Normal Blood Pressure and Maximum Rate Pressure Product Responses to Treadmill Exercise Test in Healthy British Children

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Background: Normal cardiovascular responses to exercise in childhood with regards to maximum blood pressure response, rate pressure product and recovery time are not well documented. In addition, maximum normal blood pressure response to exercise in childhood is extrapolated from adult studies which make assessment of hypertensive response in disease situation such as coarctation rather difficult. We therefore aimed to define normal cardiovascular responses to exercise in healthy British children.

Method: We retrospectively reviewed our experience in all children who underwent exercise testing (Bruce treadmill protocol) at University Hospital of Wales between 2003 and 2010. 137 children without any structural heart disease were included in the study.

Results: There were 80 males and 57 females and their age ranged from 9 to 16 years. All children achieved minimum exercise duration of 12 minutes regardless of age or gender. Lower VO2max values were observed in females compared to male subjects in younger age but not so much in adolescents. All subjects achieved over 90% of maximum predicted heart rate for any given age. Younger subjects showed quicker heart rate recovery compared to older individuals. Maximum blood pressure did not exceed above 153.6±3.6mmHg in any age group. Maximum rate pressure product was similar both gender before puberty but higher in males in 15-16 year group. The rate pressure product values in children are similar to adults. However the utilisation of RPP in children for estimating myocardial oxygen requirements and the peak cardiovascular performance is uncertain.

Peak cycle work rate <60W, exercise duration <5 minutes, and RPP<12500 predicts increased cardiovascular mortality in adults. The low value of PRP suggests significant compromise of coronary perfusion. However in children there is no data regarding prognostic value of RPP.