Gender-specific Equations for Predicting Maximal Heart Rate in Exercise Stress Testing

[1]Nagle, T., [1]Godlasky, E., [1]Weber-Peters, S., [1]Bradford, R., [1]Miller, N., [1]Lott, M. [1]The Penn State University Milton S. Hershey Medical Center, Heart and Vascular Institute, Hershey, PA.

Tnagle@hmc.psu.edu, egodlasky@hmc.psu.edu, sweberpeters@hmc.psu.edu, rbradford@hmc.psu.edu, nmiller3@hmc.psu.edu, mlott@hmc.psu.edu

PURPOSE: To compare the commonly used maximal heart rate (HRmax) prediction equation to the newer gender-specific equations in the clinical setting. **METHODS:** This retrospective study randomly reviewed 1,233 exercise treadmill tests (stress echocardiograms and exercise tolerance tests) done between 2010 and 2012. A total of 516 participants' (266 men, 250 women) met the inclusion criteria and did not have coronary artery disease, congenital heart disease, a pacemaker, or beta-blocker medication. Data analysis included repeated measures ANOVA and linear regression using $P<0.05$ for significance. **RESULTS:** The majority (85%) of the stress tests were stress echocardiograms with chest pain (63%) as the main indicator for the test. The mean age was 53 yrs ± 1 (range 18-91yrs) and 52 yrs ± 1 (range 18-86 yrs) for men and women, respectively. Our generated gender-specific HRmax prediction equation for men (212-.94(age)) was similar to the commonly used Fox (1971) prediction equation (220-age) than the prediction equations by Tanaka (2001) and Inbar (1994). However for women, our gender-specific HRmax prediction equation (205-.85(age)) was similar to Gulati's (2010) prediction equation (206-.88(age)) than the Fox or Tanaka equations. The exercise treadmill tests revealed that 4.6% of the total tests were positive and 6.3% of the total tests were non-diagnostic. In examining the percentage of men and women who were unable to achieve 85% HRmax by the Fox or gender-specific equations, we showed a two- fold increase of non-diagnostic tests for men using the Tanaka and Inbar equations compared to the Fox equation (7.8%, 7.8%, and 3.1%, respectively). For women who were unable to achieve 85% HRmax, Tanaka's equation showed a two-fold increase of non-diagnostic tests compared to the Fox and Gulati equations (8.0%, 4.6%, and 5.0%, respectively). **DISCUSSION:** We concluded that the use of a gender-specific exercise HRmax prediction equation for women needs to be highly considered in the clinical hospital setting.