

## Effects of aging on neuromuscular activity during the performance of a ballistic motor skill

António M. Vences Brito<sup>1, 2, 3, 4</sup>, Mário A. Rodrigues-Ferreira<sup>1, 2, 3</sup>

<sup>1</sup> Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Santarém, 2040-413 Rio Maior, Portugal

<sup>2</sup> Unidade de Investigação do Instituto Politécnico de Santarém (UIIPS), Portugal

<sup>3</sup> Centro de Investigação em Qualidade de Vida (CIEQV), Portugal

<sup>4</sup> International Martial Arts and Combat Sports Scientific Society (IMACSSS), Poland

### Background

Human aging leads to a progressive decline in biological functions that affect the neuromuscular systems. Sport practice is associated with health maintenance and a better quality of life in older people.

### Objective

The aim of this study was to investigate the effects of aging on neuromuscular reaction time and electromechanical delay during the performance of the karate frontal kick (*mae-geri*).

### Methods

Participated in this study 9 elite karate athletes (age, 21±2.47 years; height, 175±6.53 cm; weight, 72±9.25 kg) and 9 veteran karate practitioners (age, 54±3.87 yr.; height, 176±4.72 cm; weight, 76±9.17 kg).

Surface electromyography was recorded from rectus femoris (RF) and vastus lateralis (VL) portions of the quadriceps femoris, long head of the biceps femoris (BF), tibialis anterior (TA) and lateralis gastrocnemius (GA). Kinematic analysis was performed with Ariel Performance Analysis System (APAS, Ariel Dynamics-2003).

Neuromuscular reaction time was defined as the time interval between the auditory stimulus and the onset of electrical activation of a muscle, while the electromechanical delay was the time interval between the onset of the electric activity of a muscle and the beginning of joint movement.

Student t-test (two-tailed) was used to analyze the differences between groups, with a significance level of  $p < 0.05$  (SPSS 17.0).

## **Results**

It was observed a tendency to a longer neuromuscular reaction time of the TA in veteran karate practitioners than elite karate athletes ( $136\pm 58.80$  vs  $122\pm 45.94$  ms,  $p=0.566$ ), although a significantly shorter neuromuscular reaction time was found in RF in veteran karate practitioner ( $137\pm 27.93$  vs  $184\pm 51.55$  ms,  $p=0.030$ ).

Veteran karate practitioners presented a significantly longer RF electromechanical delay than elite karate athletes ( $127\pm 59.11$  vs  $39\pm 47.68$  ms,  $p=0.003$ ).

## **Conclusions**

The results of the study showed that with the aging process there is an increase in the electromechanical delay, although no negative impact on the neuromuscular reaction time has been observed. Therefore, continuous sport practice in veteran karate practitioners seems to attenuate the effects of aging on neuromuscular systems.

## **Keywords**

Neuromuscular reaction time, electromechanical delay, electromyography, karate.