INFLUENCE OF "STRENGTH LEADING" METHOD UPON SWIMMERS' PROGRESS

ALLAKIN, J.; LOGINOV, A.; KAZAKOV, A.
Pedagogical Institute
Penza
USSR

To achieve great sport progress in cyclical kinds of sport different technical means are used.

This paper is an attempt to investigate the "Strength Leading" method upon hydrodynamic and strength characteristics of a swimmer for the purpose of improving sport performance.

We used a special training system of "Strength Leading" /STSSL/, worked out and manufactured at the department of athletic disciplines at Penza State Pedagogical Institute in compliance with the theoretical conception of "artificially controlled medium" /Ratov I.P. 1972/.

This training system makes it possible to effect a non-stop advance along a swimming pool water track at a speed ranging from 0 up to 3 m/s. Speed dosing is controlled by an operator-investigator through the control block.

To register the value of an additional effort on the part of STSSL a traction strength recording unit is fixed in the halyard slit of the system "trainer-sportsman". Speed of advance, effort on the halyard and swimming time are indicated in the figures on the videocomplex monitor. Pedagogical control of the swimmer's row movements is realized with the help of underwater video shooting. Highly skilled swimmers took part in the experiment which was conducted in a basic mezocycle within the period of four weeks.

Coaching sessions on STSSL were held 1-3 times a week and constituted 5-20% of the total coaching. The higher the intensity of planned training tasks, the lower is the volume of STSSL utilization. Swimming with the trainer gave a 2-5% advance in speed excess over a planned speed for the given coaching, providing the equivalent of load under normal conditions and as a rule, didn't exceed the admissable maximum. The value of the additional effort on the part of STSSL constituted 4-6 H/m.

During training on STSSL the emotional state of a sportsman was taken into consideration. Negative emotions being present, training was postponed.

After a coaching task on the trainer was completed the sportman was informed of an additional effort value and frequency, so that he could correlate his own sensations with the real indications and to choose the most rational tempo-rythmic structure of movements and the best and optimal body position in the water.

With the view to reveal the changes of hydrodynamic swimming characteristics indications during the period of the experiment were conducted to analyse the background and final testing which included:

- swimming results at the distance of 50 m free style;
- passive resistance value in 4 positions at a record speed during the advanced trials on STSSL:

a) sliding, arms forward;
b) sliding, arms along the body;
c) sliding, the right arm forward, the left arm along the body;
d) sliding, the left arm forward, the right arm along the body;

- active resistance value when swimming at a 10% excess speed of advance over maximum;
- maximum traction strength on a tie for 10 sec.(Sandu J.V. 1987).

As the result of the preliminary investigation (Tab.1) correlations between sport achievements and the above mentioned parameters were revealed. As for the swimming tempo and "step" length they had a feeble statistical interconnection in this experiment.

Findings of the pedagogical experiment are listed in Table 2. From the obtained data it is clear that considerable improvement of average competitive swimming speed in the 50 m test equalled 3.2%. Testing results testify to sufficient variations in values of hydrodynamic resistance. Passive resistance indications in 4 positions accordingly correspond to 6.6%;5.9%;6.6%;5.7%. Active resistance had a 7.3% decrease.

During the experimental period it was stated that the maximum traction strength in the water on a tie had a 6% increase.

The obtained results testify to the fact that during the experiment positive shifts in sport progress were achieved at the expense of simultaneous increasing of strength indications and improving the swimmers' hydrodynamic characteristics.

TABLE 1

Parametres	Correlation coefficient
1. Passive resistance:	
a/ sliding, arms forward	- 0.68
b/ sliding, arms along the body	- 0.75
c/ sliding, the right arm forward, the left arm along the body	- 0.78
d/ sliding, the left arm forward, the right arm along the body	- 0.81
2. Maximum traction strength on a tie	- 0.73
3. Active resistance while swimming on STSSL at a speed increased 10 % over natural speed	- 0.69
4. Row tempo	+ 0.17
5. "Step" length	- 0.42

The given characteristics were improved due to swimming in conditions effected by the "Strength Leading" method. Our investigation carried out on this model of swimming proves the theoretical conception of I. P. Ratov in the respect that improvement of sport progress with the simultaneous improvement of defining movement characteristics is successfully realized mainly in conditions of specialized trainer systems of "artificially controlled medium" (Ratov I. P. 1972).

The change in hydrodynamic resistance indications illustrated that in a swimming regimes, at a record speed, the swimmer himself looks for the most optimal body position in water, movement rythm in the conditions of the trainer and then he reproduces all these in natural swimming (Clarys J. P. 1979).

Swimming in conditions of "Strength Leading" gives the sportsmen the opportunity of searching for new movement tactics Similar results were obtained in the experiment with mortified and living dolphins where it was stated that wind resistance of an living dolphin is less than that of a mortified one (Glazer R. 1988). Active movements of the swimmer and of the living dolphin spontaneously participate in the process of flow optimizing.

So, swimming in conditions of the "Strength Leading" method forms a more rational structure of swimming movements with a higher content while simultaneously decreasing of hydrodynamic resistance; this allows one to achieve a new inaccessible, in usual conditions, record speed.

TABLE II
Readings of Background and Final Testing

Parametres	before experiment	after experiment	absolute shift	%
1. Average swimming speed at 50 m m/s	1,86±0,06	1,92± 0,06	0,06^{x}	3,2
2. Passive resistance on STSSL at a test speed at 50 m				
a) arms forward	10,66±0,83	9,95± 0,64	+0,71^{x}	6,6
b) arms along the body	13,35±1,35	12,55± 1,24	+0,80^{x}	5,9
c) right arm forward	12,00±1,11	11,20± 1,15	+0,89^{x}	6,6
d) left arm forward	12,03±1,19	11,34± 0,99	+0,69^{x}	5,7
3. Active resistance at swimming on STSSL at a speed which is 10% higher the record speed H/m. 10.	6,14±0,35	5,68± 0,43	+0,45^{x}	7,3
4. Maximum Traction strength on a tie	16,93±0,93	17,95± 0,56	1,02^{x}	6

x - trustworthiness of differences at the level $p < 0,05$

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