NEUROMUSCULAR RESPONSES OF THE GLIDE EFFECT IN BREASTSTROKE TECHNIQUE: A CASE OF STUDY

Conceição A[1,2], Seifert L[4], Komar J[4], Puel F[4], Vantorre J[4], Barbosa T[5], Louro H[1,3]

[1] Sport Sciences School of Rio Maior, Rio Maior, Portugal
[2]Research Center in Quality of Life, Santarém, Portugal
[3]CIDESD- Research Center in Sports Sciences, Health and Human Development, Vila Real, Portugal
[4] Faculty of Sport Sciences, University of Rouen, CETAPS EA 3832, Mont Saint Aignan, France
[5] Nanyang Technological University,Singapura
E-mail: Ana Conceição- anaconceicao@esdrm.ipsantarem.pt

AIM**:** The aim of this study was to examine the capability of a trained breaststroke swimmer to adapt his muscular responses to different glide and speed conditions. In other words, we explored which parts of the muscular responses were kept stable and which parts varied.
METHODS**:** A 18-y-old male swimmer performed 9 x 25m breaststroke trials of increasing velocity. Each trial required an individually imposed swim pace corresponding to 70, 80 and 90% over the best time of 25 m and to a specific glide condition: non-glide, normal glide and extra-glide.
Using a wireless signal acquisition system (bioPlux research, Portugal), surface electromyogram was collected in eight muscles *gastrocnemius medialis(GM)*, *tibialis anterior(TA)*, *rectus femoris(RF*) *biceps femoris*(*BF*) *bíceps brachii(BB)*, *deltoid anterior(DA)*, *pectoralis major(PM)*, *tríceps brachii(TB)*.
All EMG analysis was conducted with a MATLAB routine (Mathworks, Inc.,Natick MA,USA). Starting from the raw signal, DC components were removed and thereafter filtered with a fifth-order Butterworth band pass filter where the lower and upper cut-off frequencies were set to 10 and 500Hz respectively. The temporal evolution of the active and nonactive phases average durations during stroke were calculated for each muscle for all the trials. Linear regression curves were fitted to the data and the durations of the fitted curves at the beginning and completion of the swim were compared. The average amplitude of EMG of each active phase was estimated using the average rectified value (ARV) and plotted as a function of time. As a measure of the central tendency of PSD we used the mean frequency of the PSD (MNF).
RESULTS**:** The long duration of neuromuscular active phase was shown in the TB (1.47 s) and TA (0.97 s) in the normal condition or 70% of swim pace, GM (1.99 s) in the no-glide condition for 80% of the swim pace and TB (3.37 s) in the no-glide condition for 90% of the swim pace. The EMG average rectified value (ARV) showed the highest values in the extra-glide condition for the BB and DA and in the no-glide condition for the DA. The lowest ARV values were shown in the BF muscle in all the conditions and swim paces. The mean frequency of the power spectral density (MNF) showed the highest frequency in the 80% (155.2 ± 2.3 Hz) and 90% (156.4 ± 7.3 Hz) for the TA muscle for all the swimming conditions and the lowest frequency for TB.
CONCLUSION**:** It can be concluded that the neuromuscular responses of the muscles *tibialis anterior* and *gastrocnemius medialis* for the lower limbs, and the *bíceps brachii, deltoid anterior, tríceps brachii* for the upper limbs may play a strong and meaningful role on the glide effect and speed effect. These results might be useful to develop specific training and enhance swimming performance in breaststroke swimmers.