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Exercise Protects Against Heart Disease by Lowering Stress

By Dr. Joseph Mercola
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Mercola

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A reduction in stress-related brain activity may be behind some of exercise's heart health benefits

People with higher levels of physical activity had lower stress-related activity in the brain and a 23% lower risk of developing cardiovascular disease compared to those who didn't exercise regularly

Stress signals in the brain are linked to inflammation, hardening or thickening of the arteries, increased blood pressure and higher sympathetic nervous system activity

Exercise was about twice as effective in lowering cardiovascular disease risk among people with depression

If you're middle-aged or beyond, focus on fun, social and moderate-intensity exercise; too much vigorous exercise can backfire

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Part of the reason why exercise is so good for your heart may be its ability to help relieve stress. While exercise's role in heart health is often attributed to related physical improvements, like improved circulation, blood pressure and blood sugar levels, physical activity also helps reduce stress levels, which is important because stress can increase the risk of cardiovascular disease.

A study led by investigators at Massachusetts General Hospital (MGH) revealed, however, that a reduction in stress-related brain activity may be behind some of exercise's heart

health benefits.[1]

Exercise Boosts Heart Health by Lowering Stress-Related Brain Activity

Stress-related brain activity, which refers to the brain's responses and changes in function due to stress, is linked to both heart disease and mental health issues like anxiety and depression. This activity is primarily associated with the amygdala, a part of the brain that plays a key role in processing emotions, particularly fear and stress.

When the amygdala is activated by stressful situations, it can influence other parts of your brain and the body, leading to various physical and psychological effects. For instance, the amygdala can signal the hypothalamus to initiate the release of stress hormones, such as cortisol and adrenaline.

These hormones prepare your body to react to a perceived threat or stressor, a response often referred to as the "fight or flight" response. Over time, however, repeated activation of this stress response and the resulting high levels of stress hormones can contribute to the development of cardiovascular disease and other health issues.

Under stress, the functioning of the prefrontal cortex, which plays a role in cognitive functions such as decision making, emotional regulation and problem-solving, can also be notably impacted.

The featured study explored whether physical activity reduces stress-related brain activity and whether these brain changes help lessen heart disease risk, particularly in people with depression. It involved data from 50,359 participants from the Mass General Brigham Biobank, who completed a physical activity survey. Among them, 774 participants had brain imaging tests to measure stress-related activity.

Those with higher levels of physical activity had lower stress-related activity in the brain and a 23% lower risk of developing cardiovascular disease compared to those who didn't exercise regularly.[2]

According to a Massachusetts General Hospital news release, the reductions in stress-related brain activity were "driven by gains in function in the prefrontal cortex, a part of the brain involved in executive function (i.e., decision making, impulse control) and is known to restrain stress centers of the brain."[3]

"Individuals who exercise more had a graded reduction in stress related signals in the brain," lead study author Dr. Ahmed Tawakol, a cardiologist at Mass General Hospital and associate professor of medicine at Harvard Medical School in Boston, told CNN.[4] "We found nice associations that exercise appeared to, in part, reduce heart disease risks by decreasing stress-related signals."

Stress signals in the brain, Tawakol explained, are linked to inflammation, hardening or thickening of the arteries, increased blood pressure and higher sympathetic nervous system activity.[5]

Exercise's Heart Benefits Even Greater for Those with Depression

The cardiovascular benefit of exercise was especially impressive among people with higher stress-related brain activity, including people with depression. Tawakol noted:[6]

> "Physical activity was roughly twice as effective in lowering cardiovascular disease risk among those with depression. Effects on the brain's stress-related activity may explain this novel observation.
>
> Prospective studies are needed to identify potential mediators and to prove causality. In the meantime, clinicians could convey to patients that physical activity may have important brain effects, which may impart greater cardiovascular benefits among individuals with stress-related syndromes such as depression."

Exercising at levels above recommended guidelines also led to a reduction in cardiovascular events, such as heart attack and stroke, but only among those with depression.

