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Are improvements in arterial stiffness associated with moderate physical activity and modulated by nitric oxide by-products in overweight adults?

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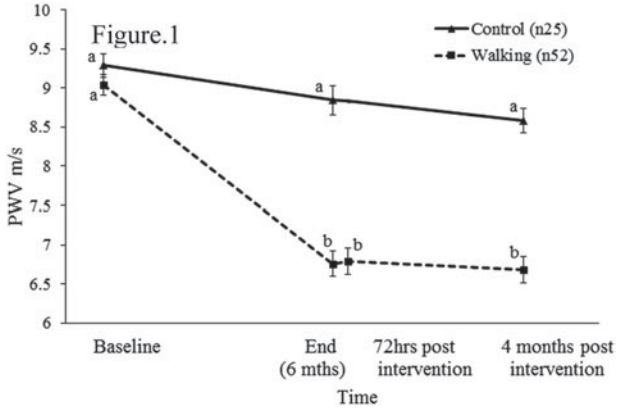
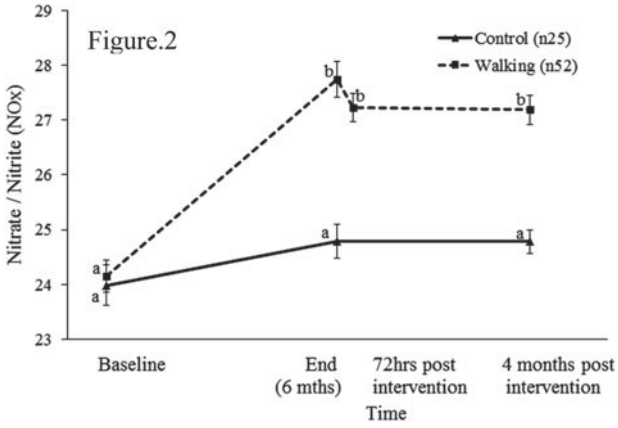
Arterial stiffness, measured via pulse wave velocity (PWV) has been shown to be a strong independent predictor of cardiovascular morbidity and all-cause mortality[(1)]. Healthy compliant brachial arteries normally have a PWV of 7–9 ms^{-1}, whereas stiffer arteries tend to be in the range of 12–15 ms^{-1}[(2,3)]. It has been hypothesised that regular physical activity improves endothelial function due to vascular shear stress causing an increased production of the vasodilator nitric oxide (NO)[(4)]. We previously reported that six months of brisk walking was associated with a decrease in PWV[(5)]. Here we investigated whether the observed beneficial changes in PWV following regular brisk walking were associated with changes in serum nitrate and nitrite (NO_x) (a surrogate marker for the vasodilator NO) concentrations.

77 overweight sedentary individuals (19 males, 58 females; mean age 45.6 (SD 6.55) years; BMI 29.18 (SD 4.27) kg/m^2) participated in a randomised control trial and were allocated to one of three groups: control group (n25), walking with monthly telephone contact group (n25) and walking with weekly telephone contact group (n27). The walking groups were asked to incorporate 3 × 10 minute bouts of brisk walking into their daily routine on 5days/week and were contacted over six months on to provide support. The control group were given light stretching exercises to carry-out on 5days/week and were contacted on a monthly basis to control for attention effects. Percentage body fat (Tanita scales), BMI (kg/m^2), and PWV were measured at baseline and repeated after six months with follow-up measurements taken four months later. PWV was measured using a sensor based device as described by McLaughlin *et al.*[(2)]. For the purposes of the present investigation, both walking groups were combined (n52) and telephone contact was included as a covariate. Time by group interactions were analysed using repeated measures two-way analysis of covariance (ANCOVA). Between subject differences were analysed using a one-way ANOVA with *posteriori* Tukey Honestly Significant Difference (HSD) test.

There was a significant decrease in PWV ($P<0.001$) coupled with significant increases in NO_x ($P<0.001$) over the 6 month intervention, in the walking group as compared to control, and these beneficial effects were sustained beyond the end of the intervention period (i.e. at 4 months follow-up) (Figure 1 and 2). Furthermore a strong negative correlation between PWV and NO_x was also observed ($r = -0.65$, $P<0.001$).





The results demonstrate that the beneficial changes in PWV observed with regular brisk walking for 3 × 10 minutes per day may be explained by concurrent increases in nitric oxide by-products in these overweight individuals.

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