

加速度計を応用した運動中のエネルギー代謝の評価方法

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Method to Evaluate Energy Expenditure During Exercise by Using Accelerometer

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ABSTRACT

Rowing has a unique exercise characteristic, that is, moving body toward back and forth to generate power output, and the work for that kind of movement was not considered when predicting energy expenditure. The aim of this study was to evaluate aerobic and anaerobic energy supplies during 2000 m rowing test with using a newly developed accumulated oxygen deficit (AOD) method which takes the exercise characteristic of rowing into account. Thirteen male university rowers conducted 2000 m test. In each 250-m section, utilized anaerobic energy was determined by subtracting measured oxygen uptake from predicted oxygen demand which was predicted by power output and accelerometer output measured by rowing ergometer and tri-accelerometer sensor being put on rower's back, respectively. The highest sectional anaerobic energy utilization was observed at the first section, then sectional anaerobic energy utilization gradually decreased with time course, however, contribution of anaerobic metabolism maintained around 10 % during second half of the test. Although entire contribution of anaerobic metabolism reached 18.3 ± 6.2 %, total amount of anaerobic energy was not correlated with average power output of 2000 m test ($r = -0.15$, $p = 0.625$), however, maximal oxygen uptake was ($r = 0.83$, $p = 0.001$). The

highest sectional power output was observed at the first section and gradually decreased with time course, meanwhile, power output at the final section was not significantly different from its previous section. Amount of available anaerobic energy at the final section and the second from final section were significantly correlated with relative power output at the final section ($r = 0.66, p = 0.015$ and $r = 0.57, p = 0.04$). These results suggested that rowing performance is mainly related to aerobic ability as reported previously, and anaerobic capacity would be important to maintain higher power output during second half of the test and especially at the final section.

要 旨

本研究では、13名の男子大学生ボート選手を対象に、テスト中の発揮パワーおよび身体に装着した加速度計の測定値から2000mテスト中の酸素需要量を推定し、そこから実際の酸素摂取量を差し引くことで無酸素性エネルギー供給量を定量した。その結果、テスト中の無酸素性代謝の貢献割合は $18.3 \pm 6.2\%$ であったが、平均発揮パワーと無酸素性エネルギー供給量の間に関係は認められなかった ($r = -0.15, p = 0.625$)。一方、1500mおよび1750m地点における無酸素性エネルギー量の残存率と、2000mテストの平均発揮パワーを基準にした最終区間の発揮パワー水準の間には、それぞれ有意な正の相関関係が認められた ($r = 0.57, p = 0.04, r = 0.66, p = 0.015$)。本研究の結果から、無酸素性代謝能力はラストスパートにとって重要な能力であることが示唆された。