

ABSTRACT

This thesis aimed to establish criteria for defining $\dot{V}O_{2max}$, and to investigate test-retest reliability, test duration, event specialism and pacing strategy as determinants of the % $\dot{V}O_{2max}$ attained during 400 and 800 m running.

Study I established criteria to define $\dot{V}O_{2max}$. Each participant ($n = 8$) completed four ramp tests. $\dot{V}O_2$ was determined using 15 and 45 s sampling periods. A $\dot{V}O_2$ -plateau and a criterion $\dot{V}O_{2max}$ were identified using a modelling approach. For the 15 s data, two averaging methods and periods were used to define the highest $\dot{V}O_2$ attained ($\dot{V}O_{2peak}$) and the criterion validity and test-retest reliability of these were derived. A $\dot{V}O_2$ -plateau was identified in all participants for both the 15 and the 45 s data. Bias between $\dot{V}O_{2peak}$ and the criterion $\dot{V}O_{2max}$ was less than $0.9 \text{ ml.kg}^{-1}.\text{min}^{-1}$. Test-retest variation in $\dot{V}O_{2peak}$ was less than $\pm 1 \text{ ml.kg}^{-1}.\text{min}^{-1}$ for 30 s averages for a $\dot{V}O_{2peak}$ of $70 \text{ ml.kg}^{-1}.\text{min}^{-1}$. It was concluded that deriving $\dot{V}O_{2peak}$ using a 30 s moving average is both valid and reliable for the determination of $\dot{V}O_{2max}$.

Study II investigated test-retest reliability and $\dot{V}O_{2max}$ as determinants of the % $\dot{V}O_{2max}$ attained during 800 m running. Each participant ($n = 15$) completed a ramp test and two 800 m runs. Participants were split into high and low $\dot{V}O_{2max}$ groups. $\dot{V}O_{2peak}$ was reliable in both groups but more so in the high $\dot{V}O_{2max}$ group (± 2.3 vs. $\pm 3.5 \text{ ml.kg}^{-1}.\text{min}^{-1}$). There was a significant ($p = 0.001$) negative correlation ($r = -0.77$) between $\dot{V}O_{2max}$ and the % $\dot{V}O_{2max}$ attained. The % $\dot{V}O_{2max}$ attained by the low $\dot{V}O_{2max}$ group was significantly ($p < 0.001$) higher than for the high group (96.5 vs. 89.7%). It was concluded that $\dot{V}O_{2max}$ cannot be attained by aerobically fit runners during 800 m running and that the % $\dot{V}O_{2max}$ attained is negatively related to $\dot{V}O_{2max}$.

Study III investigated test duration and event specialism as determinants of the % $\dot{V}O_{2max}$ attained during 400 and 800 m running. Six 800 m specialists completed a ramp test, a 400 and an 800 m run. Six 400 m specialists completed a ramp test and a 400 m run. The % $\dot{V}O_{2max}$ attained was significantly ($p = 0.018$) higher for the 800 than for the 400 m run (89.1 vs. 85.7%). The % $\dot{V}O_{2max}$ attained was significantly ($p = 0.001$) higher for the 400 m specialists than for the 800 m specialists during the 400 m run (93.9 vs. 85.7%). It was concluded that there is a between-event (but within group) difference in the % $\dot{V}O_{2max}$ attained by 800 m specialists during 400 and 800 m running. However, there is also a between-group (but within event) difference in the % $\dot{V}O_{2max}$ attained between 400 and 800 m specialists during 400 m running.

Study IV investigated pacing strategy as a determinant of the % $\dot{V}O_{2max}$ attained during 800 m running. Participants ($n = 8$) completed a ramp test, constant speed accelerated start, and accelerated fast-start 800 m runs. The % $\dot{V}O_{2max}$ attained was significantly ($p = 0.048$) higher for the fast-start run compared to the constant one (92.5 vs. 89.3%). It was concluded that pacing strategy is an important determinant of the % $\dot{V}O_{2max}$ attained during 800 m running.

In conclusion, this thesis has shown that the determinants of the % $\dot{V}O_{2max}$ attained during 400 and 800 m running are more complex than previously reported. The % $\dot{V}O_{2max}$ attained varies within (i.e. as a function of aerobic fitness) and between 400 and 800 m running for 800 m specialists, between 400 and 800 m specialists for 400 m running, and in response to different pacing strategies during 800 m running. It was beyond the scope of this thesis to identify mechanisms that may explain these findings. However, there appears to be a potential link with differences in aerobic fitness between and within event specialists and how these differences may influence the $\dot{V}O_2$ response to severe intensity exercise.