Does the Heart Fatigue After Running a Marathon?

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Purpose: Evidence suggests that prolonged activity may cause a depression in left ventricular (LV) systolic and diastolic function. Most available data, however, pertains to trained athletes performing ultra-endurance activities so we sought to broaden the database by studying marathon runners heterogeneous for age and training status over four years (2002-5) at the London Marathon. Methods: 105 marathon runners (93 men; mean±SD age 33±9 years) were recruited to two testing sessions; c. 24 hours prior to the race and within 30 min of race completion. Height (174±8 cm), body mass (77.3±10.1 kg), resting heart rate (56±8 beats.min⁻¹), systolic (128±11 mmHg) and diastolic (77±7 mmHg) blood pressure were assessed via standard procedures. All runners underwent standard 2-D, M-mode and Doppler echocardiographic assessment of LV function and sub-groups underwent tissue-Doppler assessment (n=56) and colour M-mode flow propagation analysis (n=27). Results: LV systolic function was not significantly depressed post-race (ejection fraction: 73±8 to 73±8 %; end-systolic pressure/volume ratio: 3.4±1.8 to 3.7±2.2 mmHg.ml⁻¹; peak systolic myocardial tissue velocity: 14.7±4.2 to 15.7±4.5 cm.s⁻¹). Indices of LV diastolic function were significantly depressed post-race (early to atrial peak filling velocity ratio [E/A]: 1.76±0.45 to 1.19±0.32; early to late peak myocardial tissue velocity ratio [E'/A']: 1.80±0.60 to 1.31±0.44; flow propagation velocity in early diastolic filling [Vp]: 71.6±14.3 to 59.7±12.4 cm.s⁻¹, all P<0.005). Data collected in a small sub-sample (n=10) reported that these indices returned to baseline in 24 hours. Pre to post-race changes in E/A, E'A' and Vp were not significantly related to runners age (r²=0.03-0.12), finishing time (r²=0.01-0.12) or changes in LV loading/heart rate (r²=0.01-0.08). Conclusions: There is consistent evidence that running a marathon can lead to a transient reduction in LV diastolic but not systolic function. The performance and clinical consequences of these alterations are not fully understood.

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Keywords: Endurance Performance, Cardiac, Athlete's Heart

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