For people without a history of depression, no further reductions in cardiovascular disease risk were seen after about 300 minutes of exercise.[7] Karmel Choi, clinical psychologist and assistant professor at Harvard Medical School and Massachusetts General Hospital, further told CNN:[8]

> "We know depression is an important risk factor for heart disease and it is also one of the most common stress-related conditions. Even though some people may be more susceptible to stress and its health consequences, here we see they may also stand to benefit more from exercise and its stress-modulating effects. Which is encouraging."

What's the Sweet Spot for Exercise?

Most Americans don't exercise enough, but it's important to find that sweet spot when it comes to exercise dosing. Exercise too little and you'll miss out on important benefits, but exercise too much or too vigorously and you also risk harming your health.

A landmark study that radically changed my views on exercise was published by Dr. James O'Keefe, a cardiologist with the Mid-America Heart Institute at St. Louis Hospital in Kansas City, and three coauthors.[9]

If you're sedentary and begin to exercise, you get a dose-dependent decrease in mortality, diabetes, depression, high blood pressure, coronary disease, osteoporosis, sarcopenia, falls and more. But people who are doing the highest volume of vigorous exercise start losing longevity benefits. If you're doing full-distance triathlons when you're in your 40s and 50s, your risk of atrial fibrillation increases by 500% to 800%.

However, in the case of moderate exercise — loosely defined as exercising to the point where you're slightly winded but can still carry on a conversation — there's clear evidence that more IS better and cannot be overdone. Perhaps even more surprising, moderate exercise, which includes walking, also improves all-cause survival better than vigorous exercise — about two times better, according to O'Keefe.

Too Much Vigorous Exercise Backfires

If your goal is to optimize your cardiovascular health and longevity, more is better for moderate-intensity exercise, but not for vigorous exercise. For high-intensity exercise, optimal benefits plateau at approximately 150 minutes/week. As explained in O'Keefe's study, "Very large volumes of strenuous exercise and/or weightlifting may not be the ideal for optimizing longevity."[10] The study, a systematic review of research from 2011 to 2022, explained:

> "[A] Harvard School of Public Health study that included 116,221 individuals assessed 15 times during 30 years of follow up suggests that if one's goal is optimizing long-term CV [cardiovascular] health and overall longevity, more is better for moderate-intensity exercise.
>
> However, the same cannot be said for vigorous exercise, where optimal benefits are achieved at approximately 150 minutes/week … For an individual whose goal is to decrease the risk of CVD and boost life expectancy, a routine of MPA [moderate physical activity] appears to be adequate.
>
> Although chronically performing very high doses of VPA [vigorous physical activity] may attenuate some of the benefits bestowed by less extreme efforts, this is relevant for only about 2.5% of the United States (U.S.) adult population.
>
> This is not to say that VPA is harmful; it substantially reduces all-cause mortality and CVD mortality compared to a sedentary lifestyle. Yet, the magnitude of the mortality and CVD risk reductions with high doses of VPA do not appear to be as substantial as for high doses of MPA.
>
> In the Lee study,[11] chronically doing very high doses of moderate exercise reduced risks of all-cause mortality and CVD mortality at least two-fold better compared to chronically performing very high doses of vigorous exercise."

Keep Exercise Social and Fun After 40

In our interview, O'Keefe further noted that he used to push his body with high levels of exercise, running triathlons, 5K and 10K races and marathons.

"But when I got to be about 45, I started to get palpitations and sometimes I'd get this aching after a really high intensity bike ride or things like that," he said. "I realized, 'Wait a minute, where did I get this notion that if exercise is good, this extreme exercise in middle age is better?' It's just not." He continued:[12]

> "Exercise is good for you — 70% of U.S. adults don't get enough exercise, and they would be healthier getting more exercise, any exercise. In fact, the first 20 minutes of exercise will get you most of the benefits. Even getting out for a walk is dramatically better than sitting on the couch, sitting in front of a screen or sitting behind a windshield.
>
> We have a sedentary lifestyle, and if you don't actively incorporate movement into your day, you're going to be in trouble, no question about it, just like following the standard

