



Abstract

Heart Rate Responses during High-Intensity Functional Training in Child Female Gymnasts [†]

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[†] Presented at the 9th Greek Conference of Biochemistry and Physiology of Exercise, Thessaloniki, Greece, 18–20 October 2019.

Published: 3 September 2019

Abstract: **AIM:** Energy supply in artistic gymnastics is derived mainly through the anaerobic metabolism, due to the brief duration of the competitive routines. However, during training, gymnasts perform repetitive exercises and routines, which may require aerobic adaptations, in order to recover fast and maintain high quality of execution. To improve this aspect of fitness, coaches use high-intensity interval circuit training with sport-specific exercises. Despite the popularity of this training method, there is limited information regarding the demands placed on aerobic metabolism, especially in very young athletes. Thus, the aim of this study was to examine heart rate responses during a high-intensity functional training session in female child gymnasts, to indirectly assess the contribution of aerobic energy metabolism. **MATERIAL & METHOD:** Seventeen girls aged 9.8 ± 0.8 years (height, 1.38 ± 0.10 m; body mass, 33.7 ± 7.25 kg) performed two 5-min sets, each consisting of five rounds of five gymnastics exercises (5–7 s work and equal rest) executed at maximal effort. The two sets were separated by a 3-min recovery period. Prior to the main measurement, athletes performed a 20-m shuttle run test until exhaustion where maximum heart rate (HR_{max}) was measured and the maximum oxygen uptake (VO₂max) was estimated. Heart rate was continuously monitored during all sessions using a Polar team 2 system. **RESULTS:** VO₂max was 47.8 ± 3.0 mL kg⁻¹ min⁻¹ and HR_{max} was 207 ± 5 bpm. During the first set, peak HR was 192 ± 7 bpm and average HR was 171 ± 8 bpm (83% HR_{max}). During the second set, peak HR was 196 ± 8 bpm and average HR was increased to 186 ± 6 bpm (90% HR_{max}, $p < 0.001$ compared with set 1). The time during which HR was above 90% of HR_{max} was 2.0 ± 1.2 min in set 1 and increased to 3.4 ± 1.7 min in set 2 ($p < 0.01$). HR recovery was similar after both sets, with HR decreasing by about 30% (to 139 ± 7 bpm and 134 ± 10 bpm) after 2 min ($p < 0.001$). **CONCLUSION:** These results suggest that high-intensity training using sport-specific exercises increases HR to levels above 90% HR_{max} for extended time periods. Thus, this type of training may be an appropriate stimulus for concurrent improvements in muscle strength/power and aerobic fitness.

Keywords: heart rate; high-intensity functional training; gymnastics

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