Surface EMG as a method for following-up sports training efficiency

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Abstract

The purpose of the present study was to evaluate the applicability of surface electromyography (EMG) for evaluation of training related changes in muscle contractile properties. Eight nationally ranked junior tennis players participated in a six weeks training program designed to increase speed and explosiveness. Their physical characteristics were evaluated before and after the training period by: tennis-specific field tests, measuring isometric twitch contraction of the medial gastrocnemius muscle, and by monitoring the frequency spectrum of the EMG at 50% of the maximal voluntary contraction. All the players improved the results of tennis specific field tests after the training period, but only three players were recognized to increase contractile speed of the medial gastrocnemius muscle expressed by shorter twitch contraction times after the training period. The same three players exhibited higher characteristic frequency (defined as the mean frequency lying between the sixth and ninth decile of the spectral distribution function) and a wider EMG amplitude spectrum after the training period. A good correlation was found between the number of the parameters of the isometric twitch contraction that were improved by more than 2% after the training period (NP) and the ratio between characteristic frequency after the training period (fA) and characteristic frequency before the training period (fB) (fA/fB) ($p = 0.0065$), as well as between NP and the slope of the linear approximation of the dependence between decile frequencies of the EMG signal after the training period (dAf) and decile frequencies of the EMG signal before the training period (dBf) (dAf = f(dBf)) ($p = 0.0035$). The correlation between the number of parameters of the isometric twitch contraction that were improved after the training period and the changes in characteristic parameters of EMG suggests the applicability of EMG for following-up sports training efficiency.

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