



Harvard Heart Letter

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The best strength-building exercise to lower blood pressure?

Exercise that engages your muscles without movement—such as wall squats and planks—may help lower blood pressure. But traditional physical activity is important, too.

Aerobic exercise involves moving the largest muscles of your body in a rhythmic, repetitive pattern—think brisk walking, running, cycling, and swimming. It's long been considered the best type of activity to lower blood pressure. But growing evidence shows that strength training can also reduce blood pressure. According to a new study, the most effective type involves contracting your muscles without any movement, which is known as isometric or static exercise (see “Muscle-strengthening activity: Types, terms, and examples,” page 7).

Published October 2023 in the *British Journal of Sports Medicine*, the study pooled findings from 270 clinical trials involving a total of more than 15,000 people. All the



Although a plank involves no movement, this isometric exercise uses muscles throughout most of your body.

trials lasted at least two weeks and reported the effects of exercise on blood pressure. As expected, most types of exercise helped lower blood pressure. But the most effective workout, especially in people who had high blood pressure, was isometric exercise training.

“It’s an interesting and somewhat provocative finding because of the historic focus on aerobic exercise for reducing blood pressure,” says Dr. Timothy Churchill, a cardiologist at the Cardiovascular Performance Program at Harvard-affiliated Massachusetts General Hospital. Aerobic (which means “with oxygen”) exercise boosts your heart rate and increases blood circulation to deliver oxygen throughout the body. The blood pressure benefits appear to stem from improvements in heart and blood vessel health.

Adding isometric exercise

The new findings add to the evidence that strength-based exercises are also good for cardiovascular health. But rather than taking priority over all other types of exercise, strength training should be incorporated into your overall routine, says Dr. Churchill.

continued on p. 7 ▶▶

WALL SQUATS



To do wall squats, stand with your back flat against a wall. Walk your feet about 18 inches from the wall, placing your feet shoulder-width apart. Tighten your abdominal muscles, then inhale and exhale as you slide your back down the wall until your thighs are as close to parallel as possible to the floor and your knees are above your ankles. Hold for 20 to 60 seconds. Slide slowly back up the wall to a standing position. Rest for 30 to 60 seconds, and repeat two times.



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ASK THE DOCTOR

by CHRISTOPHER CANNON, M.D., Editor in Chief



Can I improve my ejection fraction?

Q I'm a 69-year-old man. Seven years ago, I had a heart attack and received a stent. After some recent chest discomfort, I underwent a nuclear stress test, which fortunately showed no evidence of blockages. However, the report said that my ejection fraction was 49%, which I understand is just below what's considered normal. Is there anything I can do to increase my ejection fraction?

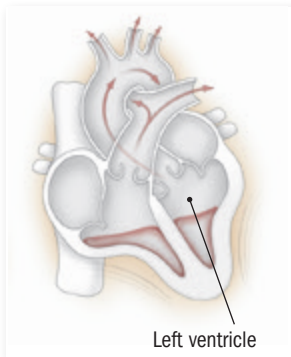
A Ejection fraction is the fraction (expressed as a percentage) of the blood that your heart “ejects” out to the rest of your body each time it contracts. A healthy heart pumps out about half to two-thirds of the blood from its lower left chamber, the left ventricle. So a normal ejection fraction ranges from 50% to 70%.

An ejection fraction below 40% means the heart is struggling to provide sufficient blood to the body, which is known as heart failure. Values between 40% and 50% are considered borderline low and may be a sign of future heart failure risk. Because your ejection fraction falls just below what's considered normal, it might be a sign of a mild problem. However, a nuclear stress test has limited views, and there can be some variability in the results. Another option is to consider an echocardiogram (heart ultrasound), which is the standard test used to measure ejection fraction.

If the echo confirms that your ejection fraction is slightly lower than normal, your doctor will want to investigate the cause. The findings from your nuclear stress test rule out a blood flow problem, but there are several other possibilities. Causes of low ejection fraction include cardiomyopathy, a disease of the heart muscle with varied causes, such as a viral infection or a genetic disorder. Chronic high blood pressure can also decrease ejection fraction. So can the strain caused by a leaky or narrowed heart valve. An abnormally fast heart rate for a long period of time—such as from uncontrolled atrial fibrillation—can also weaken the heart.

If you're diagnosed with early heart failure, the good news is that exercise can help, including both aerobic exercise and strength training. Larger, more efficient muscles in the legs and arms can better extract oxygen from circulating blood, which appears to help compensate for the heart's decreased pumping power. If you're not already exercising regularly, however, be sure to check with your doctor first.