> American diet will absolutely get you in trouble. But about 2% of people are overdoing it. It might be 5%. Highly active people, competitive people. And it's probably because the world you and I live in — I know a lot of people like this. I see patients like this all the time.
>
> They come with AFib, or accelerated atherosclerosis with a lot of calcium in the coronary, or ventricular problems. It can even shorten your lifespan if you get really extreme about it … you don't want to be exercising intensely for five, seven hours a day, let alone do a full-distance triathlon. You're just asking way too much of your heart.
>
> There's an intuitive logic about this as well. Like everything in nature, you're better off not [being] in the extremes. And that's true with exercise. When you drill down on what types of exercise really correlate best with longevity, it's not the maximum amount of high intensity interval training. Some of that's important, but more is not necessarily better for vigorous intense exercise."

In short, O'Keefe says, once you get into your mid-40s and 50s, exercise should be fun and stress-reducing, not competitive. In his analysis, O'Keefe also stresses the importance of "social exercise" over solo exercise: playing a game of pickleball with friends, for example. O'Keefe and colleagues published a study in 2018 that looked at long-term granular data on physical activity and longevity.[13]

It turned out playing tennis added 9.5 years of extra life expectancy, badminton 6.2 and soccer 4.7, compared to 3.2 years for jogging and 1.5 years for health club activities like weight lifting and running on a treadmill. At first, O'Keefe thought the analysis had somehow gone wrong. But then he realized it was the social aspects of the sports that conferred the added benefits.

> "Exercising and making social connections at the same time, that is an absolute goldmine of a longevity activity. That means that even walking with your dog or your friend or [playing] pickleball is huge … The whole thing is to move your body in a fun, playful manner and make it social."

Is Walking an Ideal Form of Exercise?

Walking is a powerful form of activity for a number of reasons. It's free and accessible — you can do it virtually anywhere. And it's gentle enough that most people can engage in it, even if you're out of shape and haven't exercised in a while. If you walk with a friend or group, you also get that social element that O'Keefe describes.

Research has shown that even a modest amount of walking offers significant longevity benefits. In a study of 3,101 adults, those who took 8,000 steps or more just one or two days a week had significantly lower all-cause and cardiovascular mortality risk.

"The study's findings suggest that for adults who face difficulties in exercising regularly, achieving the recommended daily steps only a couple days a week may have meaningful health benefits," researchers wrote in JAMA Network Open.[14]

People who participate in outdoor walking groups also enjoy significant reductions in systolic and diastolic blood pressure, resting heart rate, body fat, depression scores and body mass

index, along with increases in VO2max, a marker of fitness level.[15]

Meanwhile, a review published in GeroScience[16] found that walking is a powerful antiaging intervention that can reduce the risk of chronic age-related diseases like heart disease, high blood pressure, Type 2 diabetes and cancer, while relieving pain and improving function in musculoskeletal disorders.

The bottom line is, exercise is protective of your heart and overall health, in part by reducing stress-related activity in your brain, and in part by positively influencing everything from mitochondria health to your mood. If you're middle-aged or beyond, focus on fun, social and moderate-intensity exercise that makes you feel rejuvenated and alive — not grueling high-intensity sessions that drain your energy or leave you with aches and pains.

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Notes

[1] J Am Coll Cardiol. 2024 Apr 23;83(16):1543-1553. doi: 10.1016/j.jacc.2024.02.029

[2, 3, 6] Massachusetts General Hospital April 16, 2024

[4, 5, 7, 8] CNN April 15, 2024

[9, 10] Missouri Medicine March-April 2023; 120(2): 155–162

[11] Circulation August 16, 2022;146(7):523–534

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[13] Mayo Clinic Proceedings December 2018, Volume 93, Issue 12, P1775-1785

[14] JAMA Netw Open. 2023 Mar; 6(3): e235174

[15] Br J Sports Med. 2015 Jun;49(11):710-5. doi: 10.1136/bjsports-2014-094157. Epub 2015 Jan 19

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