OXYGEN UPTAKE AND BLOOD LACTATE IN FULL AND FRACTIONATED SYNCHRONIZED SWIMMING DUET ROUTINES IN ELITE SWIMMERS


INEFC-Barcelona Sports Sciences Research Group, Institut Nacional d’Educació Física de Catalunya, Universitat de Barcelona (Catalonia, Spain)

Introduction
Synchronized swimming (SS) combines intense muscular exercise with body position changes and prolonged apnoeic periods that impose additional physiological demands (Rodriguez-Zamora et al. 2012). Oxygen uptake (\(\dot{V}O_2\)) and blood lactate (La\(_b\)) have traditionally been used as key indicators to assess the internal load in sports. No studies have examined \(\dot{V}O_2\) in SS. We aimed to describe the time course of \(\dot{V}O_2\) and La\(_b\) across fractionated competitive routines in elite swimmers.

Methods
16 elite junior and senior swimmers (age 16.5±2.5 years, height 165±7 cm, body mass 53±8 kg) completed eight full duet routines fractionated into two periods in coincidence with prolonged apnoeic periods. Measurements were taken before exercise (PRE) and before and after the full routine (FULL), and before and after the first and second prolonged apnoeic phases (Pre/PostAP1, Pre/PostAP2). Capillary blood samples were obtained from the earlobe at rest and at min 3, 5, (7) after each subroutine. \(\dot{V}O_2\) was estimated from 30-s backward extrapolation of breath-by-breath postexercise measurements (K4 b\(^2\) Cosmed, Italy). RPE was measured with the Borg CR-10 scale. RM-ANOVA and post-hoc Bonferroni tests compared values obtained before and after the five subroutines (P<\(\alpha\)=0.05 for significance).

Results
Exercise duration (s), peak La\(_b\) (mmol·l\(^{-1}\)), and peak \(\dot{V}O_2\) (ml·kg\(^{-1}·\)min\(^{-1}\)) was, respectively: PRE: 0, 1.0±0.5, 10.4±3.4; PreAP1: 67±21, 3.7±1.6, 54.7±6.5; PostAP1: 81±22, 3.8±2.2, 55.5±9.6; PreAP2: 171±25, 4.9±1.9, 60.2±11.1; PostAP2: 183±23, 5.7±2.0, 60.7±10.8; and FULL: 197±10, 5.9±1.4, 61.8±15.1. All postexercise \(\dot{V}O_2\) and La\(_b\) values were different from PRE, but \(\dot{V}O_2\) was similar among subroutines and compared with FULL (P>0.38). Peak La\(_b\) was higher after FULL than after PreAP1 and PostAP1 (P=0.04 and 0.005).

Discussion
Continuous measurement of \(\dot{V}O_2\) and La\(_b\) during SS routines is not possible due to the frequent immersion phases. The fractionation strategy used here allowed us to build up a picture of the time course of these parameters across competitive duet routines in elite swimmers. \(\dot{V}O_2\) showed a fast rate of increase during exercise (e.g., ~90% \(\dot{V}O_2\)peak was attained after ~67 s). Since no differences were noted between in any of these parameters before and after prolonged apnoeic phases, we propose that the fast rate of increase of \(\dot{V}O_2\) and La\(_b\) accumulation are essentially caused by the high energy demands of exercise and not by the prolonged hypoxic bouts, despite the dramatic effect on heart rate.

References

Contact
farodriguez@gen.cat