In addition, many medications, including beta blockers, ACE inhibitors, and angiotensin-receptor blockers, can improve or stabilize the ejection fraction. Increasingly, doctors strive to get all people who have heart failure with reduced ejection fraction (a common type of heart failure) on what's known as the “four pillars” of therapy, which consist of drugs in four different classes that help in different ways. ♥



As the heart contracts, it pushes out most of the blood in the left ventricle.

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Illustration by Scott Leighton

The false promise of fish oil supplements



Despite what the labels say, there's no evidence that these amber capsules will improve your cardiovascular health—and they may even harm it.

Millions of Americans—including one in five people over age 60—take fish oil supplements, often assuming the capsules help stave off heart disease. Who can blame them? After all, the product labels say things like “promotes heart health” and “supports healthy cholesterol and blood pressure levels.”

“People will often say ‘I don’t like eating fish, but I know it’s good for me. So I’m taking this supplement instead,’” says Preston Mason, a faculty member in the Cardiovascular Division at Harvard-affiliated Brigham and Women’s Hospital who studies the unique fats found in fish oil, known as omega-3 fatty acids.

Here’s the catch: Studies dating back more than a half-century find that people who eat fatty fish tend to have lower rates of heart disease. But over

the past two decades, multiple randomized trials pitting fish oil against placebos show no evidence of heart-related benefits from fish oil supplements. While the supplements do provide omega-3 fatty acids, there are better ways to get these essential fats from your diet (see “Three key omega-3s”).

Confusing health claims

What’s up with the misleading messaging? The FDA considers all dietary supplements, including fish oil, to be foods, not drugs. Unlike companies that make aspirin, antacids, and other over-the-counter drugs, supplement manufacturers aren’t required to do any rigorous clinical testing or undergo any

production oversight, Mason explains. Despite this, they’re allowed to include limited health claims on their labels, and heart-related promises are common on fish oil supplements, according to a study published October 1, 2023, in *JAMA Cardiology*.

Among the more than 2,800 different fish oil supplement labels the researchers checked, about 2,000 featured one or more heart-related statements. Most of these health claims (about 80%) featured general but vague descriptions of the role of omega-3 fatty acids in the body. Most (62%) were cardiovascular claims, such as “helps support a healthy heart.”

In addition, the researchers analyzed 255 fish oil products from 16 major manufacturers and found a wide variability in the actual amounts of EPA and DHA (the two main omega-3 fatty acids) in the supplements. These findings confirm Mason’s research.

What’s more, many widely used fish oil supplements are produced through an industrial process that leaves the omega-3 fatty acids vulnerable to uncontrolled heat and oxygen, says Mason. “This results in the oxidation of these highly unsaturated fatty acids, with a consequent loss of any biological benefit,” he says, adding that multiple laboratory tests on dozens of products have confirmed these findings. Consuming oxidized oil has been linked to vascular inflammation, a key cause of cardiovascular disease.

Three key omega-3s

Omega-3 fatty acids are considered “essential,” which means people must get them from their diet or other sources. Fatty fish such as salmon, tuna, sardines, and mackerel are good sources of two omega-3s: eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

Another omega-3, alpha-linolenic acid (ALA), is found in many plants, including seeds, nuts, and some green vegetables. Your body can convert a small amount—about 8%—of dietary ALA to EPA and DHA.

Nutrition experts suspect that one reason fish eaters have fewer heart attacks may be that they eat correspondingly less red meat or processed meats, both of which are associated with a higher risk of heart disease.

Vegetarians (who don’t eat fish) and vegans (who avoid all animal-based foods) can meet their omega-3 requirements by eating plenty of ALA-rich foods, such as flaxseed, walnuts, pumpkin seeds, and soybean or canola oil. People who follow these plant-focused diets have lower rates of heart disease than omnivores, who include animal-sourced foods in their diets.



You’re better off getting your omega-3 fats from fish or vegetarian sources than wasting money on fish oil supplements, which have no benefit.

Prescription-strength EPA

If you have heart disease, you might ask your doctor about the prescription drug icosapent ethyl, a high-dose, purified EPA preparation that lowers cardiovascular risk when taken with a statin. “The unregulated fish oil supplements found in stores and online are not an effective substitute,” Mason cautions. If you don’t have heart disease, eating two servings of fatty fish weekly or following a vegetarian diet rich in healthy oils, nuts, and seeds is a far smarter strategy than buying fish oil supplements. ♥



Holiday gifts that keep the heart in mind

For gifts that keep on giving, consider presents that encourage healthy eating and exercise.

