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Recalibrated Formula Eases Women's Workouts

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If you are a woman who exercises, get ready to do some math.

Last week, researchers at Northwestern Medicine in Chicago announced a new formula for calculating a woman's maximum [heart rate](#), a measure commonly used by athletes to pace themselves and monitor their progress. In a study of nearly 5,500 healthy women, scientists discovered that a decades-old formula for calculating heart rate is largely inaccurate for women, resulting in a number that is too high.

The news may be a vindication to many women who have struggled to keep up with lofty target heart rates espoused by personal trainers and programmed into treadmill displays.

The commonly used formula subtracts a person's age from 220. But based on the data collected in the Chicago study, the right formula for calculating a woman's maximum heart rate is a little more complicated: 206 minus 88 percent of a woman's age.

The findings are significant because many runners, cyclists and other exercisers obsessively monitor their heart rates by taking their pulse and rely on the old formula to gauge the intensity of the workout. The typical goal is to stay within 65 to 85 percent of the estimated maximum heart rate, depending on whether the athlete is trying to build aerobic capacity or increase endurance.

But the new study shows that for women, the number typically derived from the standard formula is far off the mark. Using the old formula of 220 minus age, a 40-year-old woman would achieve an average maximum heart rate of 180 beats per minute. That means her pulse should stay around 153 beats per minute during her workout to achieve a target heart rate of 85 percent.

But based on the new calculation, the same woman's average maximum heart rate is 171 beats per minute, meaning her desired target heart rate is just 145 beats per minute, 8 beats a minute slower than under the old formula. Although the gap seems small on paper, it can be the difference between an exhilarating workout or a frustrating one that ends in exhaustion.

"There's nothing wrong with achieving a higher heart rate with exercise, and if you can maintain that, it's fine," said Dr. Martha Gulati, a cardiologist and assistant professor of medicine and [preventive medicine](#) at Northwestern, who led the study. "But it might be that some women are getting tired and need to stop or slow down because they're not able to maintain their heart rate at the higher level. But they've been using the wrong numbers."

During the study, researchers collected maximum heart rate data from 5,437 healthy women, aged 35 to 93, who took part in treadmill tests during which they exercised as long and hard as they could until they had to stop. After following the women for 16 years, the researchers found a link between abnormal heart rate responses and higher risk for [heart attack](#).

But the data also helped generate the new formula to calculate maximum heart rate. And it is important to remember that even this formula is based on averages, Dr. Gulati notes. Some women may find that the heart rate calculation is too low or still too high.

Michael Lauer, director of the division of cardiovascular sciences at the National Heart Lung and Blood Institute, called the work the "best study of exercise in asymptomatic women that we have."

"We've always told people to use 220 minus age based on data in men," said Dr. Lauer. "This new equation can give women a better estimate of what their peak heart rate ought to be."

Of course, the new formula for women also raises new questions about the reliability of the old heart rate calculations for men. The original formula stems from research in the early 1970s that reviewed average maximum heart rates from 10 studies of men. The formula was a general calculation made for discussion purposes among academics, never intended to be used by the public.

However, the simplicity of the calculation appealed to a generation of exercisers who were looking for guidance about how hard to push themselves to improve fitness and improve their heart health. Companies promoting heart rate monitors, fitness clubs and family doctors all embraced the formula as a simple measure of fitness and the 220 minus age calculation became standard fitness advice.

But many researchers say it is ridiculous to base exercise goals on a person's age rather than individual fitness level.

"The fitness industry, by attaching this to every treadmill ever made, kind of perpetuated this formula," says Dr. Tim Church, an exercise researcher and director of preventive medicine at the Pennington Biomedical Research center in Baton Rouge, La. "There's the idea that the formula was somehow not working out for women, but I'd make the argument that it doesn't work out for anybody."

In 2001, a [University of Colorado](#) team also concluded that the standard heart rate equation was inaccurate for both men and women. They [devised a similar formula they said applied to both sexes](#) — maximum heart rate equals 208 minus 0.7 times age — but the equation never caught on with the public.

Dr. Church says that except for elite athletes heart rate monitoring is not very useful and can distract from finding an exercise program you enjoy and will stick to. "Everyone kind of has their own natural pace," Dr. Church says. "If you like to work a little harder, then work harder. If you like to work less hard but a little longer, then do that. Find what works for you."
