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MUSCULAR POWER IN FREESTYLE SWIMMING AND SELECTED DRY LAND EXERCISES

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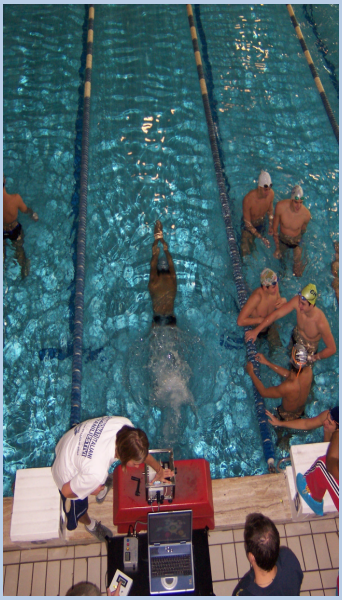
INTRODUCTION:

Training and development of muscular strength in swimmers have been widely investigated so far, but studies produced inconsistent results because of methodological difficulties (Sharp,1986). Our work investigated the relationships between the power produced by upper limbs in fast freestyle swimming and in dry land exercises. We considered the upper limbs because they are fundamental for the propulsion in freestyle swimming (Holmer,1974).



METHODS:

Nine elite male swimmers (age: 22,7±2,6; height: 182,8±5,2 cm; bm: 79,6 ± 5,6 kg) were recruited. Data were collected on two separate sessions in water and dry land respectively. The maximal swimming speed (v-max15) was measured with an accelerometer (Speed, ApLab, Rome) during a 25m trial, considering a 15m fraction to avoid the influence of the dive and the arrive. In the same session the active drag was assessed through a "perturbated speed" test (Kolmogorov, 1992). The swimmers were equipped with a mechanical brake with adjustable intensity (Ben Hur, ApLab, Rome), fixed on the border of the pool and tied with a belt to the athlete in a semi-tethered situation. 4 incremental swimming trials (overloads: 15-18-23-28 N) was used to estimate with accuracy the drag value. For each swimmer the Power Drag (Pd) was then computed with the formula Pd=drag*speed. In dry land we assessed the maximal power (MP) produced in two exercises very close to the freestyle stroke in water: the "pulley with cables" (pulley) and "bilateral rower" (row). MP was computed from the force/speed relationship obtained with an incremental test, consisting of 5 sets of 1 rep, with an initial load of 15 kg (pulley) and 35 kg (row) and an increase of 5 kg/set. The Pearson correlation coefficient (r) was used to determine the amount of association between variables.

Subject n°	1	2	3	4	5	6	7	8	9	Mean	SD
v-max15 (m/s)	1,73	1,77	1,84	1,74	1,82	1,72	1,78	1,74	1,86	1,78	0,05
PD (N)	84,77	159,99	208,36	137,95	153,15	129,41	138,11	130,64	179,29	146,85	34,69
Pulley (W)	1252,74	1863,9	1854,09	1789,34	1465,61	1513,68	1692,23	1451,88	1931,59	1646,12	233,83
Row (W)	887,81	1544,09	2304,37	1716,75	1573,52	1481,31	1745,2	1409,7	1719,69	1598,05	371,9

Tab. 1

RESULTS:

In our sample (Tab.1) mean v-max15 was 1,78±0,05 m/s while mean estimated Power-Drag resulted 146,85±34,69 W. Maximal Power in average was similar in the two exercises (Pulley: 1646,12±233,83 W; Row: 1598,05±371,90 W). Correlation coefficients (Tab.2) showed a strong association between: v-max15 and PD (r=0,81); PD and Pulley MP (0,80), PD and Row MP (0,91).

CONCLUSIONS:

Our data show that in top-level athletes, with similar values of "technical efficiency", the muscular power during swimming and during selected dry land exercises are highly correlated. Those exercises can be considered to have specific characteristics for the training of freestyle swimmers. This training must be directed not only to the development of physical strength, but also to the development of maximal muscular power.

	v-max15	PD	Pulley	Row
v-max15	1			
PD	0,81	1		
Pulley	0,58	0,80	1	
Row	0,64	0,91	0,76	1

Tab. 2

REFERENCES:

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