Need some holiday gift ideas for loved ones and friends—or maybe even yourself? Here are some suggestions from two Harvard experts that may help inspire heart-friendly habits.

Kitchen tools and gadgets

Eating home-cooked meals made with fresh ingredients is a good way to make sure your diet benefits your heart and overall health. Gadgets that make food prep easier, quicker, and safer can help, says Kate Mitchell, a dietitian at the Lipid and Cardiovascular Disease Prevention Clinic at Harvard-affiliated Beth Israel Deaconess Medical Center. “The No. 1 tool I recommend is a food chopper, which you can use to dice onions and many other vegetables and fruits,” she says. They often come with adjustable blades for different cutting styles, such as a very small dice or thin slices.

A high-quality chef’s knife is an essential tool for home cooks. For an extra-thoughtful gift, pair it with a knife sharpener and a cut-resistant metal glove,

says Mitchell. Made of flexible stainless steel mesh, this kind of glove protects your hand from nicks and cuts. Another small but handy gift is a set of silicone freezer food molds, which makes it easy to store single servings of soups and stews.

Food-related gifts

Having fresh produce readily available is another great way to support healthy eating. You can provide a friend with a one-time box of fresh fruit or send a “fruit of the month” for up to a full year from various online sources, if you’re feeling generous. A sampler of spices and salt-free herb blends could be good for someone with high blood pressure who’s trying to eat less salt. A basket filled with Mediterranean-inspired treats is yet another option (see “A Mediterranean gift basket”).

Gifts to encourage fitness

With New Year’s just around the corner, gifts that help people keep their resolutions to get in shape may be especially appreciated. Because strength-based exercises can improve cardiovascular



A gift basket of fresh fruit is often a welcome—and far healthier—alternative to traditional holiday treats.

health (see page 1), consider home workout equipment, such as a set of dumbbells or various types of stretchy, elastic bands (called resistance bands). Shawn Pedicini, a physical therapist with Harvard-affiliated Spaulding Rehabilitation Network, recommends elastic straps you can attach to a door frame to perform Pilates-based exercises, which are especially good for strengthening your core muscles.

Does the person you’re shopping for have a favorite activity or sport? He or she might welcome related gadgets, gear, or clothing—think cycling gloves, swim goggles, or a yoga mat. Pedicini also has suggestions for people who enjoy two popular sports, pickleball and golf. “Pickleball requires direction-changing movements, and an agility ladder can help them practice those skills,” he says (see photo below). Exercising with a medicine ball—a grippable, heavy ball—can help improve a golfer’s driving distance. Pedicini recommends a 4- to 8-pound padded ball, which can be lifted as a weight or thrown forcefully to the ground or against a wall to strengthen the upper body. ♥



An agility ladder can help people practice quick foot movements (such as hopping and side-stepping) to enhance their pickleball skills.

A Mediterranean gift basket

Long recognized as a heart-healthy style of eating, Mediterranean cuisine features many tasty, nonperishable foods that would work well in a gift basket, such as

- ▶ olive oil (look for cold-pressed, extra-virgin)
- ▶ sun-dried tomatoes packed in olive oil
- ▶ marinated artichoke hearts
- ▶ balsamic vinegar
- ▶ olives
- ▶ capers
- ▶ stuffed grape leaves
- ▶ dried fruits (such as dates, figs, and raisins)
- ▶ nuts (such as walnuts, almonds, pistachios).



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What is palliative care for heart failure?

It involves specialized clinicians who provide additional care and support for patients and families in collaboration with a cardiologist.

Thanks to medical advances in recent decades, people with heart disease now live much longer than in the past. As more people survive heart attacks and other cardiovascular problems, the number of people living with heart failure—when the heart struggles to pump enough blood to meet the body’s needs—continues to rise. By 2030, nearly one in 12 people ages 65 to 70 will have heart failure, according to one estimate.

In 2022, leading cardiology organizations published guidelines for managing heart failure. The guidelines include an expanded range of medications that help reduce the need for hospitalization and may also prolong life. They also recommend palliative care for all people with heart failure. Yet only a small percentage receive this type of care.

