Development of a new resisted technique in active drag estimation

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Previous Methods

- Kolmogorov & Duplischeva (1992) (Velocity Perturbation Method):

  Estimated active drag using a resisted method to compare free swimming velocity with the velocity from swimming while a hydrodynamic body was attached by a cable to the swimmer's waist.

  Assumptions were considered:

  - a constant mechanical power output in both conditions
  - a constant average velocity during each trial

Previous Methods

- Wang et al. (2007):

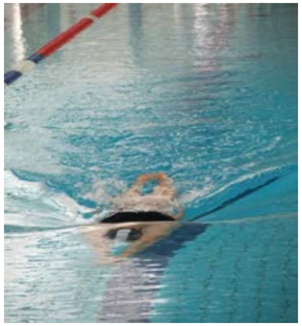
  Designed a new resisted system using a gliding block which was attached to the swimmer to adjust the drag which was required to reduce the swimmer's maximal velocity. They used the equations and the assumptions of the VPM method.

Purpose

To implement a new technique for estimating active drag using an electrically braked resisted force, whilst fluctuations in intra-stroke velocity were allowed

Method

- Twelve national and international level swimmers (average age: 20.5 years) from the AIS swimming squad team and NSW swim clubs
- All tests performed in one day
- Five minutes rest between each trial to eliminate the influence of fatigue on swimmer's performance
- Two maximum free swim velocity trials over a 20 m interval to obtain mean maximum swim velocity
- Two passive drag trials over a 20 m interval, towing at mean maximum swim velocity



Method

- Two active drag trials over a 25 m interval with velocity averaged over six full stroke, towing at approximately 5% to 8% slower than the mean maximum swim velocity
- A force range between 4 to10 N was required to slow the swimmer to desired velocity
- Selection of the force was based upon the swimmer’s mean maximum velocity and value of the passive drag

Statistical analysis

A paired t-test by using SPSS software

Active drag measurement

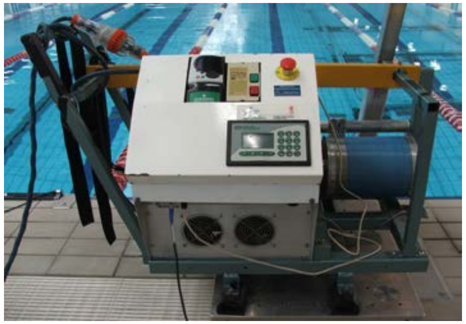
- Active drag equation:

$$F_A = \frac{F_B V_2 V_1^2}{V_1^3 - V_2^3}$$

FB = Force need to slow the swimmer to the desired velocity as measured from force platform

V1 = Swimmer's free swim mean maximum velocity

V2 = Mean tow velocity as measured from the dynamometer



Result

- No significant differences between the active drag and the passive drag values ($p=0.05$)
- The averages of active drag and passive drag were 89.2 ± 16.7 N and 93.7 ± 11.7 N

Discussion

The result of our research was in conflict with previous studies:

- Kolmogorov et al. (1992) reported that in most cases, the active drag values were lower than the passive drag values.
- Shimonagata et al. (1998) found that the mean active drag was 76% of the mean passive drag.
- Formosa et al. (2011) and Mason et al. (2011) used assisted towing techniques (ATM) at constant velocity and at fluctuating velocity respectively and found that the active drag values were considerably higher than the passive drag values.

Discussion

- The mean active drag result in this research was similar to previous two resisted techniques research by Kolmogorov et al. (1992) and Wang et al. (2007)
- The active drag values found in the ATM technique at the constant velocity (Sacilotto et al. 2012) and at the fluctuating velocity (Hazrati et al. 2013) were significantly higher than this research. Although, the both resisted and assisted techniques used the same equipment, the reasons that different result achieved could be a consequence of:

✓ **Difference between assisted and resisted techniques**

✓ **Different power applied during assisted and resisted techniques by swimmer**

Summary

Resisted techniques were used the known resistive force found similar values and considerably lower than the velocity-assisted techniques.

Future research

Future investigation to determine why this relationship exists between the resisted and assisted testing conditions

Acknowledgment

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THE UNIVERSITY OF SYDNEY

Thank you

Questions