

# Radial Pressure Pulse and Heart Rate Variability in Heat and Cold-stressed Humans

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## Abstract

This study aims to explore the effects of heat and cold stress on the radial pressure pulse (RPP) and heart rate variability (HRV). The subjects immersed their left hand into 45°C and 7°C water for 2 minutes respectively. Sixty healthy subjects (age 25 ± 4 yr; 29 men and 31 women) were enrolled in this study. All subjects underwent the supine temperature measurements of the bilateral forearms, brachial arterial blood pressure, HRV and RPP with a pulse analyzer in normothermic conditions and thermal stresses. The power spectral low-frequency (LF) and high-frequency (HF) components of HRV decreased in the heat test and increased in the cold test. The heat stress significantly reduced radial augmentation index (AIr) ( $p < 0.05$ ), but the cold stress significantly increased AIr ( $p < 0.001$ ). The spectral energy of RPP did not show any statistical difference in 0~10Hz region under both conditions, but in the region of 10~50Hz, there was a significant increase ( $p < 0.001$ ) in the heat test and significantly reversed in the cold test ( $p < 0.01$ ). The changes in AIr induced by heat and cold stress were significantly negatively correlated with the spectral energy in the region of 10~50Hz ( $SE_{10-50\text{Hz}}$ ), but not in the region of 0~10Hz ( $SE_{0-10\text{Hz}}$ ). The results demonstrated that the  $SE_{10-50\text{Hz}}$  which only possessed a small percentage in total pulse energy presented more physiologic characteristics than the  $SE_{0-10\text{Hz}}$  under the thermal stresses.

**Keywords:** spectral energy – 10~50Hz – radial augmentation index – thermal stress.