remained relatively constant. Wide variations in white cell count were observed during the study in both the swimmers and control groups. These results were discussed in relation to various factors, including physical training, which may alter the concentrations of cellular components in the peripheral blood, either through altering the plasma volume and/or by altering the total red cell population.

TRANSIENT OXYGEN UPTAKE IN TRAINED CHILDREN AT THE ONSET OF MAXIMAL ARM AND LEG EXERCISE

N. Armstrong*, B. Davies** and J. Mulhall**

*Movement Science Laboratory, City of Liverpool College of Higher Education
**Metabolic Profile Unit, University of Salford

This study was designed to compare the $\dot{V}O_2$ – on response of a group of well-trained, young swimmers at the onset of maximal arm and maximal leg exercise.

The cycling $\dot{V}O_2$ max and arm cranking $\dot{V}O_2$ max of 10 male swimmers (age 14.5 ± 1.3 yr) were determined using incremental, continuous protocols on a Monark ergometer. On the day following each of these tests the exercise intensity at which the VO_2 max had been elicited was applied without any warm-up and the subjects maintained this intensity, either arm cranking or cycling, for five minutes. In all tests respiratory gases passed via a low resistance valve into an on-line computerised gas analysis system and heart rates were recorded using a bipolar lead. VO_2 and associated parameters were recorded every 30 seconds.

The mean VO_2 maxs elicited in the incremental tests (cycling, 3.48 ± 0.57 l/min; cranking 2.40 ± 0.38 l/min) were not significantly different from those elicited in the corresponding 5 minute constant intensity test (cycling, 3.34 ± 0.46 l/min; cranking, 2.43 ± 0.29 l/min). The changes in VO_2 during the first four half minute periods of the constant intensity leg exercise expressed as a percentage of the final VO_2 were not significantly different from the corresponding arm exercise changes expressed in the same manner.

There is no study of arm exercise or of the specificity of VO_2 – on response in children with which to compare these results directly but they do not support the finding in adults that trained muscles are characterised by a relatively faster rise of VO_2 at the onset of exercise. The methodology used does not make it possible to express the increase of VO_2 as the half-time directly but the percentage changes in VO_2 in leg exercise are considerably lower than those reported elsewhere (Macek and Vavra, 1980) using similar methodology with pre-pubescent boys. Further studies utilising breath by breath analysis are necessary to elucidate the initial kinetics of metabolic transients during exercise with trained children.

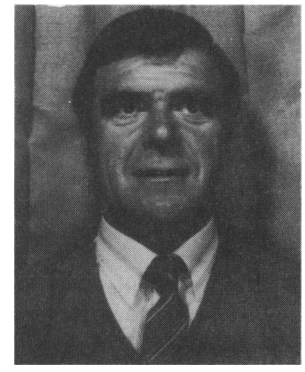
References

Macek, M. and Vavra, J., 1980 "The adjustment of oxygen uptake at the onset of exericse: A comparison between pre-pubertal boys and young adults". Int.J. Sports Med. 1: 70-72.

AEROBIC CAPACITY AND OXYGEN DEBT RELATED TO CANOE RACING PERFORMANCE

G. E. Cooper

Dept. of Physical Education, University of Birmingham



G. E. Cooper

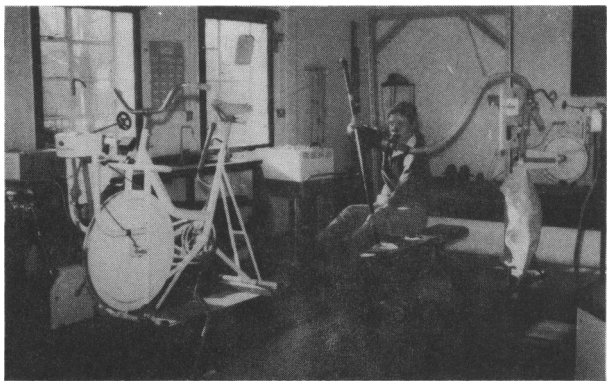
In a previous study using high speed film analysis it had been established that the action of paddling a kayak was essentially that of a 2nd order lever system (Cooper, 1974). The canoe ergometer, as illustrated, was consequently designed to replicate the technique of actually paddling the kayak and was validated using EMG.

