中等度・短期間の運動が自律神経機能および心機能に及ぼす影響の経時的変化

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Effects of Dynamic Exercise Training on The Autonomic Nervous System and Cardiovascular System in Healthy Young Men

by

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ABSTRACT

Effects of dynamic exercise training on the autonomic nervous system and cardiovascular system were examined in healthy young men. We investigated to clarify whether short-term training could alter the parasympathetic activity and the heart rate. We also investigated whether the negative chronotropic effect was associated with the changes of the left ventricular size and functions.

Four subjects (mean age: 21 yr) were trained for 2 weeks using treadmill (60% maximum exercise for 1 hour a day). The following parameters were measured before and after 1 and 2 weeks training: 24 hr-ECG and -blood pressure, 12-leads ECG at rest, echocardiography. The autonomic nervous functions were estimated from spectral analysis for the variability of R-R interval. Parasympathetic activity was assessed from the high-frequency (0.15－0.40 Hz) power spectral density ($msec^2$) (HF) and the sympathetic activity was from the ratio of the low-frequency (0.04－0.15 Hz) power spectral density ($msec^2$) (LF) to HF (LF/HF). We also tested the responses of heart rate,

blood pressure, HF and LF/HF during exercise before and after 1 and 2 weeks training.

Heart rate decreased and HF increased during sleeping time and during exercise after the training for 1 and 2 weeks. These changes were associated with the increase of left ventricular diastolic dimension, stroke volume, fractional shortening, and systolic blood pressure. However, ventricular wall thickness at rest did not alter.

These data suggest that 7 days dynamic exercise training can enhance parasympathetic activity of the heart, which is associated with the increases in left ventricular size and systolic function at rest.

要　旨

運動を継続することによってもたらされる心臓副交感神経機能の亢進が，短期間の運動によっても出現するか，また心臓の形態や収縮機能の変化を伴うか否かを検討した．

健常人を対象に，トレッドミル装置を用いて負荷強度が最大運動の60%に相当する運動を毎日1時間，14日間行い，トレーニング前，トレーニング7日目，および14日目に下記の検査を行った．24時間血圧，24時間心電図を記録し，心電図R-R間隔変動の周波数解析から自律神経機能を算出した．心エコー・ドプラー法を用いて左室径, 心室壁厚, 左室駆出率，左室短縮率，1回心拍出量を測定した．さらに，トレーニングと同じ10分間の運動負荷を経時的に行い，反応の変化を調べた．

安静時および運動中の心臓副交感神経機能は亢進し，心拍数は減少した．これらの変化はトレーニング後7日目より生じ，心臓の拡大と1回心拍出量の増加，心収縮力の増強を伴っていた．

運動による心臓副交感神経機能亢進のメカニズムは不明であり，今後の研究が期待される．