

Exercise and Menopause: Positive Health Effects

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Chronic diseases and disorders, such as cardiovascular disease (CVD), cancer, obesity, diabetes, osteoporosis and depression, are common among postmenopausal women. Exercise can prevent and/or alleviate these health problems. It can do so by lowering low-density lipoprotein (LDL) cholesterol and raising high-density lipoprotein (HDL) cholesterol, by helping individuals reach an optimal blood pressure level, by decreasing breast cancer risk, aiding in weight loss, reducing risk factors for diabetes, and by helping to prevent osteoporotic fractures. Physicians caring for menopausal and postmenopausal women should stress the importance of exercise for prevention of these chronic conditions, and advise their patients about adequate exercise regimens.

Cardiovascular Disease

CVD is the leading cause of death among postmenopausal women.¹ Postmenopausal women are at an increased risk for cardiovascular disease because of physiologic changes occurring during menopause, including weight gain and atherogenic changes in serum cholesterol profiles. The atherosclerotic process is attenuated in women until perimenopause because circulating estrogen prevents the incorporation of LDL into atherosclerotic plaques.² LDL plasma levels increase in women after age

50, and these particles become more dense. It is the denser, smaller form of LDL that increases coronary heart disease (CHD) risk.³ Similar to LDL, HDL plasma levels fluctuate and decline with the onset of menopause. The HDL particle is also altered during menopause, with the denser HDL-3C increasing and the less-dense HDL-2C decreasing.⁴ Individuals with CHD typically present with the HDL-3B subclass.⁵

Studies indicate that women who have both low HDL levels and high triglyceride levels have an in-

creased incidence of CVD.⁶ In fact, low HDL levels in women are stronger predictors of CVD mortality than total cholesterol levels or LDL levels.⁷ In 2001, the National Cholesterol Education Program updated lipid profile designations and suggested that individuals at low or moderate risk of CHD maintain LDL levels lower than 100 mg/dL and HDL levels higher than 40 mg/dL (Table).⁸ For individuals not meeting these levels, adjustments in diet and exercise are recommended.

While many studies suggest that exercise can reduce the risk of CVD, research is limited. First, there are only a few studies examining the effect of exercise on CVD. The dearth of exercise studies is due partly to lack of compliance and the lack of long-term intervention examined in a blinded fashion. Second, most of the research thus far has been conducted on men. More randomized clinical trials need to be conducted on women to prove that exercise reduces CVD, and to establish the level of intensity, frequency and exercise duration necessary to produce maximal protective effects in postmenopausal women.

In the meantime, studies that do focus on women and exercise demonstrate exercise to be effective in reducing heart disease. In fact,

one study found that women with a very low fitness level had a relative risk of death almost five-fold greater than those with a higher fitness level.⁹ Physical activity can prevent CHD due to its favorable influence on plasma lipids, lipoproteins and triglycerides.⁹ Exercise increases lipoprotein lipase, the enzyme responsible for catabolizing triglyceride-rich lipoproteins; thus, the less dense HDL-2 cholesterol subfraction increases.⁹ During menopause the HDL-2 subfraction typically decreases.¹⁰

Exercise and weight loss improve blood lipid profiles by decreasing LDL and increasing HDL levels, thus improving systolic blood pressure.¹¹ However, the exact frequency and intensity of exercise needed to positively influence lipid profiles in postmenopausal women is not precisely mapped, because few studies have been conducted on this demographic. Official guidelines from the Centers for Disease Control and Prevention (CDC) recommend walking 2 miles (3.2 km) briskly most days, which is the energy equivalent of running 5 to 7.5 miles (8 to 12 km) per week.¹² However, studies have found substantial increases in plasma HDL concentrations in women who exercised at levels exceeding the CDC recommendations.¹³ Plasma HDL concentrations increased for every additional kilometer run per week.¹³ Other studies similarly observed a significant increase in HDL after a minimum of 4 months of strenuous activity, such as running 10 to 15 miles (16 to 24 km) per week.¹⁰ Moderate activities, such as walking 30 miles (48 km) per week, required 3 months to ob-

Table.
Adult Treatment Plan (ATP) III Classification of LDL,* Total, and HDL* Cholesterol (mg/dL)^a

