

Age dependency of cardiovascular autonomic responses to head-up tilt in healthy subjects. Laitinen T, Niskanen L, and other. J.Appl.Physiol. 2004 Jun; 96(6):2333-40.

In elderly subjects, heart rate responses to postural change are attenuated, whereas their vascular responses are augmented. Altered strategy in maintaining blood pressure homeostasis during upright position may result from various cardiovascular changes, including age-related cardiovascular autonomic dysfunction. This exploratory study was conducted to evaluate impact of age on cardiovascular autonomic responses to head-up tilt (HUT) in healthy subjects covering a wide age range. The study population consisted of 63 healthy, normal-weight, nonsmoking subjects aged 23-77 yr. Five-minute electrocardiogram and finger blood pressure recordings were performed in the supine position and in the upright position 5 min after 70 degrees HUT. Stroke volume was assessed from noninvasive blood pressure signals by the arterial pulse contour method. Heart rate variability (HRV) and systolic blood pressure variability (SBPV) were analyzed by using spectral analysis, and baroreflex sensitivity (BRS) was assessed by using sequence and cross-spectral methods. Cardiovascular autonomic activation during HUT consisted of decreases in HRV and BRS and an increase in SBPV. These changes became attenuated with aging. Age correlated significantly with amplitude of HUT-stimulated response of the high-frequency component ($r = -0.61$, $P < 0.001$) and the ratio of low-frequency to high-frequency power of HRV ($r = -0.31$, $P < 0.05$) and indexes of BRS (local BRS: $r = -0.62$, $P < 0.001$; cross-spectral baroreflex sensitivity in the low-frequency range: $r = -0.38$, $P < 0.01$). Blood pressure in the upright position was maintained well irrespective of age. However, the HUT-induced increase in heart rate was more pronounced in the younger subjects, whereas the increase in peripheral resistance was predominantly observed in the older subjects. Thus it is likely that whereas the dynamic capacity of cardiac autonomic regulation decreases, vascular responses related to vasoactive mechanisms and vascular sympathetic regulation become augmented with increasing age.