Author's response to reviews

Title: Single Beat 3D Echocardiography for the Assessment of Right Ventricular Dimension and Function after Endurance Exercise: Intraindividual Comparison with Magnetic Resonance Imaging

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Version: 2 Date: 1 February 2012

Author's response to reviews: see over
Cover letter

Single Beat 3D Echocardiography for the Assessment of Right Ventricular Dimension and Function after Endurance Exercise: Intraindividual Comparison with Magnetic Resonance Imaging

Dear Dr. Picano,

We would like to re-submit our improved manuscript “Single Beat 3D Echocardiography for the Assessment of Right Ventricular Dimension and Function after Endurance Exercise: Intraindividual Comparison with Magnetic Resonance Imaging” to Cardiovascular Ultrasound.

Thank you for the very helpful reviewer comments. We have improved the manuscript accordingly.

Here you find the specific answers to the issues raised by the reviewers:

Reviewer: Lorenza Pratali

- **In the methods, the author did not specify which hematological parameters were collected. The author showed the parameters only in table 5**

  Table 5 was deleted.

- **Methods: Section echocardiography: which parameters was evaluated in the standard echocardiography?**

  The parameters evaluated by standard echocardiography are listed in table 2.

- **In the final part of the discussion the author affirmed that all the other previously studies the RV function after endurance run was evaluated after rehydration. If we analyze i.e. the Oomah JASE 2011 publication is not specify if the subjects are studied after dehydration.**

  That is right. The publication by Oomah lacks some major information on how the study was done. Moreover, showed the athletes in the Oomah-study the same weight after the race as they had before the race. This is a very interesting phenomenon. The rehydration-status of the runners is not mentioned in Oomah’s publication, but from the fact that the runners needed to be transferred to a different location after finishing, we concluded that they were rehydrated by the point they got measured. Also, CMR was performed in Oomah’s study within 24h. Rehydration is very probable within this timeframe.

- **Please add the inter-rater agreement statistic (K) for the EF, RVEDV, RVESV.**

  The intra-class-correlation coefficient is given in table 4.

- **The author affirmed that evaluate the RV function immediately after run. Maybe immediately is not the right definition because the mean HR post-run was low 76 ± 13 bpm. In the paper written by Oomah 2011 the mean value of the HR 97 ± 11 with a shorter run.**

  In Oomah’s publication the heart rate of 97/min at the time of TTE measurement is not credible. After finishing, the athletes had to be transferred to a nearby hospital for measurements. 97/min must be the heart rate after crossing the finish line. The heart rate after exercise in our paper is the heart rate at the time of CMR/echo (recorded by the CMR/echo systems). The length of a race does not give a clue on how high the post-race heart rate must be.

- **On the basis of the referred HR, the author cannot affirmed that they evaluated high heart rate subjects and that single beats 3D echo is feasible in presence of tachycardia.**
Not all runners had a tachycardia at the time of examination. However, all runners (including those with elevated heart rate) could be examined.

- It is well known that during exercise is described exercise-induced pulmonary hypertension, with a 70% increase in pulmonary artery pressure due to increased RV-afterload seen during a marathon. In this study the author finds a significant decrease in PVAT even the absolute value is not pathological. Have the author any information also regarding RA-RV gradient that is normally measured or at least evaluated during a standard echocardiography?

Our runners did not have a tricuspid regurgitation that would be prerequisite to PAP measurement. Therefore we cannot give any information on sPAP.

- By the way according to these results the RV afterload after run seems do not increase too much in these subjects so this could be the possible explanation of the normal RV function present in these subjects. Could be interesting divide the population study in those, that performed the echo really after the run, and those whose performed echo after CMR, and check all parameters of RV function and PVAT and check if the results on RV function should be the same.

We have divided our study population in the two groups (first MRT and first echo). We could not detect any difference in RV dimension and function (RVEF: p=0.28, RVEDV: p=0.92, RVESV: p=0.56, RVSV: p=0.65, PVAT: p=0.42, PVET: p=0.42, TAPSE: p=0.69) between the two groups.

Reviewer: Thomas Buck

- The authors studied healthy runner and found normal RV function after exercise which is not surprising.

The EF did not decrease from pre- to post-exercise, which stands in contrast to other studies.

- The authors should discuss the limitation of using 3D surface reconstruction for 3D echo volumetry versus Simpson’s method for CMR which has been demonstrated to provide discrepant results by former studies.

On page 11 (reference 23) we mentioned the methods of 3D and 2D volumetry in the two imaging modalities and stated that using the same method for both modalities does reduce the discrepancy.

- The number of 13 authors is not appropriate and should be reduced to a maximum of 8.

All authors have contributed substantially to this very complex study, that involved cardiologists and radiologists at different time points. The study involved time-consuming data analysis. All authors meet the criteria for authorship.

- Page 7, line 1: Please indicate the manufacturer’s name of SC2000 workplace

We added “Siemens AG, Erlangen, Germany”.

- In the Reference List the reference of JASE as ‘Official Publication of the ASE seems to be unusual and unnecessary.

The JASE references were corrected.

- In legend of Fig. 1 omit ‘Beutel’ as it was not further used and explained in the text.

The word “Beutel” was deleted in the figure legend 1.

- Table 5 can be omitted as being of no relevance for this study.

Table 5 was deleted.
• The Bland-Altman plots in Fig. 4 have a difficult scaling of the x-axis. Scaling seems to be unequally distributed with the consequence of unequal distances between -2sd and 0 versus 2sd and 0 particularly in B, C, and D.

We have tried to find a scaling that transports best the range of the presented data. There are no outliers that are not represented in the Bland-Altman plot.

We hope that the manuscript in the current form meets the criteria for publication in Cardiovascular Ultrasound.

Yours sincerely,

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