

## Variation of the Seismocardiogram Depending on Measurement Position

Munck, Kim; Pedersen, Maria Weinkouff ; Udesen, Nanna Louise Kunker; Omar, Massar; Sørensen, Kasper; Struijk, Johannes Jan; Møller, Jacob Eifer; Søgaard, Peter; Schmidt, Samuel Emil

*Published in:*  
Annual Computing in Cardiology Conference, CinC

*Creative Commons License*  
CC BY 4.0

*Publication date:*  
2019

[Link to publication from Aalborg University](#)

*Citation for published version (APA):*

Munck, K., Pedersen, M. W., Udesen, N. L. K., Omar, M., Sørensen, K., Struijk, J. J., Møller, J. E., Søgaard, P., & Schmidt, S. E. (2019). Variation of the Seismocardiogram Depending on Measurement Position. In *Annual Computing in Cardiology Conference, CinC* <http://www.cinc.org/2019/Program/accepted/210.html>

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal -

### Take down policy

If you believe that this document breaches copyright please contact us at [vbn@aub.aau.dk](mailto:vbn@aub.aau.dk) providing details, and we will remove access to the work immediately and investigate your claim.



# Variation of the Seismocardiogram Depending on Measurement Position

Kim Munck, Maria W Pedersen, Nanna L J Udesen, Massar Omar, Kasper Sørensen, Johannes J Struijk, Jacob E Møller, Peter Sjøgaard, and Samuel E Schmidt

## INTRO

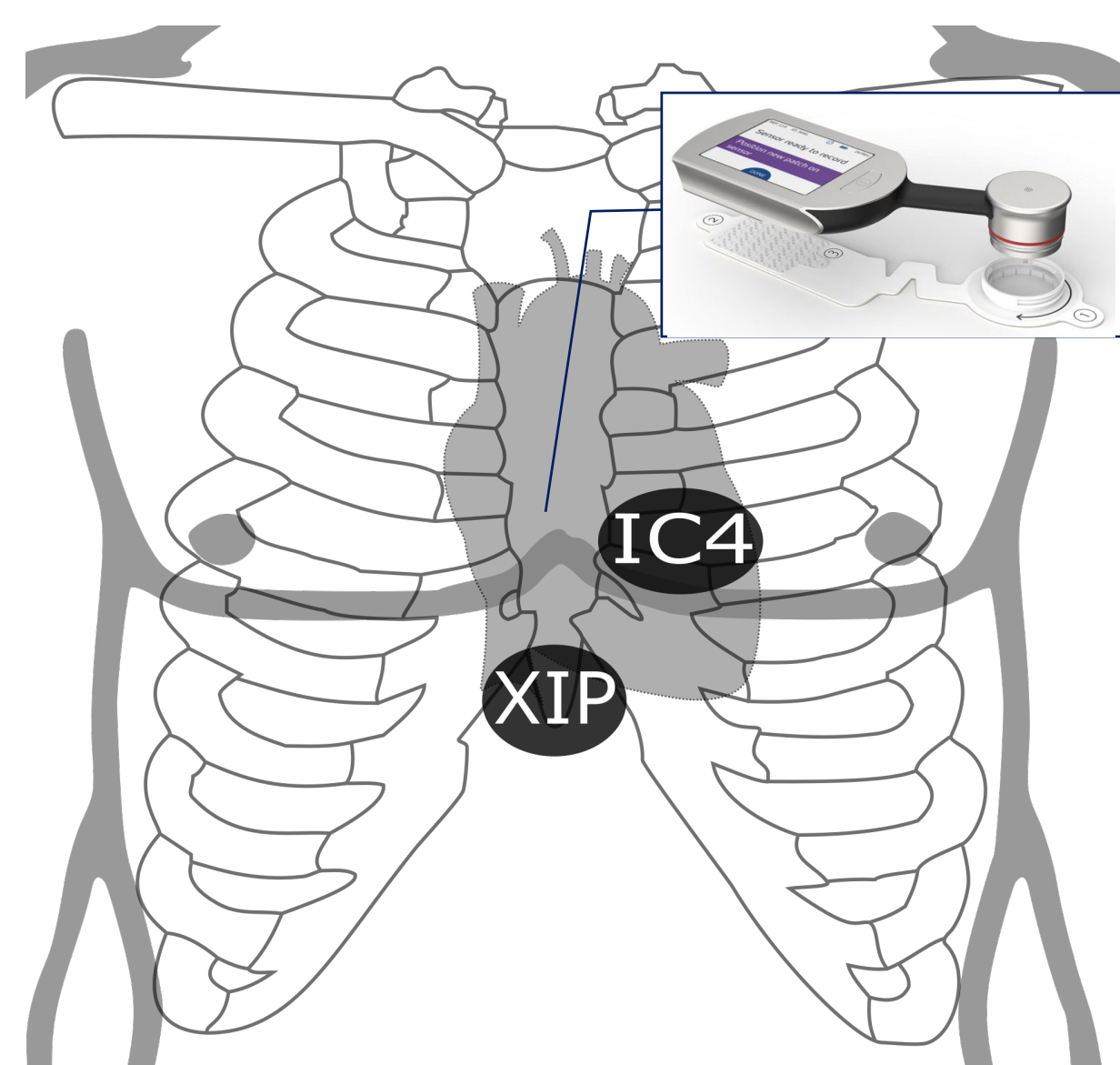
- Do we measure the same seismocardiogram at the xiphoid process and the fourth intercostal space?