To explain what palliative care entails and its role in heart failure, we asked two specialists from the Palliative Care & Geriatric Medicine Division at Harvard-affiliated Massachusetts General Hospital: physician Dr. Julia Gallagher and nurse practitioner Christine McCarthy.

Understanding palliative care

Contrary to what many people believe, palliative care is not the same as hospice care. Palliative care can begin as early as the diagnosis of any serious illness. It’s provided by a team of physicians, nurses, and other specialists who work collaboratively with the patient’s other doctors to provide additional clinical assessments and support. Hospice is reserved for the smaller subset of patients whose illness has progressed to the point where their doctors would not be surprised if they passed away within six months.



Palliative care can provide emotional and social support for people with serious conditions such as heart failure.

“The goal of palliative care is to improve quality of life by addressing all the domains of suffering—not just physical symptoms, but also emotional, psychosocial, and spiritual issues,” says Dr. Gallagher. Even with excellent medical management of heart failure, patients may feel worried, anxious, or depressed because the progression of heart failure is often unpredictable. Identifying and treating anxiety and depression improves quality of life in patients. Equally important is identifying caregiver stress and worry, which allows members of the palliative care team to support that individual along with the patient. Palliative care also includes talking with patients about their personal goals and what matters most to them, which can help guide their care as the illness progresses.

Preparing for what’s next

Often, people with heart failure feel much better after a brief hospitalization early in the disease, and may recover to their prior level of function, says McCarthy. “But there is no cure

for most cases of heart failure. Instead, there’s usually a progressive decline, with repeated hospitalizations, which is rarely talked about,” she says. Being more transparent about the unpredictable trajectory of heart failure can help people understand what lies ahead and how to plan for the uncertainty.

When symptoms suddenly worsen again, going to the emergency room and being admitted back into the hospital may seem like the easiest thing to do. However, it may be possible to manage the situation at home. For some people, receiving hospital-level care at home may be an option (see “Hospital at home: A movement whose time has come” in the May 2023 *Heart Letter*). There are many advantages to home-based care, including avoiding infections and spending more time with family.

Clarity about possible complications

A palliative care approach helps people understand the benefits and risks of different tests and therapies, including receiving implanted cardiac devices. “As an example, what does it really mean to be at risk for bleeding or a blood clot? We explain what might happen, ranging from needing frequent blood draws to possible serious complications, such as a stroke that could leave them unable to communicate,” says McCarthy.

“We focus on you as an individual and how you’re feeling, treating your symptoms, helping to maximize your medical management, and working toward making every day as good as possible,” says Dr. Gallagher.

You can request palliative care, which is covered by Medicare and most health insurance, at any point along the trajectory of a serious illness. For people with heart failure, a palliative care consultation is available during a hospitalization. It’s also provided through some outpatient clinics as well as home-based palliative care programs, says Dr. Gallagher. ♥

Living with heart disease? Avoid unnecessary testing

New guidelines recommend against certain routine tests and procedures for people without symptoms.

Medical tests are an important part of managing chronic health problems such as cardiovascular disease. Some, like checking blood pressure or cholesterol levels, are fairly simple and straightforward. But others (especially those that use special equipment to visualize the heart) are time-consuming, stressful, and costly—and in some cases, unnecessary.

It's not uncommon for people with known chronic coronary disease (see

“What is chronic coronary disease?”) to undergo such imaging tests on a routine basis, even when they don't have any symptoms to suggest that their condition is progressing or worsening. Now, new guidelines recommend against this practice.

“People with established coronary disease who don't have symptoms shouldn't be undergoing tests on a periodic basis,” says Dr. Dhruv Kazi, who directs the Cardiac Critical Care Unit at Harvard-affiliated Beth Israel Deaconess Hospital. The guidelines, published Aug. 29, 2023, in the journal *Circulation*, say that for those people, there is no benefit for the following three tests:

Cardiac CT angiography (CCTA) uses a CT scanner to take multiple, high-speed x-rays to create three-dimensional views of the blood vessels and other heart structures. It requires an injection of special dye into a vein in the arm or hand that “lights up” the blood vessels.

Echocardiography uses ultrasound to show how well the heart's muscles and valves are working and to measure the ejection fraction, an assessment of the heart's pumping ability (see page 2).



Tests such as cardiac CT angiography can be helpful in diagnosing heart disease. But after a diagnosis, such tests are not advised unless you have symptoms.

