

Kinetic and kinematic analysis of the freestyle flip turn in a national level swimmer: a case report

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Purpose: The aim of the present study was to acutely examine the influence of several verbal instructions on kinematic and kinetic parameters in order to obtain the greatest final velocity (V_f) in the freestyle flip turn. The verbal instructions given to the athlete included the combination of different initial velocities (V_i) and angles of knees flexion during the push-off phase.

Methods: One national level female swimmer participated (age: 25 years, weight: 56,0 kg, height: 164 cm) in the present study. The athlete performed six flip-turns resulted from the random combination of two initial velocities (maximal: typical of a 50 m freestyle; submaximal: typical of a 200 m freestyle) and three angles of knees flexion [small (60°), medium (110°) and large (150°) angular displacement]. The trials were: first = small, V_i max; second = large, V_i submax; third = large, V_i max; fourth = small, V_i submax; fifth = medium, V_i submax; sixth = medium, V_i max. Initial, final velocities and knee angle were measured by using two cameras (sampling rate = 60 Hz). The waterproofed force platform (sampling rate = 100 Hz) was fixed below the starting block to measure the reaction force over time. The videos were analyzed with the software Kinovea (open-source project version 0.8.15), while the kinetic data [maximal reaction force (MRF), impulse (I) and rate force development (RFD)] were analyzed with the software muscle-lab (Egotest Innovation, Porsgrunn, Norway).

Results: The verbal instructions did not produce the expected displacement of knee angle and the values measured ranged from 57° to 74° . Furthermore, the maximal push-off force (2938 N), RFD (17,487 N/s), I (475.4 N•s) and the higher initial velocity (4.67 m/s) did not increase the final velocity (2.36 m/s). Conversely, in the trial executed with submaximal initial velocity, reduced by almost 40% (2.52 m/s), the swimmer reached the highest final velocity by almost 10% (2.60 m/s). The kinematic analysis revealed differences among the shapes of the trajectory depicted by the swimmer during the flip turns.

Conclusions: The structure of motor skills of the swimmer, related to the number of training years, limited the verbal instructions effect on acute changes of the knee angle flexion during the flip turn. MRF, RFD, I, and V_i did not increase the V_f , whereas a submaximal V_i probably allowed greater coordination during the flip turn, determining an increase in the final velocity.

References

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