Cholesterol Level	Classification
LDL Cholesterol	
<100	Optimal
100-129	Near optimal/above optimal
130-159	Borderline high
160-189	High
≥190	Very high
Total Cholesterol	
<200	Desirable
200-239	Borderline high
≥240	High
HDL Cholesterol	
<40	Low
≥60	High

*LDL: low-density lipoprotein cholesterol; HDL: high-density cholesterol.

serve a significant rise in HDL.¹⁰ Another study found that the frequency of participation in exercise, rather than the intensity of the exercise, improved HDL levels.¹⁴ Regardless of whether it is the frequency or intensity of the physical activity that improves cholesterol levels, almost all exercise studies demonstrate some increase in HDL. It should, however, be noted that one study found that walking 3 or 5 days per week did not alter serum lipids of nonobese, normolipidemic postmenopausal women, despite increased peak volume of oxygen utilization and decreased body fat.¹⁵ Because postmenopausal women tend to take medications, including antihypertensive medications, thiazide di-

uretics, and beta-adrenergic blockers, all of which increase blood cholesterol levels, exercise and weight loss should be recommended before antihypertensive medications are prescribed.¹¹

In addition to affecting plasma lipids and triglycerides, exercise also affects blood pressure-related risk factors. Studies indicate that active postmenopausal women have more favorable systolic blood pressure-related CVD risk factors compared to sedentary, healthy women of the same age.¹⁶ Diet and exercise regimens should be introduced to obtain an optimal blood pressure of less than 120/80 mmHg.

The effect of exercise on lipid and lipoprotein profiles for women on hormone therapy (HT) remains

controversial. Studies of postmenopausal women using exogenous estrogens suggest that regular exercise increases HDL concentrations, decreases LDL levels and decreases total cholesterol.¹⁷ One trial in postmenopausal women found that the exercise group had lower total cholesterol and LDL levels, but HDL and triglycerides were unaffected by the exercise regimen.¹⁸ Another study found that the combination of oral estrogen and exercise does not produce additional improvements in lipid metabolism.¹⁹ Although studies involving HT, exercise, and their effects on lipid and lipoprotein profiles are often conflicting, clinicians should encourage women to engage in physical activity starting at a young age so they can enter the menopausal phase of life with improved CVD risk factors.

KEY POINTS ▼

Cardiovascular Disease

- Physical activity can help prevent CHD due to its favorable influence on plasma lipids, lipoproteins, triglycerides and systolic blood pressure.
- At a minimum, women should walk 2 miles (3.2 km) briskly most days, which is the energy equivalent of running 5 to 7.5 miles (8 to 12 km) per week.¹²
- Larger improvements in lipid levels were observed when women ran 10 to 15 miles (16 to 24 km) per week or walked 30 miles (48 km) per week.¹⁰

Cancer

Exercise initiated early in life appears to protect against breast cancer, cancers of the reproductive system, nonreproductive system

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cancers, diabetes and obesity. Overweight women who increased physical activity (5.1-10.0 metabolic equivalent-hours per week [MET-h/week], which is equivalent to 1.25-2.5 hours/week of brisk walking) reduced their risk of breast cancer by 18%.²⁰ When these same women increased the intensity of their physical activity >40 MET-h/week, they further reduced their risk of breast cancer by 22% as compared with sedentary women.²⁰

In particular, weight tends to correlate with breast cancer risk. Studies suggest an association between weight gain early in adult life and an increased breast cancer risk in Western women.^{21,22} Obesity is also a risk factor for postmenopausal breast cancer.²⁰ Another study found obesity to be a breast cancer risk factor only among women who have never taken HT; for women who have taken or are taking HT, there appears to be no association between body mass index (BMI) and breast cancer risk.²⁰ For women who do not use HT, weight at the time of enrollment

was the strongest predictor of breast cancer risk, with heavier women (BMI >31.1) having a greater relative risk of postmenopausal breast cancer when compared to slimmer women (BMI ≤22.6).²³ This risk was more pronounced in younger women (50-69 years of age) than in older postmenopausal women.

