

Title: A Statistical Comparison of Heart Rate Variability Measurements between Devices: a Chest Strap vs. a Finger Probe

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Introduction:

Heart rate variability (HRV) between R-R intervals is the result of complex interactions between respiratory activity and autonomic cardiovascular control. Measurements of HRV are powerful predictors of cardiac morbidity and mortality. With a need for more accurate devices to measure HRV, we compare the CorSense finger probe to the Polar H7 strap as the gold standard.

Methods:

This data was collected in our study (NCT04121741) of volunteers aged 59-79 with coronary artery disease. HRV was recorded with the Polar H7 chest strap and the CorSense finger sensor for 3 minutes each at rest, during and after singing. We captured HRV in both the time-domain (Root mean square of successive RR interval differences (rMSSD), Standard deviation of NN intervals (SDNN), Percentage of successive RR intervals that differ by more than 50 ms (PNN50)) and frequency-domain (low- and high-frequency power). Outliers were removed by 10% trimming before linear regression. The Wilcoxon-signed-rank-test (WSRT) was performed on the paired data measurements of both devices.

Results:

HRV data from 28 subjects (mean age 69 ± 10 , 42% female) were analyzed by data from both devices compared using linear regression and paired WSRT. The quality of linear regression was improved by 10% trimming (Figure, left) while the best agreement between device readings were observed for SDNN and high-frequency power (Figure, right, is an example) as indicated by the mean square error (MSE) and the p-value (not shown). Data shown in the plots were normalized by min-max scaling.

Conclusions:

The HRV data was most closely correlated between devices during the resting state and improved by trimming outliers from the data. More significant discrepancies during singing and the recovery period may be related to several factors: movement while singing, sweat development, or medical comorbidities such as peripheral vascular disease. These discrepancies will be explored in future analyses.