## METHODS

- 30 patients with suspected heart failure
- Seismocardiogram, with a modified CADSCOR®-system from Acarix

## Measurement sites and device

A illustration of the modified CADSCOR®-system, from Acarix, and the location of the measuring sites the xiphoid process (IXP) and the fourth intercostal space (IC4).



- Segmentation and average beat with a duration-dependent hidden Markov model
- Manual annotation of 4 fiducial points in the systolic complex
- Statistical analysis:
  - Pearson's correlation coefficient (r)
  - Paired-sample t-test

## RESULTS

### Comparison of fiducial point amplitudes

The mean and standard deviation of the fiducial points amplitudes. The table also includes the correlation coefficient R for the comparison between the xiphoid process (IXP) and fourth intercostal space (IC4).

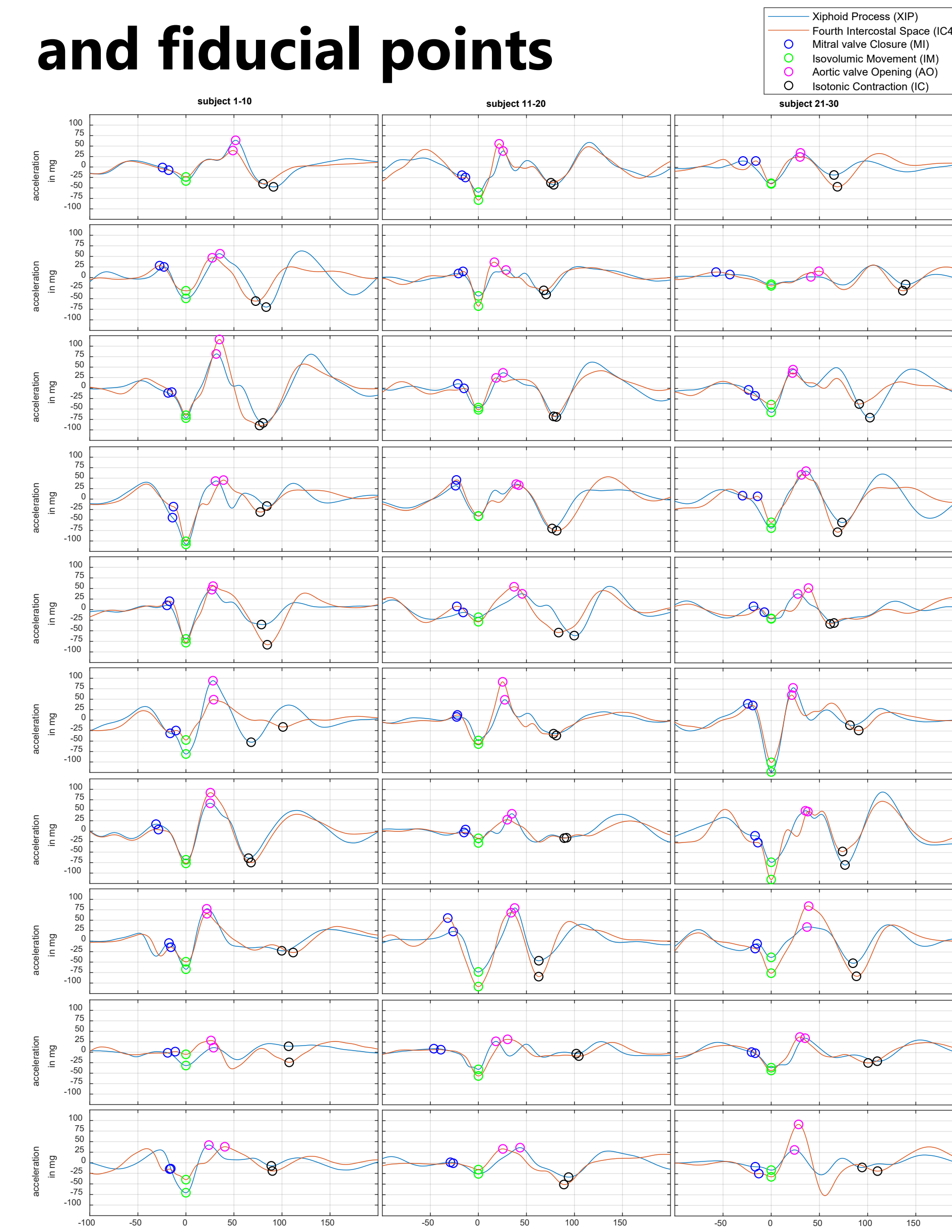
mean(std)	MC	IM	AO	IC	
Amplitude [mg]	XIP 2.5(17.4)	-51.9(26.1)	46.7(21.5)	-38(25.4)	
	IC4 2.0(20.9)	-52.4(29.1)	51.5(24.0)	-44.7(24.2)	
Correlation between XIP and IC4	r	0.82	0.75	0.51	0.67