KEY POINTS ▼

Breast Cancer

- Exercise initiated early in life appears to protect against breast cancer.
- Among women not using HT, heavier women (BMI >31.1) are at greater risk for postmenopausal breast cancer.²³

Obesity

Obesity is common in postmenopausal women and is characterized by excess body fat, or an excess storage of triglycerides in adipose tissue. Central and total adiposity tend to increase with age, and contribute to the development of CVD, diabetes, low HDL levels, hypertension, degenerative arthritis, lipid disorders, gallbladder disease, renal disease, cirrhosis of the liver, and several forms of cancer.²⁴

Obesity is defined by BMI, which is weight in kilograms divided by height in meters squared. A BMI above the 85th percentile (or >27) at approximately 65 years of age is associated with increased risk of CHD in later life.²⁵ The American Heart Association recommends that women maintain a BMI between 18.5 kg/m² and 24.9 kg/m² and a waist circumference <35 inches.²⁶ Android obesity is associated

with low HDL-2 levels and increased risk of CVD, while lower-body adiposity appears less harmful and is more favorably associated with serum triglycerides, HDL and markers of insulin resistance.²⁷

Obese individuals with high total adipose content often have problems with insulin resistance. Insulin resistance leads to reduced catabolism of triglycerides and an increase in circulating free fatty acids.²⁴ This reduction in catabolism leads, in turn, to decreases in HDL and increases in LDL, thus placing obese individuals at risk for CVD. In addition, high insulin levels also contribute to the development of hypertension, a CVD risk factor. Excessive weight gain in early adult life can lead to the development of hyperinsulinemia in women who are genetically susceptible to insulin resistance. In postmenopausal women hyperinsulinemia correlates to overall obesity, while in premenopausal women it is related to abdominal adiposity. This may explain why a high BMI is a risk factor for breast cancer in postmenopausal, but not in premenopausal, women.²⁴ Women who put on the most weight during menopause tend to have larger increases in LDL, triglycerides and insulin levels, and have an increased risk for CVD.²⁸ In a study by Manson et al very overweight women (BMI ≥ 29) had a threefold increase in risk for CVD.²⁹

Hyperinsulinemia is reversible with weight loss. Obese women have more difficulty losing weight compared with men, who are able to maintain HDL levels and lose central obesity by diet alone. Women must reduce their caloric

Exercise not only helps with weight loss, but also promotes a more sensitive insulin response.

intake and exercise to obtain the same results.³⁰ Exercise not only helps with weight loss, but also promotes a more sensitive insulin response. Realistic weight loss programs and goals should be prescribed for overweight patients.

KEY POINTS ▼

Obesity

- Obesity causes decreases in HDL levels and increases in LDL levels, thus placing obese individuals at risk for CVD.
- A BMI >27 at 65 years of age is associated with increased risk of CHD later in life.²⁵
- Women should maintain a BMI between 18.5 and 24.9 kg/m², and a waist circumference < 35 inches.¹⁰
- Exercise, along with caloric restriction, is necessary (in most instances) for women to lose weight and reverse hyperinsulinemia.¹⁰

Diabetes

Metabolic syndrome is characterized by risk factors including abdominal obesity, atherogenic dyslipidemia, elevated blood pressure, insulin resistance or glucose intolerance, prothrombotic state, and proinflammatory state. Metabolic syndrome places women at risk for

CHD and other diseases related to plaque buildup in artery walls, as well as type 2 diabetes. Regular exercise by older adults (over the age of 67) has been shown to reduce the development of metabolic risk factors for CVD, result in fewer exercise-induced cardiac abnormalities, reduce comorbidity and decrease risk factors for diabetes.³¹

Diabetes mellitus, a type of chronic metabolic syndrome, causes alterations in carbohydrate, protein, and lipid metabolism that often produces atherosclerosis and microvascular complications. Factors contributing to diabetes include genetic predisposition, aging, physical inactivity, and weight gain, especially android obesity.

Exercise can prevent many of these complications. Exercise increases insulin sensitivity, decreases triglycerides and total cholesterol, and improves glucose tolerance. Preventing weight gain and, possibly, losing weight decrease the likelihood of developing diabetes. The chances of developing diabetes can be curtailed by 50% if a sedentary individual starts walking approximately 5 km per day, or swimming, running or biking 30 to 60 minutes per day.²⁴ Manson et al³² showed a 16% decrease in the relative risk of diabetes in women aged 34 to 59 years who exercised once per week; furthermore, among the women who exercised, those who lost weight demonstrated a 33% decrease in their relative risk of diabetes. Long-term athletic training in premenopausal women is also associated with a lower risk of developing diabetes.³³ All high-risk women over 30 years of age who are overweight, hypertensive, or

who have a family history of diabetes should exercise at least once per week to lose weight and to prevent type 2 diabetes.

