

# MAXIMAL AND SUBMAXIMAL CARDIOPULMONARY RESPONSES TO WHOLE-BODY SIMULATED SWIMMING

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The purpose of this study was to explore the relationship between oxygen uptake and heart rate in response to whole-body simulated swimming.

Nine club swimmers (mean  $\pm$  SD; age:  $20 \pm 4$  years, stature:  $1.68 \pm 11$  m, mass:  $63 \pm 12$  kg) signed an informed consent and participated in the study. All subjects performed a simulated front crawl combined arm-pulling and leg-kicking incremental exercise test to exhaustion using a swim bench and a leg-kicking ergometer. Oxygen uptake ( $\dot{V}O_2$ ) and heart rate (HR) were recorded at 15 s intervals and at exhaustion ( $\dot{V}O_{2peak}$ ;  $HR_{peak}$ ). The HR at ventilatory threshold (VT) was determined ( $VT_{HR}$ ) and the  $\dot{V}O_2/HR$  relationship explored.

The mean  $\pm$  SD for  $\dot{V}O_{2peak}$  and  $HR_{peak}$  values were  $3.3 \pm 0.4$  L $\cdot$ min<sup>-1</sup> and  $174 \pm 8$  b $\cdot$ min<sup>-1</sup> respectively, whereas  $VT_{HR}$  occurred at  $162 \pm 5$  b $\cdot$ min<sup>-1</sup> at a predicted  $\dot{V}O_2$  of  $2.4 \pm 0.4$  L $\cdot$ min<sup>-1</sup>. The relationship between  $\dot{V}O_2$  and HR was shown to be linear in all subjects ( $r=0.94$ ;  $P<0.05$ ).

Previously published data have demonstrated linear relationships between HR/EI and  $\dot{V}O_2/EI$  ( $r=0.99$  and  $r=0.98$  respectively;  $P<0.05$ ) for simulated arm-pulling exercise. The peak values for simulated front-crawl arm-pulling and leg-kicking exercise were:  $2.85 \pm 0.26$  L $\cdot$ min<sup>-1</sup>,  $171 \pm 3$  b $\cdot$ min<sup>-1</sup> and  $3.1$  L $\cdot$ min<sup>-1</sup>,  $170 \pm 3$  b $\cdot$ min<sup>-1</sup>, respectively. Our results suggest that the  $\dot{V}O_2$  and HR responses to full-stroke simulated swimming are higher than the respective responses to arm-pulling or leg-kicking separately. This type of whole-body ergometry might be useful for assessing maximal and submaximal cardiopulmonary responses to exercise in swimmers.

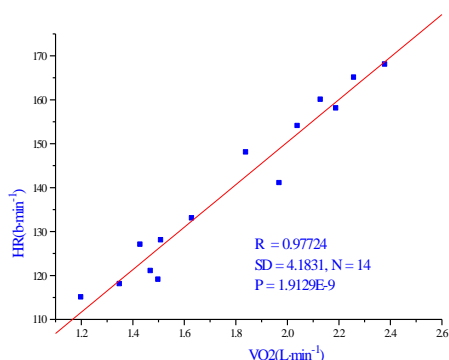


Figure 1.  $\dot{V}O_2$  and HR in response to full stroke simulated swimming

## REFERENCES

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Swaine I.L., Zanker C.L. (1996). Int J Sports Med 17(2): 140-144.