

Training for a first-time marathon reverses vascular ageing**Authors:**

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Background: Ageing is strongly associated with aortic stiffening, contributing to increased cardiovascular risk even in healthy individuals. Aortic stiffness is reduced in lifelong athletes, but whether training in novice runners can modify this process remains unclear.

Purpose: To assess the impact of first-time marathon training on age-related increases in aortic stiffness.

Methods: Untrained healthy volunteers were recruited prior to starting training for the London Marathon. Assessment pre-training and two weeks post-marathon included central (aortic) BP (cBP), and phase contrast 1.5T CMR in the ascending (Ao-A) and descending thoracic aorta at two levels (pulmonary artery bifurcation and diaphragm – Ao-P and Ao-D). Aortic distensibility and beta-stiffness (β , a pressure-independent measure) were measured and correlated with chronological age at baseline to derive biological aortic age before and after training. Data are mean changes (95% confidence intervals).

Results: The cohort comprised 139 first-time marathon completers (age range 21-69 years, 50% male). As expected, increasing age decade was associated with decreasing distensibility by 2.3, 1.9 and 3.1 x10⁻³mmHg⁻¹ for the Ao-A, Ao-P, and Ao-D respectively (partial r=0.4-0.5), Figure.

Training decreased cSBP and cDBP by 4(2.5-5.3) and 3mmHg(1.6-3.6), Table. With training, descending aortic distensibility increased at both Ao-P and Ao-D levels (by 9%,p=0.009 and 17%,p=0.001), whilst unchanged in the ascending aorta. This translated to a reduction in biological aortic age at Ao-P by 3.9(1.1-7.5) and Ao-D 4.5years(1.8-8.2). β decreased by 7% at the Ao-D level,p=0.02. Participants with slower marathon running times (Ao-P partial r:-0.20,p<0.05), and older age (Figure) showed a greater increase in descending aortic distensibility with training.

Conclusions: Training for and completing a marathon improves central blood pressure and aortic stiffness even in novice athletes. These changes are the equivalent to a ~4-year reduction in vascular age. These benefits were greatest in older, less fit individuals.

	Baseline		Follow-up		p
Central SBP (mmHg)	110	(102,121)	106	(100,114)	<0.001
Central DBP (mmHg)	76	(72,81)	74	(69,78)	<0.001

Distensibility ($\times 10^{-3} \cdot \text{mmHg}^{-1}$)					
Ascending	8.63	(5,11)	8.45	(6,12)	0.14
Proximal Descending	8.52	(6,12)	9.06	(6,13)	0.009
Diaphragmatic Descending	13.63	(11,18)	15.17	(12,21)	0.001

Data are median and interquartile ranges.

