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# Comparison of blood pressure variability calculated from peripheral and derived aortic blood pressure

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## Introduction

- Systolic blood pressure variability (SBPV), conventionally calculated from peripheral sites such as the arm or finger, may be of more utility when derived from central, aortic values as this has greater applicability to the heart and baroreceptor feedback.
- Given the relationship between aortic and peripheral blood pressure is frequency dependent in the range of heart rate frequency, peripheral and aortic SBPV may not be identical.
- Differences between peripheral and aortic SBPV have not been quantified.

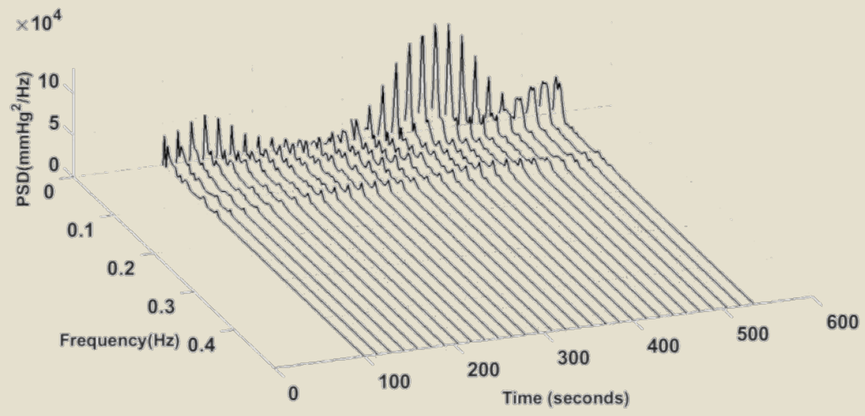


Figure 3: Pattern of short time Fourier transform power spectrum density (PSD) for finger blood pressure at given times throughout the 10 minute recording for an individual subject.

## Methods

- In this study, peripheral and derived aortic SBPV was quantified in 30 healthy subjects (range 25-62 years).
- Continuous finger blood pressure was recorded using a volume servonulling principle (Nexfin, Edwards Life Sciences) for 10 minutes in each subject with the subject in a supine position.
- Aortic blood pressure was derived from the finger blood pressure waveform using a general transfer function.
- SBPV was quantified using a short time Fourier transform in a time-frequency method to calculate the ratio of average power across the low frequency power band (0.05-0.15 Hz) to the high frequency power band (0.15-0.4 Hz).

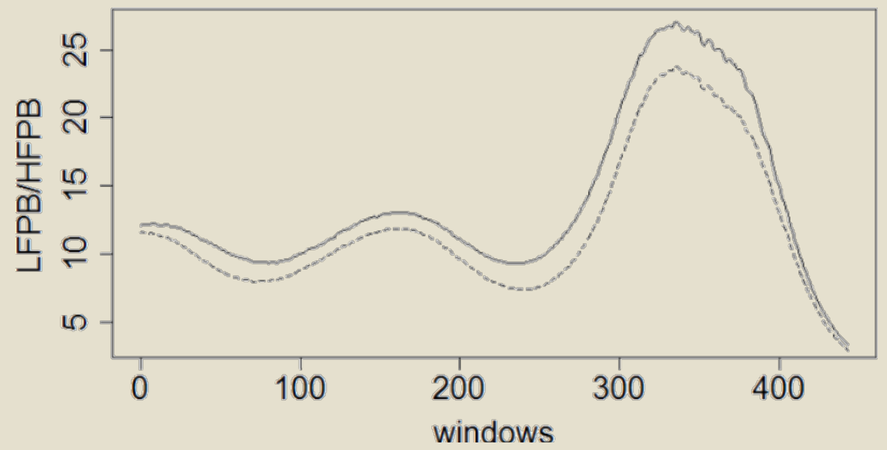


Figure 4: The low frequency (LF) to high frequency (HF) power band (PB) ratio (LFPB/HFPB) computed for 443 windows shifted by 1 second with window length of 200 for an individual subject. The solid and dash lines show the power values for peripheral, finger SBP and central, aortic SBP respectively.

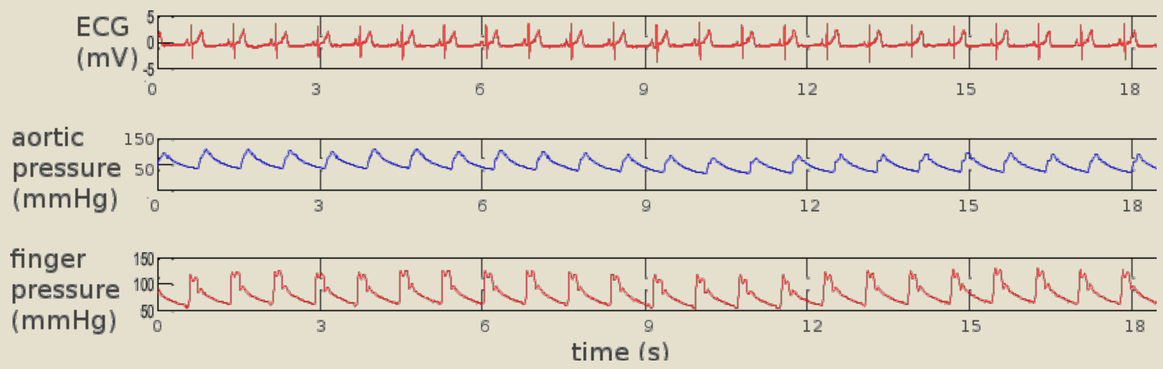


Figure 1: Example of recorded finger blood pressure waveform and derived central, aortic blood pressure waveform.

