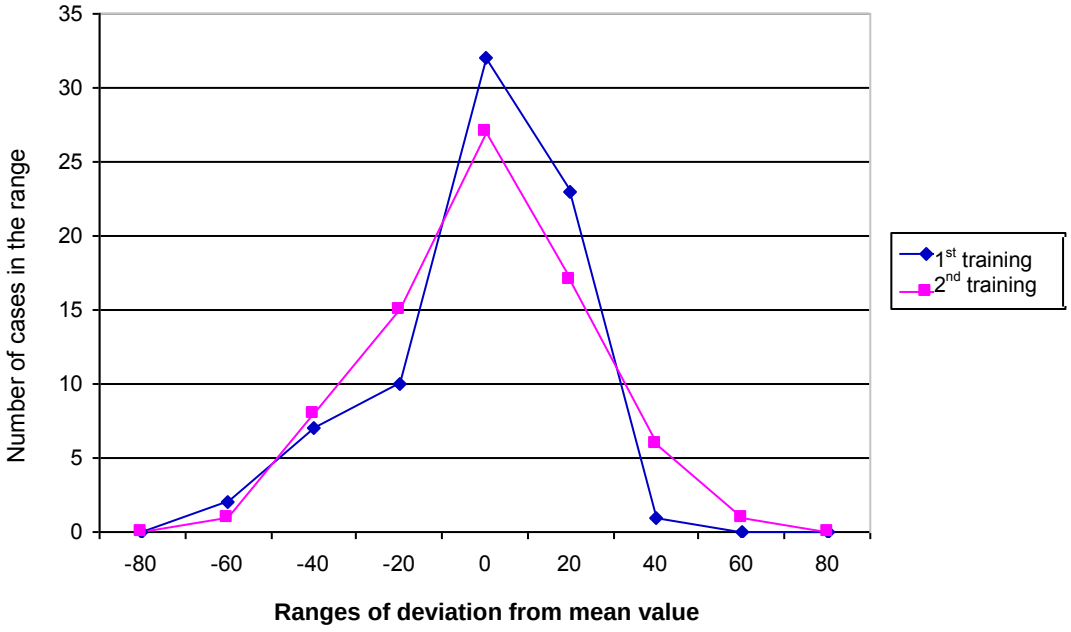

Diagram 1. HR variation curves after load. Trainings 1 and 2.

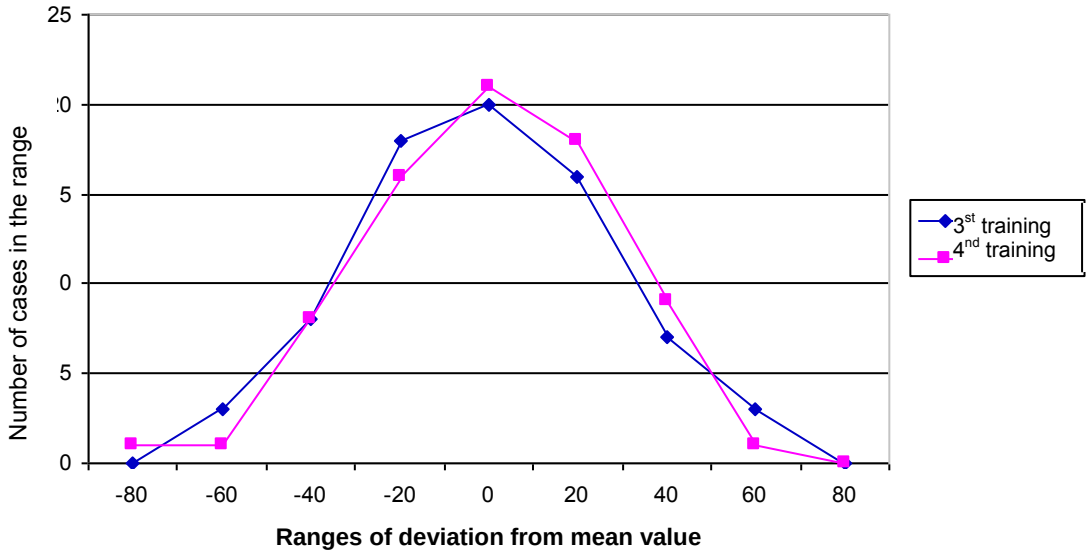

Diagram 2. HR variation curves after load. Trainings 3 and 4.

In the whole, variation curves shape evidently shows that HR values dispersion changes' character corresponds to the curves of normal dispersion. It permits us to reliably use all characteristics of normal dispersion for the analysis of results.

Variability can be evaluated also by variation coefficient V, which shows relative value (value in relation to arithmetical mean) of statistical population's variability. As a rule it is considered that with $0 < V < 10$ % variability of statistical population is low, at $10\ \% < V < 20\ \%$ - medium, at $20 < V < 30$ % -great. In our case, variation coefficient varies from 13,6 % to 15,5 %, that witness about average HR variability after load.

Besides characteristics of dispersion, in the table standard error *m* of arithmetical mean $\bar{x}$, which appears due to restricted sample size *n*, is presented. In our experiment *m* is not great and varies from 2,4 to 3,4beats p. min., that is connected with comparatively large sample size.

Evaluation of statistical confidence of differences between mean HR of group after aerobic load in 2, 3 and 4 trainings, comparing with the 1st training, was conducted by t-criterion of Student. The calculated values of the criterion in all three cases exceeded table value, i.e. the differences turned out to be statistically confident.

Summary.

All in all the conducted experiment permitted to reveal the following:

1. Increasing of step-platforms' height influences HR more significantly than the raising of music tempo and shifts training into zone of highly intensive aerobics. In connection with insufficient physical level of female students, highly intensive trainings can be used as a part of aerobics health improving academic trainings in restricted scope: raising music tempo of academic training's aerobic part up to 142–145 beats p. min. or increasing of step-platforms height up to 20 sm. is recommended only for the second and third year female students at the end of academic semesters. Increase of step-platforms' height and simultaneous raising of music tempo are possible only at trainings of sports teams of fitness aerobics.

2. 14 first year female students of (15,7 % from 89or every seventh) turned out to be insufficiently prepared for aerobics training. After usual, standard load, their HR was in average 207 beats p. min., and it corresponds to HR max, for this age. For these female students it is necessary to reduce intensity of aerobic part of training at the cost of step-platforms' height reduction and excluding of high beat choreography. In the future it is necessary in the same way to find functionally weak female students at the beginning of the first year of study in order to save them from excessive loads.

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