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Study highlights:

- A new formula for estimating a woman's peak heart rate promises more accurate prognoses from exercise tests.
- Using a formula developed from male-only studies overestimated the risks of women 35 and older.
- The new formula showed that women with a score less than 0.8 on a heart response measure were 30 percent more likely to die prematurely.

American Heart Association Rapid Access Journal Report:

New gender-specific formula gives accurate peak heart rate for women; better predicts risk of heart-related death

DALLAS, June 28, 2010 — A new formula that estimates the peak heart rate a healthy woman should attain during exercise testing more accurately predicts the risk of heart-related death, according to research reported in *Circulation: Journal of the American Heart Association*.

For nearly four decades, physicians have used a simple formula — 220 minus age — to estimate peak heart rates for women and men during exercise. However, the formula was derived from studies of men. The formula applied to women in the new study is 206 minus 88 percent of age.

“Using the standard calculation, we are more likely to tell women they have a worse prognosis than they do,” said Martha Gulati, M.D., lead author of the study and assistant professor of medicine and preventive medicine at Northwestern University's Feinberg School of Medicine in Chicago. “With this gender-specific formula, our risk predictions in women will be more accurate.”

At age 50, the original formula gives a peak rate of 170 beats per minute for men and women. The new formula yields a maximal heart rate of 162 beats for women. Many men and women use their peak heart rate multiplied by 65 percent — 85 percent to determine their upper heart rate when exercising.

The traditional formula has proven accurate for projecting the risk of dying prematurely from heart disease for a man who fails to attain at least 85 percent of his estimated peak heart rate during treadmill or stationary-bicycle testing. However, these findings demonstrate the inadequacy of that formula in women.

“Women are not small men,” Gulati said. “There is a physiologic response in women that is different from men.”

The new formula is from an analysis of 5,437 healthy women age 35 and older (average age 52) who participated in the St. James Women Take Heart Project, which began in the Chicago area in 1992.

Other studies have shown men who score less than 0.8 on a measure called the chronotropic index have a higher risk of dying prematurely. Chronotropic index is the relationship between heart rate and

oxygen uptake during exercise testing. It's a heart rate response measure that accounts for the effects of age, resting heart rate and physical fitness, and is calculated as the ratio of the heart rate reserve to the metabolic reserve used at peak exercise. In general, this ratio is about 1 in healthy people.

A low chronotropic index — less than 0.8 — is called chronotropic incompetence. However, chronotropic index assumes the peak heart rate is the classic 220-age, making this measurement less useful to predict risk in women.

The new formula makes the chronotropic index useful in predicting women's risk, Gulati said.

Other study findings include:

- 1,366 (25 percent) women exceeded and 336 (7 percent) failed to reach 85 percent of their peak heart rate, using the traditional formula. With the new formula, the number of women who did not reach 85 percent of their peak heart rate fell to 173 (3 percent).
- Women who scored less than 0.8 on the chronotropic index using the new formula were significantly older, had higher body mass index, higher total cholesterol and lower HDL cholesterol, and were more likely to have high blood pressure and to smoke.
- After accounting for traditional heart risk factors and exercise capacity, women with a chronotropic index less than 0.8 were 30 percent more likely to die of any cause.

“We need to keep studying women to get data applicable to women,” Gulati said. “It's important to not get complacent that we have data on men and assume women must be the same.”

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American Heart Association statistics on women and heart disease:

- About 8.4 million females alive today have a history of heart attack, angina pectoris (chest pain or discomfort caused by reduced blood supply to the heart muscle) or both. Of these, 3.5 million have a history of heart attack)
- This year the estimated 515,000 women will suffer from new and recurrent heart attacks and fatal heart disease; about 370,000 from new and recurrent heart attacks.
- 23 percent of women age 40 and older who have an initial recognized heart attack die within a year compared with 18 percent of men. In part because women have heart attacks at older ages than men do, they're more likely to die from them within a few weeks.
- 64 percent of women who died suddenly of CHD had no previous symptoms.
- 704,000 females diagnosed with CHD were discharged from short-stay hospitals in 2006.
- More women than men have angina in total numbers (5.5 million vs. 4.7 million).

Additional media resources:

Downloadable stock footage and animation are available at www.americanheart.mediaroom.com, click on “Multimedia Resources.”

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