Kinesiological Analysis of Karate front kicks on Portuguese Elite Competitors in Comparison with Black Belt Non Competitors Practitioners

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This study aimed to identify and compare kinematic and neuromuscular control patterns of the front kick (*mae-geri*) to a fixed target (floor training bag) performed by 14 black belt karate practitioners, and 9 Elite Karate competitors from the Portuguese Karate Team. In the group characterization, all of them were black belt with more than 13 years of practice, mean age of 23 years. The Elite group present a greater number of hours of weekly training and smaller body fat than the other group.

The kinematic and electromyographic data were collected from the dominant lower limb during the execution of the *mae-geri* from zenkutsu dachi. The hip, knee and ankle movements and the *Rectus Femoris*, *Vastus Lateralis*, the long head of the muscle *Biceps Femoris*, *Tibialis Anterior*, and the external portion of the *Gastrocnemius* muscle were studied. To collect the data a high speed camera (Casio EX-FH20) was used and the surface electromyography muscle activity was recorded with MP100 Data Acquisition System with active bipolar surface electrodes (*BIO PAC Systems, Santa Barbara, CA, USA*).

The results of kinesiological activity since the beginning of the kick until the contact on the target takes place in less than 600 ms. The muscle electric activity began earlier than the segmental movements.

The kinematic and electromiographic analysis presented a sequence of action from the proximal to distal, beginning on the hip flexion followed by the knee extension and the ankle planatar flexion, with those movements being executed with smaller amplitude, in less time and the speed peak occurring closer to the contact time in the elite karate group than in the non-elite group. It seems that is a velocity transfer from the most proximal segments to the distal ones that is revealed by the increasing in the segmental speed peak.

In both groups the muscles present two distinct periods of activity, showing greater intensity of activation in the second period, but in the elite group the duration of the muscles activity is smaller than in the non-elite group.

The study identifies a different kinematic and electromyographic pattern between the two groups of karate practitioners that must be associated with the number of hours of weekly training and competitive specific experience.