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Exaggerated Exercise Blood Pressure is Associated with Higher Left Ventricular Mass in Adolescence. The Avon Longitudinal Study of Parents and Children

Martin Schultz¹, Chloe Park², James Sharman¹, Abigail Fraser³, Laura Howe³, Debbie Lawlor³, Nish Chaturvedi², George Davey Smith³, and Alun Hughes²

¹Department of Menzies Institute for Medical Research, University of Tasmania, Australia

²Department of Institute for Cardiovascular Sciences, University College London, United Kingdom

³Department of MRC Integrative Epidemiology Unit, University of Bristol, United Kingdom

Abstract

Objective—Dynamic exercise results in an increase to systolic blood pressure (BP). Irrespective of resting BP, some individuals may experience an exaggerated rise in systolic BP with exercise, which in adulthood, is associated with greater risk of developing hypertension, cardiovascular morbidity and mortality. It is not known if exercise BP is associated with adverse cardiovascular risk during adolescence. We determined associations of exercise BP with left ventricular mass (LVM) in adolescents, with consideration of the possible confounding effect of body composition.

Design and method—We undertook a cross-sectional study of 3,949 adolescents (mean age 17.8 ± 0.4 years, 45% male) who were part of a UK population-based birth cohort study. A sub-maximal exercise step-test with automated BP measurement immediately post-exercise was completed and body composition (total fat and lean mass) assessed by dual-energy x-ray absorptiometry. A sub-sample ($n = 1,241$) underwent comprehensive echocardiographic assessment.

Results—Each 5 mmHg increase in post-exercise systolic BP was associated with $0.34 \text{ g/m}^{2.7}$ (95% CI: 0.24, 0.45) greater LVM indexed to height^{2.7} with adjustment for age, sex and hypertension status ($p < 0.001$). Further adjustment for lean mass attenuated this association to $0.29 \text{ g/m}^{2.7}$ (95% CI 0.19, 0.39; $p < 0.001$) for each 5 mmHg of post-exercise systolic BP, adjustment for fat mass attenuated it to $0.15 \text{ g/m}^{2.7}$ (95% CI 0.05, 0.25; $p = 0.003$), and adjustment for both lean and fat mass attenuated it to $0.13 \text{ g/m}^{2.7}$ (95% CI 0.03, 0.23; $p = 0.012$). Individuals with post-exercise systolic BP ≥ 150 mmHg (corresponding to post-exercise systolic BP $>70^{\text{th}}$ percentile) had a 7% greater LVM compared to those with post-exercise systolic BP < 150 mmHg ($p < 0.001$).

Conclusions—Exaggerated exercise systolic BP is associated with higher LVM, adjustment for body composition attenuates but does not abolish this association. These results may have important implications for cardiovascular risk in later life