The effect of sprint and endurance training on lactate threshold, peak lactate and velocity in swimming

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Introduction
A topic of considerable debate among sport scientists is the conflicting effect of endurance training on sprint performance and vice versa. Some believe that neither type of training interferes with the effects of the other, but others believe that one type of training, sprint or endurance, definitely reduces the training effect of the other. The purpose of this study was to investigate the impact of two different training regimens on sprint performance, lactate threshold, peak lactate and velocity of swimmers.

Methods
Ten female and 4 male collegiate recreational swimmers aged 20 to 23 years undertook an 8 X 50–m incremental swimming test on two occasions, before and after 4 weeks of training for the determination of the lactate threshold (LT), LT velocity, peak lactate and the 50 meter maximum performance (50meter Max time). They were randomly assigned to one of each two training groups. The first group (n=6), focused on sprint training (SP) with a warm-up, a main series of 180±210 meters and a cool down. The second group (n=8), focused on both sprint and endurance training (SP+End) and followed the same program as the SP group and additionally swam 1092±178 meters of endurance training after the completion of the SP main series. Both groups trained for 4 weeks, 3 times per week, under coach supervision. Before, during and after the incremental tests blood samples were collected from their fingertip and directly analysed for lactate concentration by the Accusport lactate analyser (Roche). LT was determined by the modified D-Max method as used by the Australian Institute of Sport. Times (sec) and heart rates were also recorded after each 50 meter trial. Data were analysed by a 2-way ANOVA, at P<0.05, by STATISTICA.

Results
The swimming velocity which corresponded to the lactate threshold (LT) of the SP+End demonstrated a significant increase from 1.30±0.15 meters per second (m/sec) to 1.34±0.14 m/sec which was not evident on the SP group. On the graphic representation of the individual lactate-velocity curves this was manifested as a rightward shift of the curves, whereas the lactate-velocity curves of the SP group did not show any move in either direction. Maximal 50m test time significantly decreased in both groups, from 35.35±4.31 seconds (sec) to 34.35±3.85 sec in the SP+End group and from 36.40±3.95 sec to 35.26±4.02 sec in the SP group, but training type did not have any impact on these changes. This effect was also expressed in terms of a significant increase of peak velocity in both groups. The blood lactate concentration at the LT decreased significantly only in the SP group from 4.80±0,75 mmol/L to 4.15±0,75 mmol/L even though it also decreased in the SP+End group. Peak lactate concentration did not significantly change and was not affected by training type.

Discussion
A training effect was evident in both groups as seen by the improvement in performance of the Max 50 meter time, peak velocity increase and the lower value of the lactate concentration at the lactate thresholds. Lactate threshold velocity improved only in the SP+End group as also evidenced by the rightward shift of the individual lactate-velocity curves, indicating an improvement in the aerobic capacity. The greater drop of lactate threshold concentrations of the SP group demonstrated a greater effect of sprint training on lactate kinetics. To conclude, additional amount of training despite of improving endurance did not offer any additional benefit and/or any reduction on sprint performance. The tendency to overtrain when focusing on sprint performance should be re-evaluated.

References