Effects of Isometric Resistance Training and Subsequent Maintenance Dose on Ambulatory Blood Pressure and Morning Blood Pressure Surge in Young Normotensives

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Introduction

Hypertension, a modifiable risk factor for cardiovascular disease (CVD) is associated with approximately one third of deaths globally each year. Diurnal blood pressure (BP) variability and more specifically morning blood pressure surge (MBPS) are associated with increased risk of stroke, end-organ damage and are considered to be destabilising factors for atherosclerotic plaques. Isometric resistance training (IRT) has been shown to reduce ambulatory BP and MBPS following 8-10 weeks of training. However, there is no data at present which has established the dose of training needed to maintain these reported reductions following the initial IRT period. Therefore, the purpose of this study was to determine the effects of IRT on ambulatory BP and the MBPS in young normotensives following (i) 8 weeks of IRT and (ii) 8 weeks of a once a week maintenance dose.

Methods

Twenty-five normotensive individuals (15 men, age=21±4 years; 10 women, age=22±3 years) were randomly assigned to a training-maintenance (TRA-MT, n=13) or control (CON, n=12) group. Ambulatory BP and MBPS were measured prior to, after an 8-week (3 days/week) training period and following an 8-week maintenance period (1 day/week) of bilateral leg IRT using an isokinetic dynamometer (4 x 2-minute contractions at 20% MVC with 2-minute rest periods). A two-way repeated measures MANOVA was used to assess the within and between groups changes in ambulatory BP and MBPS. MBPS was calculated as: mean systolic BP 2 hours after waking, minus the lowest sleeping 1-hour mean systolic BP.

Results

There were significant reductions in 24-h ambulatory systolic BP following IRT (pre-to-post training, -7±5 mmHg, p=0.001) and these reductions remained after the maintenance period (pre-to-post maintenance, -6±4 mmHg, p=0.000). There were significant reductions in

daytime BP (pre-to-post training, -5±5 mmHg, p=0.034) which remained following maintenance (pre-to-post maintenance, -5±5 mmHg, p=0.02), but there was no change in night-time systolic BP (pre-to-post training, -2±5 mmHg, p=0.685) or post maintenance period (pre-to-post maintenance, 1±6 mmHg, p=0.94). Additionally, there were significant reductions in the MBPS (pre-to-post training, -9±10 mmHg, p=0.005) which were maintained post maintenance period (pre-to-post maintenance, -8±11 mmHg, p=0.014). Additionally, significant correlation was identified between the magnitude of the change in MBPS and the magnitude of changes in mean SBP 2-h after waking (r = 0.78, P=0.002).

Discussion

These results provide further evidence that IRT causes significant reductions in MBPS in addition to the previously reported reductions in ambulatory BP. Additionally, these reductions seem to be maintained with a reduced exercise dose. These findings may also have important clinical implications, the significant reductions in the MBPS offer the potential for meaningful CVD and stroke risk reduction, provided these effects can be demonstrated in those who are at risk.