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Feature Extractions of EMG Signals during a Constant Workload Pedaling Exercise

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Abstract : Electromyography (EMG) is one of the important indicators during exercise, as it is closely related to the level of muscle activations. This work quantifies the muscle conditions of the lower limbs in a constant workload exercise. Surface EMG signals of the vastus laterals (VL), vastus medialis (VM), rectus femoris (RF), gastrocnemius medianus (GM), gastrocnemius lateral (GL) and Soleus (SOL) were recorded from fourteen healthy males. The EMG signals were segmented in two phases: activation segment (AS) and relaxation segment (RS). Period entropy (PE), peak count (PC), zero crossing (ZC), wave length (WL), mean power frequency (MPF), median frequency (MDF) and root mean square (RMS) are calculated to provide the quantitative information of the measured EMG segments. The outcomes reveal that the PE, PC, ZC and RMS have significantly changed (p<.001); WL presents moderately changed (p<.01); MPF and MDF show no changed (p>.05) during exercise. The results also suggest that the RS is also preferred for performance evaluation, while the results of the extracted features in AS are usually affected directly by the amplitudes. It is further found that the VL exhibits the most significant changes within six muscles during pedaling exercise. The proposed work could be applied to quantify the stamina analysis and to predict the instant muscle status in athletes.

Keywords : electromyographic feature extraction, muscle status, pedaling exercise, relaxation segment
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