A Preliminary Repeatability Study on the Estimation of Systolic Time Intervals among Healthy Subjects using Cardiac Electromechanical Signals

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Introduction: Systolic time intervals (STIs) have been used to quantify the functionality of left ventricle. STIs can be estimated through convenient and efficient techniques using cardiac electromechanical signals including electrocardiogram (ECG) and seismocardiogram (SCG). The STIs in our study included pre-ejection period (PEP), left ventricular ejection time (LVET), and their ratio (PEP/LVET). Despite numerous studies on using SCG and ECG for estimation of STIs, no repeatability study has been investigated. **Methods:** To address this gap, we collected two simultaneous SCG and ECG recordings (60 s, 1000 Hz) from 5 healthy subjects (2 females, 32 ± 4.5 years old) over two days with at least 24-hour difference. An expert annotated the aortic valve opening and closure characteristic points on the SCG, and Q wave on the ECG for all the recordings. For healthy subjects, it is not expected that STIs vary significantly between these two measurements. To quantify the repeatability, we considered the coefficient of variation (CV). **Results:** As our tabulated results indicate, there is small variation in STIs quantified by CV values, which are all less than 10%. **Conclusion:** It appears that STIs estimation through ECG and SCG is repeatable, though more subjects are needed to fully confirm the results.

The coefficient of variation (CV) for different STIs

Subject	CV of PEP (%)	CV of LVET (%)	CV of PEP/LVET (%)
1	6.5	0.5	7.5
2	3.3	2.9	0.3
3	2.5	0.7	3.4
4	2.9	1.9	1.4
5	6.6	4.9	1.9