Stress testing monitors your blood pressure, your heart rate, and your heart's electrical activity to check for evidence of decreased blood flow to the heart, either during exercise or after an injection of a drug that mimics the effects of exercise. It may also involve getting an echocardiogram (a variation called stress echocardiography) or an injection of a small amount of a radioactive substance and a PET scan (a variation known as a nuclear stress test).

No help, possible harm

When people without symptoms get testing “just to be sure,” the results are unhelpful—and in some cases harmful, says Dr. Kazi, who was on the writing committee for the new guidelines. For example, if test results aren't clear, that often generates additional testing or unnecessary procedures, including some that expose people to radiation for no reason. These tests add expense without any corresponding benefit, and the costs are increasingly being passed back to patients, in the form of copayments or higher premiums, he adds.

For people with chronic coronary disease, the real bang for the buck lies elsewhere, says Dr. Kazi. “As the guidelines emphasize, people should focus on getting regular exercise, eating a healthy diet, and taking medications to control their blood pressure and cholesterol—all strategies that we know help people live longer, healthier lives,” he says. ♥

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What is chronic coronary disease?



People are said to have chronic coronary disease if they

- ▶ have had a heart attack or stable angina (chest pain that occurs with activity or emotional stress)
- ▶ have had a procedure to restore blood flow to the heart (angioplasty with a stent or coronary artery bypass surgery)
- ▶ have a low ejection fraction (see page 2) from coronary blockages
- ▶ show evidence of coronary artery disease on an imaging test.

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Strength-building exercise ... from p. 1

While isometric exercise—especially wall squats—appeared to lower blood pressure the most, the study authors were somewhat cautious about overselling that finding, given that relatively few studies (18 of the 270) included isometric exercise and none compared it directly against other forms of exercise.

Still, experts have speculated about a possible mechanism. During isometric exercise, clenched muscles temporarily constrain blood flow. The subsequent surge of blood may stimulate the release of factors that help relax the vessels and ultimately contribute to a reduction in blood pressure.

Isometric exercise has some additional advantages. Because you don't move your joints, isometrics can be easier and safer for people with joint injuries or diseases. Many of the exercises don't require any special equipment, and you can do them anywhere.

The physical activity guidelines don't specify how long to do muscle-building exercises. "But even just 10 to 15 minutes, two days a week, is a good place to start," says Dr. Churchill. Try doing some wall squats (page 1) or a modified plank (right).

Remember to breathe!

During any type of strength training, be careful not to hold your breath. Some people do this unintentionally, although others have a misguided belief that breath holding increases their effort and power. But breath holding during exertion can cause dangerous blood pressure spikes, says Dr. Churchill.

When you do dynamic strength training, exhale as you lift, push, or pull, and inhale as you release. When doing isometric strength training, take a big breath as you move into position. Then take shallow breaths as you hold the pose, and take regular full breaths during the rest and recovery phase. ♥

Muscle-strengthening activity: Types, terms, and examples

Anything that makes your muscles work harder than usual counts as a muscle-strengthening activity—something all adults should aim to do at least two days a week, according to the federal Physical Activity Guidelines.

Often referred to as strength training, this type of exercise works by harnessing resistance—that is, an opposing force that muscles have to strain against. It's also known as resistance training or weight training. You can use many different things to supply resistance, including your own body weight, free weights such as dumbbells, elastic bands, or specialized machines. Other options include medicine balls, kettlebells, and weighted ropes.

Muscles can grow stronger by exerting force through these three actions:

Concentric. Muscles move joints while shortening. Think of what happens when you flex your arm to show off your upper arm (biceps) muscle. It's the same type of motion you would use when raising a dumbbell or lifting a bag of groceries off the counter.

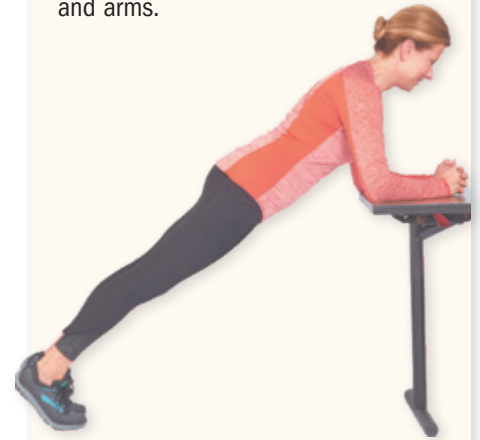
Eccentric. Muscles move joints while lengthening. As you slowly lower a dumbbell or grocery bag, your biceps muscles lengthen while producing force to lower the object in a controlled manner rather than simply letting it drop.

