

局部肌肉疲劳的表面肌电信号复杂度和熵变化

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目的在于探讨静态和动态疲劳性运动过程中肱二头肌和腰部脊竖肌表面肌电(surface electromyography, sEMG)信号的Lempel-Ziv复杂度和Kolmogorov熵的变化规律。18名男性大学生志愿者被随机分为肱二头肌和腰部脊竖肌运动负荷组,分别完成静态和动态疲劳运动负荷试验。运动负荷期间连续记录sEMG信号,在对运动负荷时间和重复次数进行标准化处理后,截取相应时段的sEMG信号,计算Lempel-Ziv复杂度和Kolmogorov熵,观察它们随肌肉疲劳发展的变化规律。研究表明,无论是静态还是动态疲劳运动条件下,被检肌肉sEMG信号的复杂度和熵均随着运动负荷时间呈现明显的单调递减型变化。该变化可能与神经系统渐进性协调众多运动单位同步收缩的“协同效应”有关。

sEMG SIGNAL COMPLEXITY AND ENTROPY CHANGES DURING EXERCISE-INDUCED LOCAL MUSCLE FATIGUE

In order to investigate the behavior of biceps brachii and lumbar erector muscle sEMG signal Lempel-Ziv complexity and Kolmogorov entropy during muscle fatigue, 18 male college students volunteered to take part in the test which required them to complete isometric and dynamic fatigue contraction test separately. The sEMG signals of biceps brachii and lumbar erector muscle were recorded and their Lempel-Ziv complexity and Kolmogorov entropy were analyzed after sustained time and contraction repetitions standardization processing. The results showed that both Lempel-Ziv complexity and Kolmogorov entropy declined linearly with fatiguing contractions regardless isometric or dynamic contraction test. This results may be related with the "coordination effects" of neuro-control system.

关键词