

## **TRUNK MUSCLE ACTIVITY DURING FRONT CRAWL SWIMMING**

*Martens, J.1, Pellegrims, W.1, Einarsson, I.2, Fernandes, R.J.3, Staes, F. 4, Daly, D.1*

*1: KULeuven, Department of Kinesiology (Leuven, Belgium)*

*2: University of Iceland*

*3: CIFI2D, Faculty of Sport and Porto Biomechanics Laboratory, University of Porto*

*4: KULeuven, Department of Rehabilitation Sciences (Leuven, Belgium)*

### **Introduction**

Core stability training is of increasing interest to both researchers and coaches. Sufficient core stability is needed to balance forces generated by the upper and lower extremities separately (Hibbs et al., 2008). In swimming the development of wireless EMG has created new possibilities to study underwater muscle activity with little hinder. The purpose here was to analyze lower trunk muscle activation during front crawl swimming and examine how trunk muscle activity is related to the arm movement, swimming velocity and arm and leg coordination.

### **Methods**

Five male swimmers (personal record 100m freestyle :  $55 \pm 4$ s) swam 2x12.5m at maximal speed without breathing using a 6-beat leg kick and no kick with a 10min rest interval. EMG was obtained with 4 wireless units (Kine ®, 1600Hz). Electrodes were placed on the left and right m. Obliquus Externus (OE) and on the left and right m. Erector Spinae (ES) following the guidelines of SENIAM. Four video cameras (Sony ® Handycam DCR-HC96: 50Hz) recorded the swims in synchronization with the EMG-signal. Dartfish Prosuite ® software was used to determine stroke phases, swimming velocity and arm and leg coordination.

### **Results**

Activation of OE was seen in both leg-kick conditions in all 5 swimmers during the first propulsive phase of the ipsilateral arm. Activation of ES occurred when the collateral arm was at 135°-180° in all 5 swimmers in both conditions.

### **Discussion**

Because of the ipsilateral activation of OE and the contralateral activation of ES in both test conditions, it can be assumed that the muscle activation pattern is linked to arm movements. During quadruped position core stability exercises on dry land contralateral activation of OE was also seen (Bergson et al., 2010). Further research (e.g. in the butterfly stroke with symmetric arm movement) is needed to clarify which arm actions are linked to abdominal muscle activation. ES is active in trunk extension and forward rotation of the pelvis (Kaneda et al., 2009), but may also act in rotational movements (Toren, 2001). It is possible that the contralateral activation of ES during front crawl swimming is needed to stabilize the lower trunk by countering forces generated at the start of arm recovery.

### **References**

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