

# ARTIFICIALLY CREATED SPEED IN TRAINING EQUIPMENT FOR SWIMMERS

RATOV, I.P.; ALLAKIN, U.A.; KOCHERIN, A.I.; KRUPNOV, V.A.  
Laboratory of Biomechanics, V.N.I.F.K.  
Moscow  
USSR

Nowadays special mechanical training techniques are broadly used in cyclic kinds of sports. One of the modifications has been designed, built and tested for application in swimming. It is based upon the force-leading concept, which has proved to be a theoretical background for a number of favourable results, shown by swimmers after using it in their practice routine.

The training equipment consists of two independent devices: one for improving speeding abilities and the other for maintaining start performance.

1. Training System of Force Leading (TSFL) is shown in Figure 1. A swimmer puts a leather belt on, which is roped to a hook, fixed on a continuously driven electric motor wire cord loop, situated above the pool. Thus the system brings about a slight propulsion of the swimmer along the whole length of the line. It helps to reach a desirable speed in artificially created conditions. After accomplishing a series of accustoming exercises a coach can adjust the speed of pulling within the range 0-3 meters per second by using available control unit.

Application of the TSFL system has appeared to be more effective than traditional methods. Investigations have been carried out during 10 lessons in a 25 meter pool. Two times a week for 90 minutes "force-leading" was used. The following results have been obtained:

a) newcomers, who learned to swim could get over 100 meters by free style and back stroke. Speed increased ( $p < 0.01$ ), swimming rate grew ( $p < 0.01$ ), stride length increased ( $p < 0.01$ ). Another group of people which did not use the system could get over just 50 meters, without mastering sport styles.

b) qualified and elite sportsmen have used the system where pulling force measurement and control unit was added. This unit enables one to detect changes in hydrodynamics of the swimmer's body position, performance effectiveness, propulsive and drag forces contribution. The training system was employed 3 times a week. The velocity of pulling was 24-54% higher than the best for a given swimmer. A variety of exercises and practicing means were used in the newly created "force-leading" media. Emotional state subjects was taken into account. Practicing was cancelled in poor psychological conditions. The additional pulling force never exceeded 6 kg. The more intensive exercise was, the less it was carried out in the "force-leading" manner. In one month swimmers improved their results ( $p < 0.05$ ), swimming rate grew ( $p < 0.05$ ), stride length did not change ( $p < 0.05$ ). Passive drag force changed. In four standard body positions active and passive drag forces reduced ( $p < 0.05$ ). Maximal propulsive force of rowing increased ( $p < 0.05$ ). In addition, the time of turning performance was decreased ( $p < 0.05$ ).

For improving start performance parameters a special pneumatic training stand was designed and built. It was made of an ordinary starting stand with a detachable high air pressure upper plate. A pump creates pressure 6-7 atm., which tilts out in a determined direction the upper plate along with a swimmer, standing on it. The delay time is 100-200 ms. The angle of throwing is adjustable. The stand is shown in Figure 2.

Repetitive execution of start jumps from heading, middle and rear points of the stand along with making similar exercises on an ordinary stand was being performed before the beginning of regular routine.

Both training systems made it possible to establish more effective practices for swimmers. In artificially created conditions the process of gaining good performance skill is rapid. Methodology of "force-leading" enables to optimize rowing acting structure, improves hydrodynamical properties and increases propulsive force. These systems are linked with a computer for biomechanical analysis in artificially created media. A computer control of both systems is now the matter of our further development.