

How the swimmer could improve his track start using new Olympic plot.

N. Houel *, A. Charliac, J.L. Rey, P. Hellard

N. Houel, Fédération Française de Natation, France, nicolas.houel@yahoo.fr
+33 6 83038298

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In sprint swimming races, performance has been strongly linked to start performance. The Start is defined as three phases: the impulse phase on the starting block (including reaction time), the flight phase, and the underwater phase. Results of studies conducted since the 70's defined that velocity, as well as minimized hydrodynamic resistances when entering in the water have direct impact on the underwater phase.

The aim of this study is to define the impulse, the flight and the anthropometric characteristics of the swimmer that can improve the beginning of the underwater phase of the swimming start. Swimmers of national level were asked to perform competitive track starts as efficiently as possible on new Olympic starting plot.

Starting bloc position on the starting plot, height, mass and percentage body fat of each swimmer were measured. A two dimension direct linear transformation (DLT) method was used to calculate the hand and hip landmarks coordinates in space. Using the coordinates of the landmarks, kinematics variables at impulse and flight phases were defined. Stepwise linear regression analysis shows that increase of horizontal velocity at take off and the flight distance (FD) associated with decrease of vertical velocity at water entry (V_{zwe}) are the best kinematics' predictors to improve the total velocity at water entry (V_{2Dwe}) ($R^2=0.66$). There was no significant relation between V_{2Dwe} and bloc position on the plot. Stepwise linear regression analysis shows that increase of mass is the best anthropometrics' predictor to improve the horizontal velocity at take off ($R^2=0.45$). For the other dependant variables (V_{2Dwe} , V_{zwe} , FD) the physical variables are not relevant ($R^2<0.4$).

In conclusion, this study shows that it can be possible to realize an accuracy training testing of the impulse and the flight phase of swimming start using one camera, two landmarks and two dimension DLT's algorithm. If the underwater phase is the most relevant of the swimming start, the swimmer could improve the efficiency of this phase by increasing the total velocity at entry. This study shows that the position of the starting bloc of the new Olympic plot doesn't influence the efficiency in track start. During a track start, increasing the horizontal velocity at the impulse phase associated with increasing the flight phase and decreasing the vertical velocity at water entry; seems to be the best predictors to improve the efficiency of the underwater phase.

Keywords : swimming start ; kinematic ; anthropometric