INVESTIGATION OF THE EFFECT OF THE TRAINING LOAD ON THE ATHLETES IN RHYTHMIC AND AESTHETIC GROUP GYMNASTICS DURING THE PREPARATION PERIOD

(Original scientific paper)

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Abstract

The natures of the rhythmic and aesthetic group gymnastics are similar but they are two different sports. In gymnastics disciplines the measuring of the load and its effect is difficult and sometimes underestimated. That is why we monitored the HR and the blood La during and after the execution of a rhythmic gymnastics and aesthetic gymnastics routine. In this investigation took part 25 high level athletes – 13 RG and 12 AGG. The aim is to determinate the character of the load, the work zones during execution of a routine in RG and AGG as well tracing the recovery period of the gymnasts.

Keywords: girls, Heart rate, blood Lactate, testing, training, standard deviations, t-test.

INTRODUCTION

The natures of rhythmic and aesthetic group gymnastics are similar Gancheva (2004). It is difficult to measure the load and its effect in gymnastics disciplines Dobreva (2006); Jenni, Sands, Salmela, Holvoet, & Gateva (2011), and these are sometimes underestimated. In rhythmic gymnastics there are more studies about the physiological changes Baldari, & Guidetti, (2001); Douda, Avloniti, Kasabalis, Smilos, & Tokmakidis, (2006); Douda, Toubekis, Avloniti, & Tokmakidis, (2008); Guidetti, Baldari, Capranica, Persichini, & Figura, (2000). in the gymnast’s body than in aesthetic gymnastics, where the researches are just starting with their investigations Gateva (2009); Gateva (2010); Gateva (2010); Gateva (2012).

The aim of the research is to determine the effect on athletes from rhythmic and aesthetic gymnastics from performing a gymnastics routine. The following tasks are set:

1. Monitoring the heart rate and the concentration of the blood lactate as a result of performing a routine in rhythmic and aesthetic group gymnastics.
2. Examining the recovery period after performing a routine in rhythmic and aesthetic group gymnastics.
3. Comparative analysis of the load of the two gymnastics disciplines.

METHODS

Subjects

Taking part of the research were 25 high level athletes from rhythmic and aesthetic group gymnastics – 13 rhythmic gymnasts and 12 aesthetic group gymnasts, age 14 to 19 (average 15,4 for RG and 16,6 for AGG).

Research protocol

The testing was performed in the preparation period (November 2012) of the gymnasts. They were asked to perform a real competitive routine, individual for rhythmic gymnastics (RG) and group for the aesthetic group gymnastics (AGG).

The indicators used in the study were the heart rate and the blood lactate. Heart rate was monitored during and after the routine up to the 9th minute of the recovery period. A drop of blood sample was taken from the fingertip to assess blood lactate using an Accutrend Plus Roche. Lactate was taken before and on the 3rd, 5th and the 9th min during the recovery period in order to assess the maximal values of the concentration of the blood lactate. The gymnasts were asked to be in an active recovery (walking) in the first two minutes after performing the routine and in passive recovery (sitting) the following seven minutes in order to take the blood samples.

Statistics

The nature of this investigation was mainly descriptive. Averages and standard deviations were calculated for all the data. The t-test was used to identify any differences between the responses in RG and AGG. The level of significance of p ≤ 0.05 was adopted in all cases.
RESULTS AND DISCUSSION

The maximal duration of a routine according to the code of points in rhythm gymnastics (RG) for individual competitors is 90 seconds Правилник по художествена гимнастика (2013-2016) (Code of Points (RG) 2013-2016, 2013). That is also the average duration of a routine. Due to the fact that a great number of exercises need to be performed for a short period of time, most of the routines are with that duration. The routine duration in the aesthetic group gymnastics (AGG) is between 2,15 and 2,45 min Правилник по естетическа групова гимнастика. (2006) (Code of Points (AGG) 2006, 2012). In our research, AGG competitors perform 2 compositions with an average duration of 2,30 min. We will review the loading (routines) and recovery for the two gymnastics disciplines researched.

The maximal heart rate values during the execution of the routines in rhythm gymnastics are reached at the very end of the routine, with the maximal heart rate measured in our research at 200 b/min, and the minimum at 187 b/min. The average maximal heart rate after execution of the routine in rhythm gymnastics is 193,5 b/min. This is approximately an average of 94,5 % of the theoretical maximum realized by the gymnasts. Each one of the tested girls reaches more than 91 % of her theoretical maximum. Those values are reported in the preparatory period and they are in concurrence with data from previous researches in rhythmic gymnastics Gatева (Гатева),(2008); Nikolov (Николов) & Кателиева (Кателиева, (2004); Salapatiska (Салапатийска), & Raeva (Раева), (2005), and aesthetic gymnastics (Gateva (Гатева) & Andonov, K. (2009), where values reach more than 200 b/min. This allows us to state that the loading varies from sub-maximal to maximal during the competitive routine in rhythm gymnastics.

The development of the heart rate values during the loading (routine) is of interest. We divided the time for the routine provisionally in two parts: time for reaching the zone of high efficiency 180 b/min and time for sustaining the high efficiency above 180 b/min. Since the routine is of short duration 90 sec., the processes run rapidly and an average of 36,9 sec. is needed for reaching the so called zone of 180 b/min. Respectively great values are sustained for 53,1 sec., increased and at the end of the routine reach (as we described before) 193,5 b/min. Despite the increment of the values there is a noticeable plateau in the heart rate graphics.

