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HEART RATE DURING MORNING WORKOUT

Lieutenant Lado MESARIC (Slovenia)

ABSTRACT

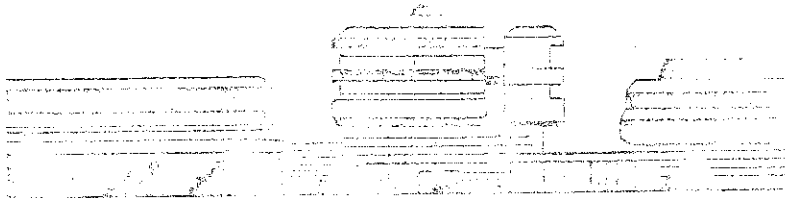
The purpose of the study was to determine individual target zones of workout in limits 65 % - 75 % of the maximum heart rate and the actual effort of individual subjects during the morning workout with the same workload.

The sample group of 44 soldiers had their heart rate values measured during the usual 20 minutes morning workout at the barracks. Every subject also had his morning heart rate at rest measured and his average morning heart (MHR) rate at rest calculated, which is a fairly accurate indicator of a subject's fitness. With the help of the heart rate Calculation table, every subject's target heart rate values were determined, representing the target zone 65 % - 75 % of the maximum heart rate and were drawn into the curve. The curve was drawn according to the measurings we performed during workouts.

The amount of exercise the subjects performed in the target zone, above the target zone and below the target zone has been established. On the basis of the results obtained, it can be concluded that the diversities between the subjects are obvious and are displayed in the morning heart rate at rest and in the effort of the subjects subjected to the same workload. This indicates the necessity of adaptation of exercise groups to the individual abilities of the subjects.

INTRODUCTION

Individual approach and gradual development are two of the main principles of workout. Therefore, the trainer has to adjust the basic workout concept to the abilities of the subjects. If not adjusted to the abilities of the subjects, continual running (the basic component of the morning workout) can cause the subjects severe feeling of tiredness, since regarded from the viewpoint of metabolism this type of workload reaches into anaerobic area and has nothing in common with purely aerobic workload, necessary for the development of the cardiovascular and respiratory functions. Therefore, we have to be aware of the subjects'abilities (4,6), which can be determined with tests. The heart rate (HR) is the most easily obtained and the most frequently measured physiological indicator. It is typical of heart rate that in relation to the exercise intensity its values increase in approximately linear proportion with the increase of work load, but specifically for each individual. Therefore, it is one of the most important indicators of the effort and especially of the working intensity of cardiovascular system



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subjected to a particular workload. The identical HR of the subjects, subjected to the same workload, indicates the similar effort for the individuals with similar capabilities, while the subjects with the identical HR, but subjected to different workloads means that they have different capabilities. This method of effort and workload evaluation is successful with submaximum workloads of 5 - 20 minutes (5). The soldiers should be subjected to this type of workload during the 20 minutes morning workout which takes place every morning, except on Sundays. In accordance with the instructions, the target zone of the heart rate during workout should be between 130 - 150 b/m. The target zone was determined with the anticipated value of HR_{max} ($HR_{max} = 220 - age$). Since the average soldiers' age is 20 years, the formula is as follows: $HR_{max} = 220 - 20 = 200$. The previously mentioned limit 130 - 150 b/m represents 65% - 75% of the maximum heart rate. This belongs to the area of weight management and the area of aerobic training (1,3). The previously mentioned principle of determining target values doesn't allow for the morning heart rate at rest, which is a relatively reliable indicator of the fitness of each individual. Therefore, the standard deviation of the actual values is $HR_{max} \pm 10$ b/m (5). The target values HR for workouts can be determined by taking into account MHR with the formula: target workload = $MHR + ((HR_{max} - MHR) \times \% \text{ of workload})$ or with the help of the heart rate Calculator table that was made experimentally on the basis of the previously mentioned formula. Even though the anticipated values of HR_{max} aren't always accurate, they provide us with the estimation of the initial state without any previous preparations. On the other hand the tests, even when done to assess the initial state, demand the suitable motoric, psychological and tactical preparations (1,4).

The purpose of the research is to determine individual target zones of HR, in which the subjects exercise in the area 65 % - 75 % of the maximum HR, and to determine the actual effort of individual subjects during the morning workouts.

SUBJECTS AND METHODS

A group of soldiers, aged 19.7 ± 1.19 years (mean, SD), voluntarily participated in the study. All of them had given their written informed consent.

