Fluid shift induced by head-out water immersion causes autonomic responses of cardiovascular system that buffer blood pressure fluctuation. The present study aimed at clarification of autonomic nervous functions in cardiovascular adaptation to fluid shift caused by head-out water immersion. Muscle sympathetic nerve activity (MSNA) recorded by microneurography from the tibial nerve in 10 healthy young (19-30 yrs old) men during thermoneutral head-out water immersion in MSNA study, and bipolar chest ECG and blood pressure wave by Finapres were recorded from 8 healthy young men (23-31 yrs old) in HRV (heart rate variability) study. Spectral analysis was applied to the time series data of R-R intervals (HRV), and systolic blood pressure (blood pressure variability, BPV).

MSNA was significantly suppressed in all the subjects during water immersion up to the neck. The very low-frequency (VLF, 0.00-0.04 Hz) component of BPV tended to increase during the head-out water immersion up to the neck, whereas the low-frequency (LF; 0.04-0.15 Hz) component of BPV and the LF/HF ratio (HF; 0.15-0.40 Hz) component of HRV were significantly reduced during head-out water immersion. The HF component of HRV increased in all the subjects during the water immersion. Concomitantly, we found a decrease in heart rate with no significant changes in blood pressure during the water immersion.

These findings suggest that both vasomotor and cardiac sympathetic activities are suppressed and that parasympathetic (vagal) activity is enhanced for the stability of blood pressure during thermoneutral head-out water immersion.