P-025

Effects of new Hightech-Swim-Suits on Passive Drag

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INTRODUCTION: Which influence do Hightech-Swim-Suits have on swimming performance was the main question during the Olympic Games 2008 and World Championships 2009. Therefore the purpose of the present study was to investigate the effects of new generation Hightech-Swim-Suits compared to conventional swimwear on passive drag. METHODS: Eight national league swimmers (4 male, 4 female) participated on repeated gliding-tests with a Semi Tethered Machine (STM). The participators wore either conventional swimwear, shoulder-to-ankle Speedo LZR Racer, bluesenventy nero comp or Arena R-Evolution. For each condition athletes were towed in a 50m pool three times at water surface (s) and 0,5m deep (uw) in randomised order. Thereby velocity was measured. After smoothing the velocity-curves the means of steady state velocity were compared with ANOVA repeated measures with Fisher post-hoc test ($p<0.05$). RESULTS: Under both conditions (s and uw) swimsuits reached higher velocities compared to conventional swimwear. Thereby Speedo LZR always reached the highest velocities (s: 1,95ms-1 ± 0,01; uw: 2,14 ms-1± 0,01), followed by blueseventy (s: 1,91 ms-1 ± 0,01; uw: 2,10 ms-1 ± 0,01) and Arena (s: 1,91 ms-1± 0,01; 2,09 ms-1± 0,01). The lowest speeds were reached with conventional swimwear (1,87 ms-1± 0,01; 2,02 ms-1± 0,01). Significantly higher velocities at the surface were found for Speedo LZR compared to normal swimwear and Arena R-Evolution. Under water blueseventy and Speedo achieved significantly higher velocities compared to normal swimwear. DISCUSSION: Drag is an important phenomenon, because its reduction improves swimming speed. Passive drag is smaller than active drag. Anyway measuring passive drag allows exposing the effects of swimsuits without any influence of swimmers skills. Former studies measured the effects of "previous" swimsuits on active and passive drag and found different results. The present study showed advantages in wearing one of the tested suits while gliding through water. Even if the results cannot be transferred to a real situation of swimming, it can be expected, that long gliding phases under water after turns and wearing a swimsuit might improve swimming performance.

P-026

Different Frequential Acceleration Spectrums In Front Crawl

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This study analyzes the three different spectrums that define the acceleration produced by front crawl swimmers during a high speed test. These swimmers (n=79) performed 25 meters at maximum speed. The acceleration was obtained from the position–time data recorded using a position transducer. The amplitude in the time domain was calculated with the root mean square (RMS); while the peak power (PP), the peak power frequency (PPF) and the spectrum area (SA) were calculated in the frequency domain with Fourier analysis. An ANOVA to establish differences between groups (spectrums) was applied. Results show three different spectrum types (type 1: 27,85%, type 2: 30,38% and type 3: 41,77%). Our work shows that type 1 frequential spectrum is related to more coherence and might discriminate to the swimmers with better RMS.

P-027

The Gliding Phase in Swimming: The Effect of Water Depth

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INTRODUCTION: Aiming to achieve higher performances, swimmers should maximize each component of swimming races. During starts and turns, the gliding phase represents a determinant part of these race components. Thus, the depth position allowing minimizing the hydrodynamic drag force represents an important concern in swimming research. The aim of this study was to analyse the effect of depth on drag during the underwater gliding, using computational fluid dynamics (CFD) METHODS: The 3-D domain representing part of a swimming pool was 3.0m depth, 3.0m width and 11.0m length. CFD simulations were applied to the flow around a 3-D model of a male adult swimmer in a prone gliding position with the arms extended at the front (Marinho et al., 2009). General moving object model was used to model the body as the moving object. During the gliding, the swimmer model's middle line was placed at different water depths: 0.20m (just under the surface), 0.50m, 1.0m, 1.50m (middle of the pool), 2.0m, 2.50m and 2.80m (bottom of the pool). The coefficient of drag and the hydrodynamic drag force were computed using a steady flow velocity of 1.60m/s for the different depths run for 3 seconds in each case. RESULTS: The coefficient of drag was 0.67, 0.62, 0.53, 0.44, 0.36, 0.30, 0.28 and the drag force was 100.20N, 92.30N, 80.50N, 65.40N, 53.40N, 44.70N and 42.0N when gliding at a water depth of 0.20 m, 0.50m, 1.0m, 1.50m, 2.0m, 2.50m and 2.80m, respectively, at the time of 2 seconds when the swimmer was approximately at the middle of the computational pool. DISCUSSION: The water depth seems to have a positive effect on reducing hydrodynamic drag during the gliding. Moreover, gliding near the bottom of the pool also presented lower drag values compared to gliding at a water depth, for instance, in the middle of the swimming pool. This finding could suggest that the positive effects of water depth are more powerful than the possible negative hydrodynamic effects of turbulence near the bottom of the pool, expected when the simulations are not carried-out with a moving model. Reducing the drag experienced by swimmers during the glide off the wall can enhance start and turn performances. Therefore, a commitment between decreasing drag (by increasing water depth) and gliding travel distance should be a main concern of swimmers and an important goal to be studied in future investigations. REFERENCES: Marinho DA et al. J Appl Biomech 2009; 25(3): 253-257. Supported by FCT (PTDC/DES/098532/2008)

P-028

Regression Analysis Model Applied to Age-Group Swimmers: Study of Stroke Rate, Stroke Length and Stroke Index

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INTRODUCTION: Training loads and methods should be adapted to swimmer's age and performance level. International age-group records times of 50m freestyle showed a progressive improvement in performance of this event. This event could be used as an evaluating tool of the race components (RC). RC should be modified with the age, growth