The results, collected from competitors in aesthetic group gymnastics are not much different from the results collected from the rhythm gymnasts, although the heart rate is few beats lower, with longer duration (60 sec. longer routine). The average maximal value (190,8 b/min) is reached in most cases at the end of the routine but there are few competitors (1/3 of the tested girls) in which maximal values have been detected during, and not at the end of the routine. As a reason for this we might point out the structure of the routines and the different level of preparedness (functional condition). The maximal heart rate values, registered during loading are 196 b/min, and the minimal – 186 b/min. 93,8 % of the theoretical maximum of the competitors is reached with these heart rate values. With the averaging of the values there is a slightly noticeable increase in the heart rate during the routine which is not always the case if individual values are reviewed. The review of every single case shows that there are competitors at which the curve is with a wave-like character and the maximal values are not always at the end of the routine. The time needed for reaching the zone of high efficiency during the execution of the routine in AGG has an average of 52,5 sec. with the plateau sustained at an average of 97,5 sec (heart rate over 180 b/min).

Comparing both group gymnasts’ (RG and AGG) results we couldn’t find significant difference between the maximal values of the HR reached at the end of the routine. Values were very similar as the rhythm gymnasts had 3 b/min higher than girls from AGG (RG – 193,5 b/min, AGG – 190,8 b/min). Probably due to the duration of the AGG routine it shows a difference when the maximal values of HR are reached as this is not al-
ways at the end of the load. Steady state (zone of high load) is sustained for longer compared to RG routine and that is why we could observe a variation of the curve in the graphics (Graph. 2 – individual case).

The recovery period is similar in both types of routine (RG and AGG one). We can divide the recovery period in three zones: 1st zone of quick recovery (from 190 b/min to 140 b/min) – from the cease of the loading up to 1,30 min; 2nd zone of slow recovery (from 140 b/min to 120 b/min) – duration 1,30 min – up to third minute of the recovery; and 3rd zone of incomplete recovery (keeps values between 120 to 100 b/min) – average of 6 min which stays up to the end of the recovery period. What we could see is that the AGG girls recovered below the 120 b/min on the 2,30 min which is quicker than GR girls who reach that value on the 3,15 min. A significant difference is not found. During the recovery period the average values of the HR are slightly higher in RG athletes than AGG ones with up to 8 b/min (Graph. 3).

The valuable knowledge for the coaches’ practice is to know the required time for recovery before the next routine. It is known that during training the number of executed routines could go up to 40 Gateva (Гатева), 2008), which makes a massive work volume. Depending on the goals, the coach could use incomplete recovery between each routine to develop the anaerobic-aerobic abilities of the gymnast (specific endurance) or utilize full recovery to precise the performance of the gymnast. Noteworthy about this investigation is that a good level of recovery is achieved at 1,30 min after performing a routine and that after the third minute (if the athlete has stopped working) extra preparation could be needed in order not to lose the muscle tone. From practical point of view the best time for a next routine is at 1,30 min of the recovery.

Concentration of the blood lactate was measured at the 3rd, 5th and the 9th min during the recovery period in order to assess the maximal values of that indicator. Different athletes have different time reaching their maximal values after executing the routine. Most of the AGG gymnasts (2/3) register their highest values on the third minute of the recovery but the rest of the
girls (1/3) on the fifth. RG girls also reach their highest values primarily on the third minute (53.85%), 30.8% of the gymnast on the fifth minute and only two of the girls have their maximal values at the 9th min of the recovery. We are interested mainly in the maximal values reached. The average values of the blood lactate after performing a routine are similar – 8.43 mmol/l for RG and 8.93 mmol/l for AGG. The maximal blood lactate concentration measured in AGG is 13.9 mmol/l which is quite similar to the one in RG - 12.8 mmol/l. The lowest measured values in both disciplines are above the anaerobic threshold (4.7 mmol/l and 4.8 mmol/l) and that proves the statement that the load of the execution of a routine is sub maximal.

CONCLUSIONS

1. Both sports: rhythmic and aesthetic group gymnastics have the duration of the load, the values of the heart rate and the blood lactate concentration of the IV zone of energy supplying – anaerobic-glycolysis regime of work with heart rate values 180-195 b/min; La above 10 mmol/l (Hadjieva (Hadzieva), Andonov (Andonov), Dobrev (Dobreva) & Petrov (Petrov), (2011).

Table 1. Descriptive statistics and t-test of the concentration of the blood lactate after executing a routine in RG and AGG

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Max</th>
<th>Min</th>
<th>S</th>
<th>V%</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>RG</td>
<td>8.43</td>
<td>12.80</td>
<td>4.80</td>
<td>2.49</td>
<td>6.18</td>
<td>t – 0.493</td>
</tr>
<tr>
<td>AGG</td>
<td>8.93</td>
<td>13.90</td>
<td>4.70</td>
<td>2.61</td>
<td>6.82</td>
<td>α – 0.627</td>
</tr>
</tbody>
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2. Despite the different duration of the routines in rhythmic and aesthetic group gymnastics there are similar values of HR at the end of the routine and during the recovery period. The same applies for the concentration of the blood La after the load since the registered differences are insignificant.

3. Incomplete recovery could be seen on the 1.30 min after the executed routine in RG and AGG. Also around the third minute the HR gets into the steady state – around 110-100 b/min.

4. We recommend recovery period of 1.30 min before the next execution of the routine if we focus on the technique and less than 1-1.30 min if we want to develop specific endurance.

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