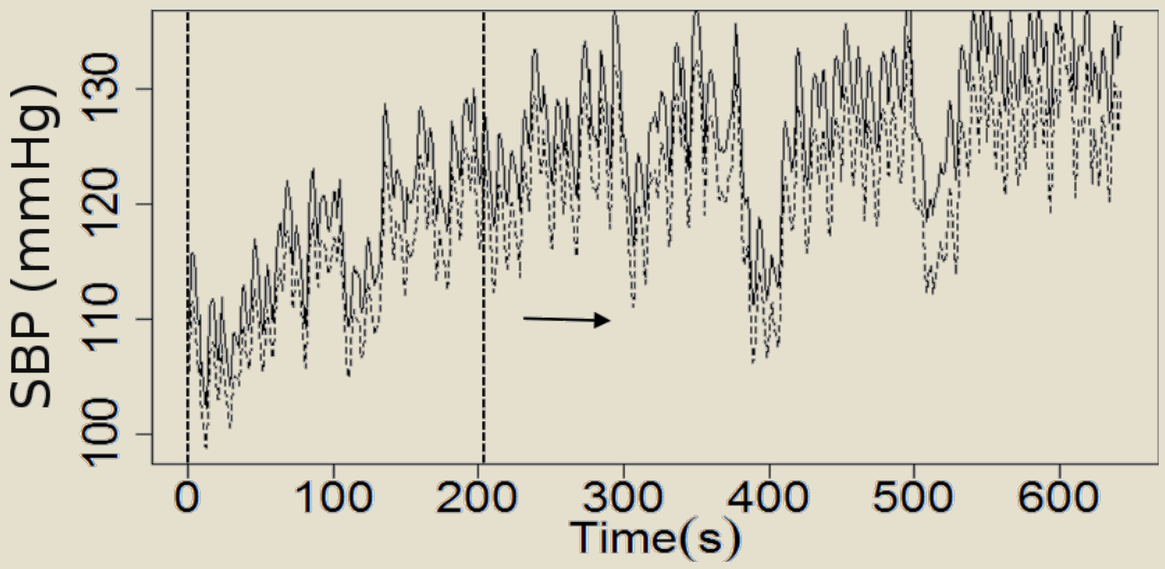


Figure 2: The solid and dash lines show the interpolated peripheral and central SBP respectively, where the peripheral SBP is consistently lower than aortic signal. The dashed vertical lines show the length of the window. The window was moved at one sample increments through the whole signal recording (10 minutes).

## Results

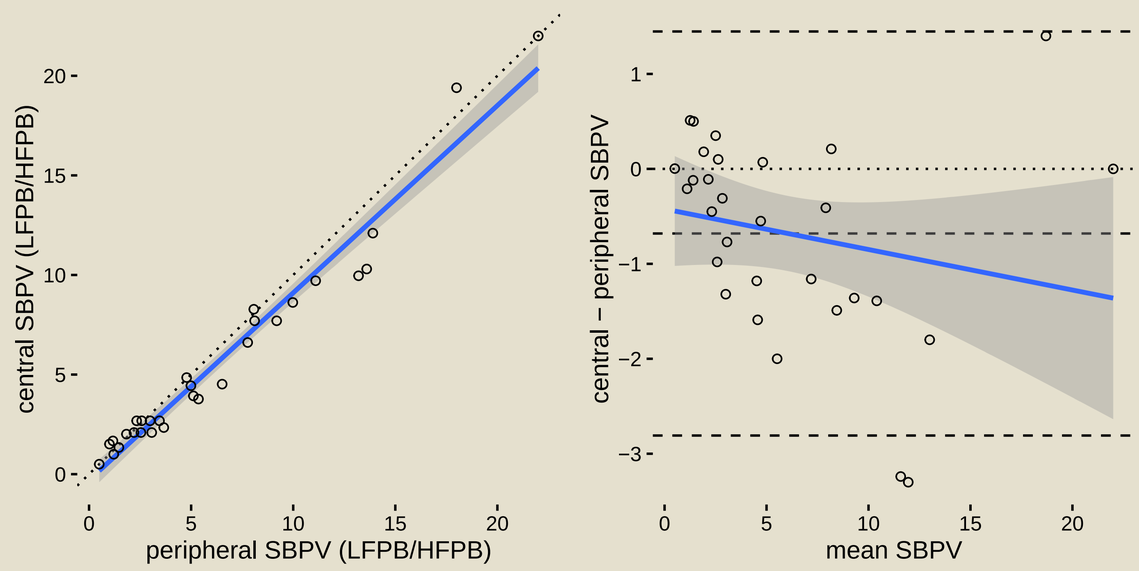


Figure 5: Relationship between central, aortic systolic blood pressure variability (cBPV) and peripheral, finger systolic blood pressure variability (pBPV). The two are correlated (slope=0.94, $R^2$=0.96, $p<0.001$) with a mean differences of -0.67±2.07 mmHg. Dotted line shows line of unity. Dashed lines show mean and mean±2×standard deviation of the difference. Axes are in unitless dimensions (ratio of low frequency (LF) to high frequency (HF) power band (PB)).
There was a bias toward lower peripheral variability at higher values of central variability.

## Conclusions

- This study demonstrates that peripheral SBPV cannot be taken as equivalent to aortic SBPV, especially where the low frequency to high frequency power ratio of SBPV is of higher magnitude.

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