Determination of the training intensity zones using breath-by-breath parameters and estimated percentages of $HR_{\text{max}}$

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Introduction

Certain training intensity zones form the basis for creation of optimal training programs aimed at developing some types of aerobic or anaerobic capacities. Nevertheless, intensity zones are often determined in an imprecise way. Modern sport requires accurate determination of physiological parameters for each intensity zone. For this reason, direct methods can be of great help in order to attain greater accuracy.

Objective

The goal of the research was to examine the differences in training intensity zones established experimentally (by using breath-by-breath parameters) and theoretically (by using defined algorithms).

Materials & Methods

All subjects performed an incremental treadmill test (1 km/h per minute, 1.5% grade).

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<th>AVG ± SD (min-max)</th>
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<tr>
<td>AGE (years)</td>
<td>18.9 ± 1.41 (17 - 21)</td>
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<tr>
<td>HEIGHT (cm)</td>
<td>181.4 ± 7.06 (166.9 - 196.7)</td>
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<tr>
<td>WEIGHT (kg)</td>
<td>74.6 ± 8.14 (56.5 - 93.7)</td>
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Upper limits of training intensity zones were determined by V-slope method which have been attributed to the corresponding heart rate ($HR_{\text{exp}}$) and then, compared to the zones determined by algorithms of the percentage of the maximum heart rate (%$HR_{\text{max}}$).

The model that was used consisted of the four training intensity zones: recovery zone (RZ), the zone of extensive aerobic training (AEZ), the zone of intensive aerobic training (AIZ) and the zone of anaerobic threshold (ANZ). One-way ANOVA and Bonferoni’s post hoc comparisons were used in statistical analyses to determine differences in observed variables. Statistics with a value of $p < 0.05$ were considered significant.

Results & Discussion

In comparison with experimentally determined zones, proposed algorithms of percentages of $HR_{\text{max}}$ in the first two zones are too low. It can be attributed to the lack of attention giving zones with a light load, although they may be substantial in a variety of training programs. Furthermore, assessment of $HR_{\text{max}}$ can be unreliable due to various intrinsic and extrinsic factors if it is not measured with appropriate test. In the last two zones is not necessary doing significant changes in determining the percentage of $HR_{\text{max}}$.

Conclusion

1. Analysis has shown that the proposed percentages of $HR_{\text{max}}$ are miscalculated.
2. The authors recommend raising the values, concretely, in the RZ for 5% (from 60 % to 65 % $HR_{\text{max}}$) and in the AEZ for 5 % likewise (from 60 - 75 % to 65 - 80 % $HR_{\text{max}}$).
3. In AIZ the range is 80-85 % $HR_{\text{max}}$ and in the ANZ is 85-90% $HR_{\text{max}}$.

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