

**Right ventricular functional shift assessed by three-dimensional echocardiography: characteristic feature of athlete's heart?**

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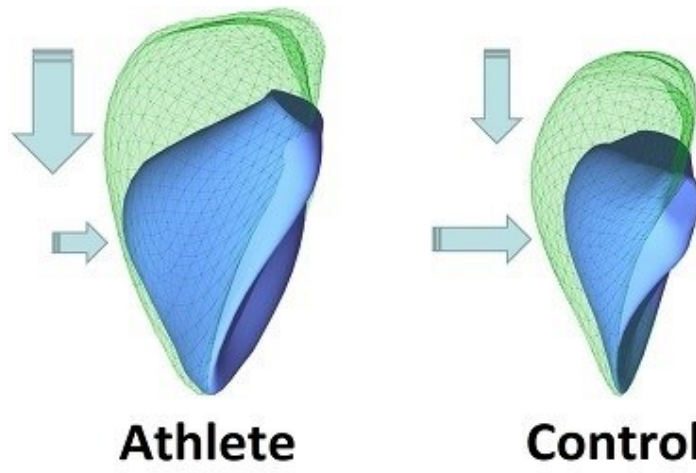
Regular physical training is associated with pronounced cardiac adaptation, also referred as the athlete's heart. While the majority of studies have focused on the left ventricle, right ventricular (RV) response to chronic exercise may also be of high interest.

Our aim was to determine the morphological and functional characteristics of the RV in a large cohort of elite athletes using three-dimensional echocardiography.

116 top-level athletes (19±4 years, 36% female) and 40 age- and gender matched healthy, sedentary controls were enrolled in our current study. Beyond conventional echocardiography, 3D acquisitions focused on the RV were also obtained. We determined RV end-diastolic volume index (RVEDVi), stroke volume index (RVSVi) and ejection fraction (RVEF) by dedicated software. Using the ReVISION method, we have decomposed the motion of the RV to determine longitudinal (LEF) and radial ejection fraction (REF). The ratio of LEF or REF to RVEF quantifies the relative contribution of longitudinal or radial (bellows effect) wall motions to global function.

Athletes had significantly higher RVEDVi and RVSVi compared to controls (athletes vs. controls; RVEDVi: 87±12 vs. 65±10 mL/m<sup>2</sup>; RVSVi: 48±6 vs. 40±5 mL/m<sup>2</sup>, both p<0.0001), however, they also demonstrated lower RVEF (56±4 vs. 61±5%, p<0.0001). When examining the relative contribution of longitudinal and radial motion to global function, athletes had more pronounced RV longitudinal motion with lower contribution of the radial motion (LEF/RVEF: 0.50±0.07 vs. 0.42±0.07; REF/RVEF: 0.33±0.08 vs. 0.45±0.08, both p<0.0001).

Intense exercise training results in complex morphological and functional changes of the RV. Along with increased volumes, a characteristic functional shift can be seen with an increased longitudinal motion, however, with decreased radial shortening. This contraction pattern may serve as a new resting marker of athlete's heart.



Relative contribution of longitudinal and radial motion

