Summary

The effect of plyometric training on triathlete's running economy after intense cycling

Introduction

Triathletes have high maximal oxygen uptake (VO2 max) values. Although VO2 max is a predictor of performance in triathletes, the anaerobic threshold and movement economy are also crucial factors. Triathlon competitions success depends on the ability to transition between disciplines, especially between cycling and running. Previous studies suggest that the running segment has the greatest influence on the final position in a triathlon race. Research indicates that prior cycling activity affects running efficiency and is associated with observed changes in neuromuscular, physiological, and biomechanical parameters. Triathletes at various skill levels often experience a subjective feeling of lack of coordination during the run after completing the cycling phase. Therefore, identifying training interventions that could minimize these disturbances may help improve after cycling running performance.

Plyometric training is a specific form of strength training. The plyometric exercises are based on the stretch-shortening muscle cycle, aiming to increase the muscle's ability to quickly generate force in the shortest time possible. Numerous studies shows that endurance training and plyometric training combination brings positive results by improving running economy in endurance athletes.

The aim of the study was to evaluate the effect of an 8-week plyometric training program on running economy after intense cycling in triathletes. Also, the study aimed to assess the impact of plyometric training on selected physiological indicators at the threshold (VT2) and maximal effort during both running and cycling.

Research methods

The experimental study involved local level competition triathletes (n=19). Firstly, all athletes underwent body composition measurements and graded exercise tests for running and cycling. Secondly, the running economy, running economy after intense cycling and biochemical markers were assessed. All tests were performed at appropriate time intervals. Next, the athletes were randomly assigned to two groups: a control group (n=9) and an

experimental group (n=10). The experimental group included plyometric training in their training plan for 8 weeks (twice per week). The control group trained as usual. After 8 weeks, all athletes repeated the body composition measurements, graded exercise tests for both running and cycling, as well as assessments of running economy and running economy after intense cycling, along with biochemical marker evaluations, just as at the start of the study.

Results

No significant changes were observed under the influence of plyometric training in physiological indicators characterizing maximal effort during cycling included HR max (p=0.53), VO2 max (p=0.97), VO2/kg max (p=0.92), VE max (p=0.93), P max (p=0.19), and P max/kg (p=0.23), and during running HR max (p=0.09), VO2 max (p=0.67), VO2/kg max (p=0.41), and VE max (p=0.94).

In the experimental group, after 8 weeks of plyometric training, a significant increase in the time to reach the second ventilatory threshold during running was observed (p=0.014 and higher running speed at the second ventilatory threshold (p=0.013).

Plyometric training did not significantly affect changes in running economy at any of the tested speeds in the studied triathletes (speed II: p=0.10; speed III: p=0.51), and did not significantly influence running economy after cycling (speed II: p=0.09; speed III: p=0.61).

No statistically significant differences were observed in the somatic indicators examined in either the experimental or control group.

Conclusion

Plyometric training does not affect running economy or running economy after cycling in triathletes. Plyometric training did not lead to changes in VO2 max during cycling and running. however, it may improve running speed at the second ventilatory threshold (VT2). The time to reach the second ventilatory threshold (VT2) during running in the experimental group increased by 9.8% after plyometric training, while the running speed at VT2 in the experimental group increased by 4.3%. Cycling significantly influences the increase in heart rate, pulmonary ventilation, blood lactate concentration, and subjective perception of effort during running.

Plyometric training should be considered as complemenatry element in triathletes' preparation for the season, as it may increase tolerance to developing metabolic acidosis during running.

Further research on the effects of strength training is recommended, particularly among national and international level athletes, where detailed analyses are still lacking.