Isometric. Muscles don't shorten or lengthen much, and joints do not move. If you push against a wall, for example, or try to lift an object that is far too heavy for you, your arm muscles will tense. But since your muscles can't generate enough force to lift the object or shift the wall, they stay in the same position instead of shortening.

Muscle-strengthening exercises that include both concentric and eccentric muscle movement is known as "dynamic" or "isotonic" strength training. Examples include push-ups, biceps curls, and squats. Examples of "isometric" or "static" strength training include doing wall squats (also called wall sits), planks, or an overhead hold.

Move of the month**Modified front plank**

For this exercise, you hold your body stiff, like a wooden plank. Although the classic version is done on the floor, you can do this easier version using a desk or table. It's an example of an isometric exercise, in which the muscles contract but do not move. Planks are a great way to strengthen muscles in the abdomen, back, legs, shoulders, and arms.



Starting position: Stand facing a table or counter (or any other solid surface that will not move) with your feet shoulder-width apart.

Movement: Align your shoulders directly over your elbows, forearms on the table as pictured. You can stand on your feet or on your toes as pictured. Balance your body in a line like a plank. Pull your belly up and in as if you were pulling on tight jeans, keeping your upper-body weight on your forearms. Hold for 15 seconds. Rest for 30 to 60 seconds. Repeat. Over time, try to build up to a two-minute hold.

Tips and techniques:

- ▶ Keep your head straight (that is, not tipped forward or back) and your spine neutral (not arched or bent) during the plank.
- ▶ Keep your shoulders down and back.
- ▶ Keep your body in a line from head to toes; don't bend at your hips or waist.



RESEARCH WE'RE WATCHING

Climbing stairs linked to lower risk of heart disease

People who climb more than five flights of stairs daily may have a lower risk of cardiovascular disease, new research finds.

The study, which included nearly 460,000 adults, relied on data about their stair climbing habits and other lifestyle behaviors, which researchers collected at the start of the study and five years later. Researchers later tallied up the number of heart attacks, strokes, and related cardiovascular problems participants had during the follow-up period, which lasted a median of 12.5 years.



Compared with people who said they didn't climb any stairs, those who reported climbing five flights of stairs daily—about 50 steps—were about 20% less likely to experience a heart-related problem or stroke. According to the

study authors, stair climbing is a minimal-equipment, low-cost way to lower cardiovascular risk that's easy to add to a person's daily routine. The study was published online Sept. 16, 2023, by the journal *Atherosclerosis*.

Treating high blood pressure may lower dementia risk

Older adults who take medications to lower their blood pressure may reduce their risk of dementia, according to a study published Sept. 5, 2023, in *JAMA Network Open*.

The report pooled findings from 17 separate observational studies that included a total of more than 34,000 adults ages 60 to 110. Their average age was 72, and they were followed for four years, on average. People with untreated high blood pressure were 42% more likely to develop dementia

compared with healthy older adults. Those who were untreated had a 26% greater risk than people with treated high blood pressure. And when researchers compared people with treated high blood pressure to healthy older adults without high blood pressure, they found no meaningful difference in dementia risk between the two groups. The findings reinforce the connection between heart and brain health and suggest that treating high blood pressure in later life may benefit both organs.

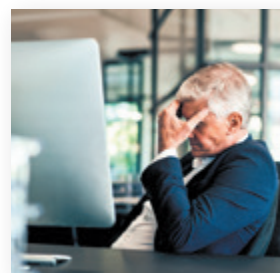
Stress at work takes a toll on the heart

Men who report specific types of job-related stress face a higher risk of heart disease than those without such stress, according to a new study.

Researchers followed more than 6,500 white-collar workers for 18 years and identified two job-related conditions linked to higher cardiovascular risks. One was job strain, defined as high demands (such as having a heavy workload and tight deadlines) coupled with low control (for example, having little say in decision making). The other, called effort-reward imbalance, occurs when a person's effort is high but their salary, recognition, or job security are low.

Compared with people who didn't experience work stress, men who reported either of

those stressors had a 49% higher risk of heart disease. But their risk doubled if they reported both types. Among women, the results were inconclusive, which the authors say might reflect the fact that women tend to develop heart disease later in life than men. The men were also more likely to have diabetes, high blood pressure, and other factors that raise heart disease risk. The study was published online Sept. 19, 2023, by *Circulation: Cardiovascular Quality and Outcomes*. ♥



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