

ABSTRACT

Title

Identifying of genetic predisposition affecting sports performance focusing on anaerobic activity of skeletal muscle activity

Problem

Inborn predispositions of every individual are mainly influenced by the inherited genetic information in their DNA with the addition of external environmental factors. Based on the high variability of the inborn predictions in the form of phenotypic differences in the anatomy or physiology of an individual, it can be deduced on the connection between genetics and a specific sport talent. According to current scientific knowledge, anaerobic performance of the skeletal muscle tissue seems to be more genetically influenced. Anatomic and functional properties of the skeletal muscle are mainly influenced by genes, which have effect on the muscle fibre structure, blood storage, metabolism, neurotransmission, and muscle regeneration, etc. Fencing is a complex sport discipline where predispositions to speed and dynamic force play a key role. The sport performance in fencing, regardless of the type of weapon, is directly dependent on the interactions between the reaction of the fencer to the surrounding stimuli (visual, tactile), accuracy, tactical and technical skills, level of anticipation and overall physical a psychological readiness of the fencer. This work is based on a hypothesis that among the observed variables from anaerobic Wingate test WT30 (maximal performance, maximal performance/kg, anaerobic capacity, overall number of revolutions, peak lactate level) and from specific motor tests (reaction time, movement time of the direct hit, movement time of the lunge, time muscle activation and the overall time in specific shuttle test performing) the differences will be observed between fencers of a different genotype. This hypothesis is based on the results and claims of previous studies, in which authors point to the fact that there are some differences between a representation of particular genotype and sport performance.

Objective

The main goal is to find out any relations among the selected polymorphisms of genes and results gained through various testing in the group of elite and subelite fencers. The partial

aim of this work is to find out whether there is a link between the observed polymorphisms and the speed of time muscle activation during the fencing lunge.

Methods

The research sample consisted from 30 fencers (men, epeeists and foilists, 24.9 ± 6.2 years of age) of elite and sub elite level from Czech and Slovak fencing federation. For the genotypic analysis of selected polymorphisms a buccal mucosae swab was used followed by the genetic lab analysis (Genomac výzkumný ústav, s.r.o; Ústav biologie a lékařské genetiky 1. Lékařská fakulta UK). In order to complete diagnostics of the anaerobic skills the thirty second Wingate test (WT30) was used. The reaction time levels tested on visual stimuli was observed via the Fitosword device (Fitronic, s.r.o., Bratislava, Slovak Republic). Also the specific fencing shuttle test was used. The time muscle activation speed analysis of selected muscles was done by surface electromyography (ME6000, MEGA Electronics, Ltd., Finland).

The results from the above mentioned tests were compared with these polymorphisms: *ACTN3* R577X, *ACTN3* (rs2229455), *ACE* ID, *NOS3* Glu298Asp, *AMPD1* C34T, *BDKRB2* +9/-9 a *CNTF* G1357A. The allele and genotype frequency of the fencers was also compared with the general Caucasian population.

Results and conclusions

Comparison analysis of allele and genotype frequency among group of fencers with the general Caucasian population showed no differences in none of the observed polymorphisms. Significant differences, however, were identified in polymorphisms *ACTN3* R577X, *ACE* ID, *BDKRB2* +9/-9 and *NOS3* Glu298Asp in relation to the selected variables obtained in the Wingate test.

Between the representation of polymorphisms *NOS3* Glu298Asp, *BDKRB2* +9/-9 and *CNTF* G1357A and results of specific motor tests (reaction time, movement time of the lunge, overall speed of the lunge, specific shuttle test, time muscle activation of the selected muscles) were also found significant differences. Furthermore, it was found that the time muscle activation of *m. flexus femoris*, *m. deltoideus* during the lunge was faster in fencers with -9 allele of the polymorphism *BDKRB2* than fencers with +9/+9 genotype.

On the basis of the results it can be stated that with regard to the different representation of the polymorphisms in the group of fencers, the differences in performance were found in the anaerobic Wingate test WT30, the reaction time during the lunge, the movement time of the lunge, the overall speed of the lunge, the specific shuttle test and the time activation of selected muscles. However, it is necessary to look at these results with some reserve, since sports performance undoubtedly affects a number of other internal and external factors.

Key words

Anaerobic performance, polymorphism, sport fencing, genotypes, motor tests, genetic predisposition, reaction time, movement time