KEY POINTS ▼

Diabetes

- Regular exercise for adults over the age of 67 has been shown to reduce risk factors for diabetes.³¹
- The risk of developing diabetes can be halved if a sedentary individual starts walking approximately 5 km per day, or swimming, running or biking 30 to 60 minutes per day.²⁴
- The relative risk of diabetes decreased for women 34 to 59 years of age who exercised once per week; their risk was even further reduced when those exercisers lost weight.³²
- At a minimum, high-risk women over the age of 30 who are overweight, hypertensive, or have a family history of diabetes should exercise at least once per week to lose weight and to prevent type 2 diabetes.

Osteoporosis

Osteoporosis afflicts almost 15% of women aged 50 years and older, and 35% to 50% of women 50 and older have low bone mass. Low bone strength, which is reflected in bone mass, bone mineral density (BMD), bone architecture, bone size and bone mineral quality, increases a woman's susceptibility to fracture. The risk of osteoporotic fracture is serious, and occurs in 40% of US women over age 50. These fractures typically occur in the vertebrae, hip, pelvis, ribs, distal forearm and other limb bones.

Menopause, high alcohol intake (usually defined as more than two alcoholic beverages per day), cur-

High-intensity strength-training exercises 2 days per week preserves bone density and improves muscle mass, strength and balance.

rent smoking and poor nutrition all affect bone health and can contribute to fracture risk. Heredity accounts for 50%–70% of the accumulated bone mass, but the remaining 30%–50% is likely determined by dietary and other lifestyle factors.³⁴ Exercise is most important during childhood and adolescence, particularly during the growth spurt at puberty, to maximize peak bone mass.³⁵ Because osteoporosis is underdiagnosed and the first fracture is often silent, it is essential that physicians identify individuals at risk for bone loss and provide strategies to maintain bone strength and prevent fractures. Exercise regimens may positively affect the risk of developing osteoporotic fractures by slowing bone loss in postmenopausal women and reducing fall risk in older adults.

Although it is clear that physical activity can positively affect bone health, the exact type, duration and frequency of physical activity needed to influence bone health is unclear. Studies indicate that women who regularly engage in high-impact physical activity in the premenopausal years have higher BMD

than nonathletic controls.³⁶ Regular exercise, including resistance training and high-impact activity, not only contributes to the development of high peak bone mass, but also improves muscle strength, flexibility and balance, thus reducing the incidence of falls.¹⁹

Mechanical-loading exercises, typical of gymnastics training, affects BMD at the lumbar spine and femoral neck, while running, swimming and muscle-strengthening activities performed by gymnasts did not appear to have pronounced effects on BMD.³⁷ However, longitudinal studies indicate that walking, which is frequently prescribed for postmenopausal women, does not prevent bone loss, and higher-intensity exercise may, in fact, be required to attenuate menopausal bone loss.³⁸ High-intensity strength-training exercises 2 days per week preserves bone density and improves muscle mass, strength and balance.³⁹ However, aerobic training three times per week at 70%–85% of maximal heart rate for 30 to 45 minutes, along with calcium supplementation, did not significantly increase forearm or lumbar BMD; the training did, however, attenuate lumbar BMD loss in early postmenopausal women (approximately 6 years after the onset of menopause).⁴⁰ Prospective studies of strength-training, muscle-loading and aerobic exercise programs in postmenopausal women are difficult to compare because they differ in terms of exercise regimen, length of follow-up, subject age, hormonal status, and method and site of BMD measurement. Nevertheless, the literature seems to indicate that exercise in-

creases forces on bone and may attenuate loss of bone mass and improve strength and balance, thus preventing falls.

