Menopause, estrogen, and training effects on exercise hemodynamics: the HERITAGE study

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Purpose: To investigate the influences of menopause, hormone replacement, and endurance exercise training on cardiovascular hemodynamics and oxygen uptake parameters during exercise in women.

Methods: Subjects were 338 premenopausal women, 29 postmenopausal women taking hormone replacement, and 28 postmenopausal women not taking hormone replacement, all enrolled in the HERITAGE Family Study. Hemodynamic and oxygen uptake data were gathered on a cycle ergometer at 50 watts (W), 60% peak oxygen uptake, and at peak exercise, both before and after a 20-wk regimen of endurance exercise training on a cycle ergometer.
**Results:** Systolic blood pressure (SBP) during peak exercise was found to be an average of 14 mm Hg less in postmenopausal women receiving hormones than in those not receiving hormones. Furthermore, menopause was associated with a 26.2 mm Hg higher SBP at 50 W power output, which remained physiologically significant after adjustment for age. At 50 W, postmenopausal women not taking hormones showed a 13.8 mm Hg greater training-induced reduction in SBP than those taking hormones.

**Conclusion:** It was concluded that hormone replacement may be associated with a vasodilatory reserve at high exercise intensities and that endurance exercise training elicits favorable hemodynamic and oxygen uptake adaptations during exercise that are, in most instances, independent of menstrual status or hormone replacement.

**Key Words:** MENOPAUSE; HEMODYNAMICS; ESTROGEN REPLACEMENT