To a sample of 15 paddlers, who were all members of the Regional "Centre of Excellence", a stepwise submaximal procedure was used to predict the max VO_2 on the bicycle and canoe ergometers.

Max VO_2 cycling was found to be not related to max VO_2 canoeing or to canoe racing performance in the 1000 metre event. However, the relationship between max VO_2 canoeing and paddling performance is highly significant.

With a sample of 11 international competitors; a continuous-type test to exhaustion was used on the canoe ergometer. The aerobic capacity and excess oxygen consumption during the immediate 10 minute recovery period were measured directly.

The max VO_2 canoeing and oxygen debt were both



found to be significantly related to performance in the 500 metre and 1000 metre events. The two predictors taken together account for 56% and 74% of the variance in performance in 500 metres and 1000 metres respectively.

The excess oxygen consumption was partitioned to determine the relative importance of the lactic and alactic components of the oxygen debt. The lactic component of the debt was found to be significantly related to the performance criteria.

Generally, the results of the investigations reinforce the arguments in favour of specificity of testing methodology and training in relation to the activity.

Reference

Cooper, G. E., 1974 "Factors related to canoeing performance". Official degree thesis, Birmingham University.

POST COMPETITION LACTATE LEVELS IN CANOE SLALOMISTS

S. J. Baker

Outdoor Education Dept., Normal College, Bangor

During the "Pre-World" international canoe slalom championships held at Bala, in North Wales in 1980, post competition blood samples were drawn from 19 competitors in four events. The events were:—

1. Mens Kayak singles in which the competitor uses a double blade paddle.
2. Mens Canadian singles in which a kneeling competitor uses a single blade paddle.
3. Mens Canadian doubles in which two canoeists each with a single paddle propel one canoe.
4. Womens Kayak singles — as mens K1.

Venous blood samples, from an antecubital vein, were drawn between 4 and 5 minutes after each competitor had finished his/her event and subsequently assayed for lactate content. It can be seen from the results shown in Table 1 that the highest lactate level 17.2 mMl/l was recorded in the mens K1 event. The highest mean lactate value 16.18 mMl/l (Table 2) is calculated also from the mens K1 event. There was a

TABLE I

The lactate content of blood plasma taken from members of the British canoe slalom teams in four events. BALA INTERNATIONAL 1980.

Event	Ints.	Resting lactate mmol/l	Post competition lactate mmol/l	Post event time to sampling	Unif fold lactate gain
	RF	1.8	15.3	4	14
	JS	1.3	14.5	5	13
K1	RM	1.3	17.1	5	16
Men	AS	2.0	17.2	5	15
	PG	1.8	16.8	4	15
	LW	1.6	15.3	5	14
C1	PK	2.1	14.3	4	12
Men	SC	1.9	11.9	5	10
	WB	1.2	10.8	5	10
	RW	2.0	9.6	5	8
	PH	1.8	9.6	4	8
C2	RJ	1.7	8.8	5	7
Men	DS	1.9	13.8	5	11
	RN	2.1	12.6	4	11
	EJ	1.3	11.1	4	10
	JH	2.0	9.6	4	8
K1	SC	1.3	12.8	5	12
Women	JR	1.5	12.8	5	11
	SG	1.9	13.6	4	12

TABLE II

Means and standard deviations of lactate levels from 19 competitors in four slalom events.

Event	Mean lactate mmol/l	Range mmol/l	SD	Sample size
K1 men	16.18	2.7	1.20	5
C1 men	13.10	4.5	1.75	4
C2 men	10.83	4.5	1.68	6
K1 women	12.20	4.0	1.77	4

TABLE III

Summary table for results of ANOVA on lactate levels from four events.

Variation	SS	df	MS	F
Between events				
Between events	81.31	3	27.10	9.09*
Within events	44.77	15	2.98	
TOTAL	126.08	18		

*F (3, 15) at .01 level = 5.42 is significant