Testing protocol

Heart rate at rest

Heart rate at rest was measured with a heart rate monitor immediately after the subjects woke up. The chest transmitter with sensors was fitted into a special holder with the heart rate monitor. The subject was lying on a bed and had his heart rate measured with the chest transmitter, while the value of the heart rate was decreasing. We used the lowest heart rate. The procedure was repeated 5 days in a row. The average value of values obtained was considered to be the morning heart rate at rest (1).

Heart rate during workload

The subjects were performing the morning workouts according to the usual program (3). A 20 minute workout included: 500 m running - 100 m walking - 500 m running - gymnastic exercises (9 exercises, repeated 10 times) - 500 m running. The prescribed workload was the same for all subjects, but small deviations are possible. The officers, who conducted the exercises were randomly chosen in accordance with the weekly workplan. The average temperature during the workout was 15 °C. The subjects performed the exercises in their usual exercise groups. They were wearing heart rate monitors POLAR Sport tester that memorised the heart rate every five seconds.

Data processing and analyses

All subjects' heart rate values were transferred from the monitor to PC. With the program POLAR HR Analysis Software (Polar Electro, Finland), we determined: heart rate curve during the workload, maximum heart rate, minimum heart rate, number of heartbeats and the duration of the exercises in individual areas, taking into account the determined upper and lower limit of the heart rate. The calculation of the heart rate value, representing 65 %, 70 %, 75 % of the maximum workload, was made by means of the heart rate Calculator table, taking

into account the average morning rate at rest and the subject's age (1). The basic statistics were calculated with the help of the EXCEL program (Microsoft, USA).

RESULTS

Heart rate at rest was $54,6 \pm 7,6$ (Figure 1). The limits of the workout area were determined with the help of the heart rate Calculator table and are $148 \pm 3,3$ b/m - $164 \pm 2,5$ b/m (Figure 2). The values are essentially higher than it is determined in the instructions as the average lower limit is almost 150 b/m. Taking into account the determined individual values of HR for the target workload 70 % of the maximum, the subjects can be divided into three groups (Figure 3). The duration of the individual areas of exercise is as following: above the individual target zone $28,04 \pm 15,5$ % , in the target area $24,90 \pm 11,25$ % and below the target area $47 \pm 14,91$ % . The values differ very much(Figure 4). The effort of the individuals with the same workload was, in some cases, extremely different. Mostly, the subjects' HR was below the target zone during the gymnastic exercises and above the target zone in the first 500 m of running (Figure 5).

DISCUSSION

On the basis of the results we had obtained, we can establish that the differences between the subjects are obvious and are exhibited in the morning heart rate at rest and in the effort of the subjects, subjected to the same workload. Therefore, morning heart rate at rest should be measured. This can be done without any particular technical equipment.

On the basis of the results, the target zone of exercise for each individual is determined. Ideally, all of the subjects would have their heart rates monitored during the workout with the defined target zone of exercises. Probably at least three exercise groups should be formed. A detailed workout plan should be made for each group. Regular monitoring of the heart rate can become one of the ways to check the successfulness of the workout. In such a way, first steps towards the individualization of the morning workout can be taken. However, since not all the subjects with identical morning heart rates do not respond identically to the same workload, the use of the heart rate monitor (the subjects can alternately use the same monitor) is reasonable. On the basis of the feed back information on the effort of the subjects, it is rendered possible that the subjects can pass over into another group and the corrections of the workout plan can be made.

For the example we have been discussing we can establish that running at the beginning of the workout is too fast for most of the subjects while, during the gymnastic exercises, the heart rate usually decreases below the limit of the target zone. Probably, after running too fast, the subjects »use the gymnastic exercises to get some rest« and don't carry them out properly.

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Figure 1 - Heart rate at rest is a fairly accurate indicator of the fitness of an individual

Figure 2 - Individual target zones in the limits 65 % - 75 % HR_{max} , determined with the help of the heart rate Calculation table

Figure 3 - The subjects achieve the heart rate, representing 70 % of HR_{max} (aerobic exercise), in the area 150 - 165 b/m. For the needs of the workout plannings, they can be divided into three groups

Figure 4 - The same workload means different effort for individual subjects. During the workout, the subjects are above, below and in the target zone

Figure 5 - Individuals respond very differently to the same workload. A trained athlete (MHR = 42 b/m) had to put much less effort in the workout than a subject with a relatively low morning heart rate (MHR= 52 b/m) who is also overweight