The Athlete's Heart - Gender Aspects

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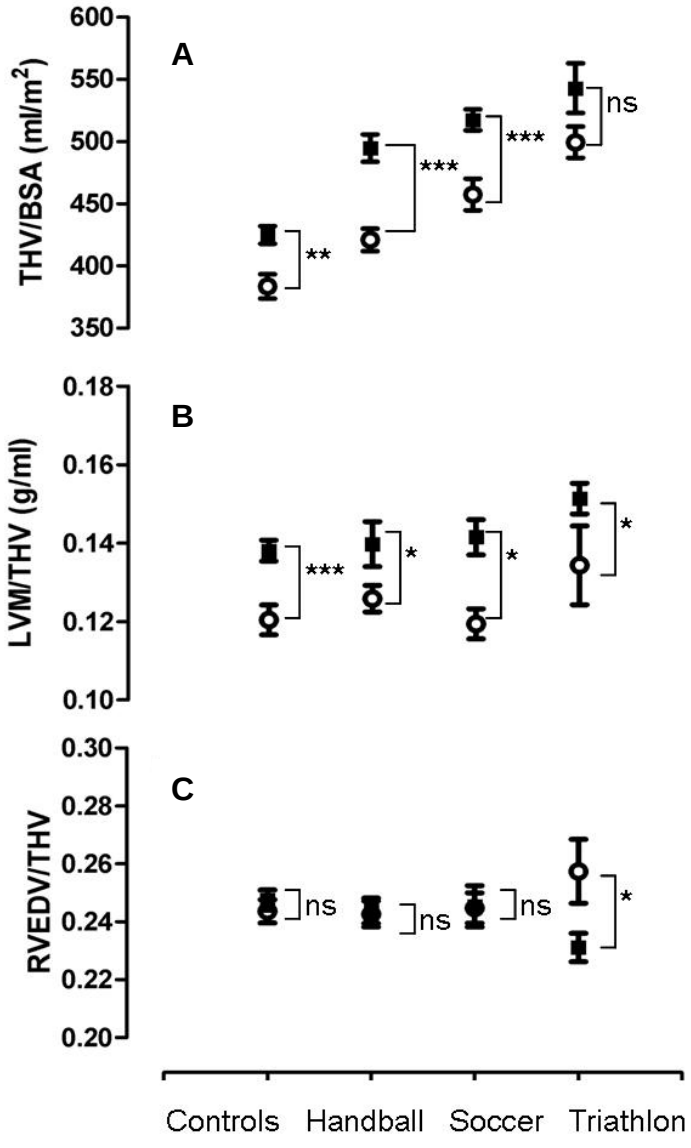
Introduction: It has previously been well described how long term training affects cardiac dimensions in male athletes. Only a few studies include females. Furthermore, most studies have focused on the effects on the left ventricle. The effects on the right ventricle and the total heart are not completely described. Therefore, the aim of the study was to investigate if the morphological response to training on the left, right and total heart differs between male and female athletes.

Methods: Seventy-one athletes (23 handball players (12 female), 30 soccer players (12 female), 18 triathletes (6 female)) and 60 controls (20 female) underwent cardiac magnetic resonance imaging (CMR). Total heart volume (THV), left ventricular mass (LVM) and left- and right end diastolic volume (LVEDV, RVEDV) was calculated using planimetry. Mann-Whitney non-parametric t-test was used to compare THV, LVM, LVEDV, RVEDV, THV/body surface area (BSA), LVM/THV, LVEDV/THV and RVEDV/THV between males and females.



Results: In all groups, males had significantly higher THV, LVM, LVEDV and RVEDV. Left ventricular EDV/THV did not differ between males and females. There was a significant difference in THV/BSA between males and females for all groups except for triathletes (panel A). In all groups, LVM/THV was significantly higher in males compared to females (panel B). Right ventricular EDV/THV differed significantly only between male and female triathletes, although the difference was very small (p=0.049) (Panel C).

Conclusion: Long term endurance training increases LVEDV, RVEDV and THV in the same order of magnitude in both males and females. Differences in THV/BSA between male and female athletes may be diminished when female athletes engage in high frequencies of long-term endurance training, as seen in the triathletes of this study. The LVM/THV, however, remain significantly higher in male athletes.

Fig.1. Panel A: Total heart volume normalized for body surface area. Panel B: Left ventricular mass normalized for total heart volume. Panel C: Right ventricular end diastolic volume normalized for total heart volume. All values are presented as SEM.