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Application of "living high-training low" enhances cardiac function and skeletal muscle oxygenation during submaximal exercises in athletes.

Purpose:The aim of this study was to determine the efficiency of the application of living high-training low (LHTL) on cardiac function and skeletal muscle oxygenation during submaximal exercises compared with that of living low-training low (LLTL) in athletes.

Methods:Male middle- and long-distance runners (n = 20) were randomly assigned into the LLTL group (n = 10, living at 1000-m altitude and training at 700-1330-m altitude) and the LHTL group (n = 10, living at simulated 3000-m altitude and training at 700-1330-m altitude). Their cardiac function and skeletal muscle oxygenation during submaximal exercises at sea level before and after training at each environmental condition were evaluated.

Results: There was a significant interaction only in the stroke volume (SV); however, the heart rate (HR), end-diastolic volume (EDV), and end-systolic volume (ESV) showed significant main effects within time; HR and SV significantly increased during training in the LHTL group compared with those in the LLTL group. EDV also significantly increased during training in both groups; however, the LHTL group had a higher increase than the LLTL group. ESV significantly increased during training in the LLTL group. There was no significant difference in the ejection fraction and cardiac output. The skeletal muscle oxygen profiles had no significant differences but improved in the LHTL group compared with those in the LLTL group.

Conclusion: LHTL can yield favorable effects on cardiac function by improving the HR, SV, EDV, and ESV during submaximal exercises compared with LLTL in athletes.