### Comparison of fiducial point timing interval

The mean and standard deviation of the fiducial points timing interval relative to Mitral valve Closure (MC). The table also includes the correlation coefficient R and statistical significance (p<0.05), marked by \*, for the comparison between the xiphoid process (IXP) and fourth intercostal space (IC4).

mean(std)	MC to IM	MC to AO	MC to IC	
Interval [ms]	XIP 22.4(7.8)*	53.9(11.1)	108(20.1)	
	IC4 19.6(9.9)	50.6(14.7)	105(22.6)	
Correlation between XIP and IC4	r	0.80	0.76	0.89

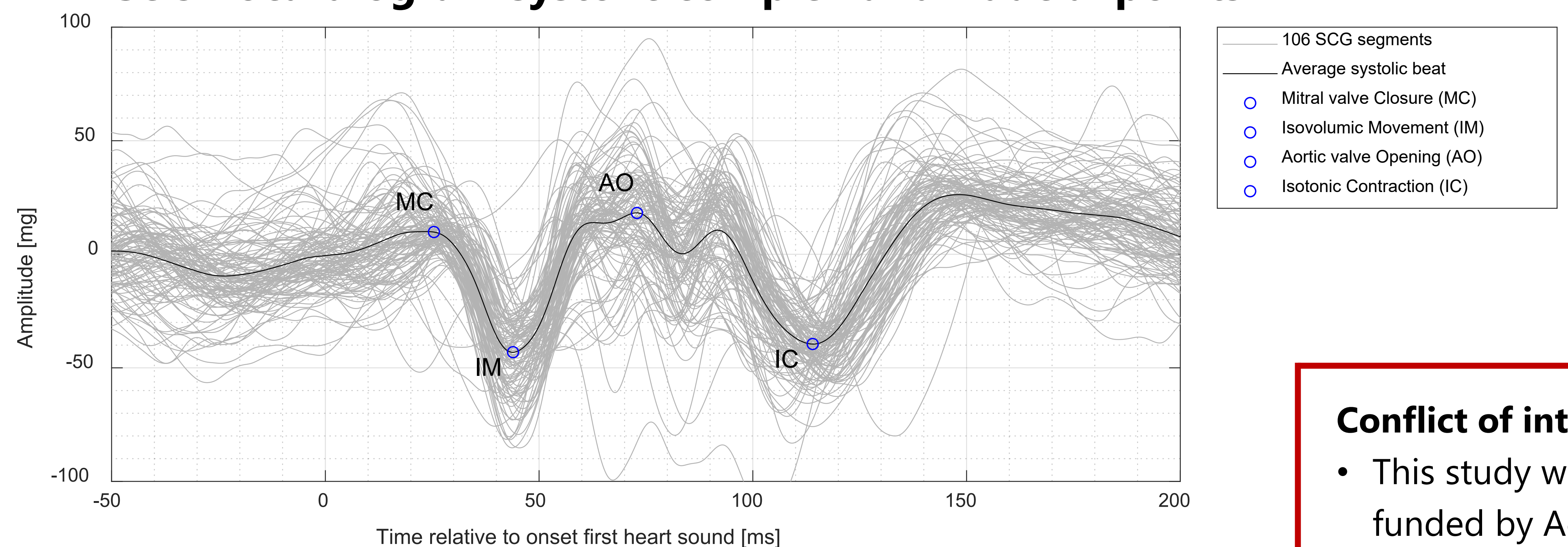
## All subjects systolic complexes and fiducial points



## DISCUSSION

- A tendency to higher magnitude of AO and IC at the fourth intercostal space
- Only a fair to moderate correlation of the fiducial points amplitude and timing interval
- MC to IM timing interval was shorter at the fourth intercostal space

## Seismocardiogram systolic complex and fiducial points



### Conflict of interest

- This study was funded by Acarix A/S

