Pulsatile and resistive systolic loads as determinants of left ventricular remodelling after physical training

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Introduction: Cardiovascular function depends on the inter-relation between heart and vasculature. The contribution of aorta and peripheral vessels to the total systolic load of the left ventricle (LV) can be represented respectively by a "pulsatile" and a "resistive" component. We sought to understand their interrelation by exploring how LV remodelling occurred with altered load associated with an external stimulus (training). Methods: 237 untrained healthy male and female subjects volunteering for their first-time marathon were recruited. At baseline and after 6 months of unsupervised training, race completers underwent 1.5T cardiac magnetic resonance, brachial and non-invasive central blood pressure assessment. For analysis, runners were divided into 4 groups according to the variation (positive versus null or negative) in Total Arterial Compliance Index (TACi), representing the pulsatile component of the LV load, and in Systemic Vascular Resistance Index (SVRI), representing the resistive component of the LV load. Results: 138runners (age 21-69 years; F: 51%) completed the race. Data are reported for each variable as Δ mean [95% Confidence Interval]. In the whole cohort, training was associated with a small increase in LV mass index (+3g/m2, [0, 6 g/m2]), indexed LV end-diastolic volume (EDVi) (+3ml/m2, [-2, 5 3ml/m2]), in LV mass/LVEDV ratio (+0.02g/ml, [0.00, 0.04 g/ml]) and in TACi (+0.02ml/m2, [0.02, 0.38 ml/m2]). SVRi mildly fell (-43dyn·s/cm2[-103, 17dyn·s/cm2]). TACi increase was associated with LVEDVi increase and no change in LV mass/EDV (eccentric remodelling). On the other hand, both TACi reduction and SVRi increase were associated with increase in LV mass/EDV and no significant change in LVEDVi (concentric remodelling). A similar increase in LV mass was observed in all groups. See Table. Conclusion: Cardiac remodelling observed after mild, medium term, unsupervised training seems to be related to the modifications of aorta and peripheral vessels. In particular, a reduction in pulsatile load seems associated with eccentric LV remodelling, while an increase in both pulsatile and resistive with concentric LV remodelling. Further research is needed to understand the interaction between TACi and SVRi.

Table 1

	LV EDVi (ml/m^2)	LV mass index (g/m^2)	LV mass/EDV
TACi increase (n = 75)	+4 [0, 9]	+3 [0, 7]	0 [-0.03, 0.03]
TACi decrease (n = 62)	-1 [-6, 4]	+3 [0, 8]	0.04 [0.01, 0.07]
SVRi increase (n = 63)	0 [-4,4]	+3 [0, 7]	+0.03 [0, 0.06]
SVRi decrease (n = 73)	+3 [-3, 7]	+3 [-1, 6]	+0.01 [-0.02, 0.04]