Body weight also contributes to BMD. Fasting insulin levels are significantly and positively associated with bone density in the radius and in the spine.⁴¹ Hyperinsulinemia may, in part, explain the association of diabetes and obesity with BMD in women. Weight loss in postmenopausal women can lead to decreased BMD. The number of pregnancies and a BMI of <20 kg/m² also has an adverse effect on BMD.⁴² In addition, increasing age and lack of exercise were found to be significant predictors of bone demineralization.⁴² Exercise programs for older women should aim to improve muscle tone, strength, flexibility and coordination, which may reduce falls in older women and prevent osteoporotic fractures.

KEY POINTS ▼

Osteoporosis

- Exercise can positively affect the risk of developing osteoporotic fractures, and should be established during childhood and adolescence, particularly during the growth spurt at puberty.³⁵
- Walking does not appear to prevent bone loss; higher-intensity exercise is necessary to reduce the risk of osteoporosis.³⁸
- High-intensity strength training 2 days per week preserves bone density and improves muscle mass, strength and balance, which may help prevent falls.³⁹

Depression

Depression is one of the most common psychiatric disorders and is

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more prevalent in women than men.⁴³ Prior depression appears highly predictive of an increased risk for subsequent depression, and lengthy perimenopausal periods are associated with increased depression.⁴⁴ A correlation exists between depression and cardiovascular disease and decreased BMD in postmenopausal women, most likely resulting from suboptimal lifestyle factors associated with depression.^{45,46}

Health professionals and regular exercisers share the belief that exercise produces psychological benefits. The effects of exercise on anxiety, depression, personality, cognition, fatigue, socialization and work performance have been extensively investigated; however, most of the studies are not carefully designed or controlled. While exercise may improve self-concept, mood and work behavior, there is little evidence substantiating claims that exercise improves anxiety, depression, body image, personality or cognition. Plasma β -endorphins are increased after running or at higher-intensity training; however, the decrease in anxiety reported af-

ter running, other mood changes and the “runner's high” are unlikely to be caused by the small changes shown to occur in peripheral plasma β -endorphin concentration.⁴⁷

Most studies of the effects of exercise on psychological health have been conducted in men. A clear need exists for well-designed studies in women, especially because preliminary evidence indicates that postmenopausal women will derive benefits from exercise in terms of fitness, psychological well-being and overall health.⁴⁸ All women should be encouraged to exercise because of the potential physical and psychological benefits they can derive from exercise. Even if future studies do not find a scientific basis for a psychological benefit from exercise, the placebo effect can be beneficial, and possibly equally effective in motivating women to exercise.

KEY POINTS ▼

Depression

- Preliminary evidence indicates that postmenopausal women will derive benefits from exercise in terms of fitness, psychological well-being and overall health.⁴⁸
- At a minimum, exercise may create a placebo effect that may be beneficial to fitness and psychological well-being.

Summary and Conclusions

Physicians should encourage their patients to initiate or continue a program of regular physical activity. Regular exercise can help prevent the development of the chronic diseases seen in older women. In patients with certain

types of established disease, exercise may delay its progression, help reverse the disease and improve prognosis. Aerobic exercise has beneficial effects on cardiovascular disease, cancer, obesity, diabetes and, possibly, on depression; specifically, it improves lipid profiles and insulin resistance and lowers body fat. Strength-training exercises can reduce bone loss and flexibility exercises can prevent osteoporotic fractures.

Healthy women can safely initiate an exercise program with adequate counseling. Exercise frequency and intensity should be prescribed according to the ability, motivation and health profile of each patient. Frequent, relatively high-intensity exercise might be more beneficial, but such a regimen is less likely to encourage compliance, may result in increased injury rates and, thus, may not have lasting effects on overall health.

Physicians should encourage their patients to incorporate exercise into their lives. One study found that patients were 50%–60% more likely to exercise when a physician directly advised them to work out.⁴⁹ Physicians should ask postmenopausal patients how much time they spend walking, running, or participating in other activities that raise their heart rate, as well as the amount of time spent strength training and stretching. Patients should then be encouraged to incorporate all three activities into their lifestyle. Physicians should familiarize themselves with the recommended frequency and intensity of exercise for postmenopausal women and encourage their patients to reach the recom-

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mended goals. In addition, physicians should consider referring patients to fitness specialists who can tailor specific weight loss and exercise regimens. ■

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