陸上と水中での運動終了直後の心拍数の回復過程の差違に関する検討

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The Difference in Vagally Mediated Heart Rate Recovery After Exercise Between Resting on Land and in Water

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ABSTRACT

It is suggested that heart rate (HR) recovery for the first 30 sec after exercise is primarily mediated by vagal reactivation. We examined the difference in vagally mediated HR recovery after exercise between resting on land and in water. Seven and 6 healthy non-smoking college students were participated in the experiments 1 (Exp. 1) and 2 (Exp. 2), respectively. In Exp. 1, students ran on land or swam in water for 4-5 min at three HR levels (125, 140 and 155 bpm) then rested on land or in water to the level of the xiphoid for the first 30 sec after exercise. In Exp. 2, students ran on land or swam in water for 4-5 min at HR 147 bpm then rested on land or in water to the level of the navel or clavicle for the first 30 sec after exercise. The time constants of the beat-by-beat HR decay for the first 30 sec after exercise (T30) was used as an index of vagally mediated HR recovery after exercise. T30 after exercise in water was significantly lower at HR 125 and 155 bpm and slightly lower at HR 140 bpm than that after exercise on land in Exp. 1. In Exp. 2, T30 after exercise in water at the level of the clavicle was significantly lower than that after exercise on land. However, there was no significant difference in T30 after exercise between that in water at the level of the navel and that on land in Exp. 2. These results suggest that the vagally mediated HR recovery for the first 30 sec after

exercise is accelerated in water compared with that on land. Augmentation of the vagally mediated HR recovery after exercise in water is thought to depend on the level of water immersion during recovery. When we use the heart or pulse rate counted for 10-15 seconds immediately after exercise for estimating the HR during exercise, these results must be taken into account.

要　旨

本研究では，運動終了直後30秒間の心拍減衰時定数（T30）を指標に，主に迷走神経系の再興奮化を介する運動終了直後30秒間の心拍数の回復が，陸上運動と水中運動で異なるかどうかを検討した．異なる3つの心拍レベル（125，140，155拍/分）で4～5分間の陸上運動（ジョギング）あるいは水中運動（平泳ぎ，回復期の水深：剣状突起レベル）を行わせ，両運動でT30を比較した．その結果，T30は，心拍数が125，155拍/分の時，水中運動の方が陸上運動に比べて有意に（$p<0.05$）低値を示し，心拍数が140拍/分の時も水中運動の方が低値を示す傾向を示した．また，4～5分間の陸上あるいは水中運動（心拍数147拍/分のジョギングあるいは平泳ぎ）を行わせ，水中運動においては，終了後の回復期の水深を鎖骨およびへそレベル（鎖骨回復，へそ回復）の2種類設定し，各運動・回復条件でT30を比較した．その結果，水中運動・鎖骨回復におけるT30は，陸上運動に比べて有意に（$p<0.05$）低値を示した．しかし，水中運動・へそ回復と陸上運動との間では，T30に有意な差は認められなかった．以上のことから，陸上運動に比べて，水中運動終了直後30秒間の心拍数の回復は速まるが，回復が速まるかどうかは，回復期の水深の影響を受けることが示唆された．また，これらの点は，運動終了直後の心（脈）拍数を用いて，運動中の心拍数を推定する際に注意する必要があると考えられた．