Exercise and the Problems of Aging

Despite having mild osteoarthritis at the age of 44 years, Riku Nikander, PT, PhD, plays tennis as often as possible. His determination to stay on the courts runs contrary to mainstream advice about arthritis, which is to avoid activities that jar the joints.

But from research done at the University of Jyväskylä in Finland, where he is a professor of sport and health sciences, Dr Nikander believes that tennis can improve the health of his bones while not hurting his cartilage. "The first studies show that when the osteoarthritis is not very bad, you could still do impact sports," he says.

Though more research is needed, these initial studies are helping resolve a dilemma for clinicians who advise aging patients about controlling two of the most common health problems of aging: osteoarthritis and osteoporosis.

Much of the research up until now has posed a dilemma. Although studies have consistently shown that exercise benefits both conditions, when it comes to the type of exercise, the findings point in different directions.

The National Osteoporosis Foundation's 2014 Clinician's Guide to Prevention and Treatment of Osteoporosis recommends "weight-bearing and muscle-strengthening exercise." And it specifically mentions walking, jogging, tai-chi, stair climbing, dancing, and tennis as examples of weight-bearing exercise.[1]

These exercises are typically considered "low to moderate impact," and studies have shown that they can preserve bone mineral density at the lumbar spine and femoral neck when combined with resistance training. (Muscle-strengthening examples include "weight training and other resistive exercises, such as yoga, Pilates, and boot camp programs.")[2]

Benefits of High-Impact Exercise

Reviews of the research found that high-impact exercises—typically defined as activities that involve jumping, such as basketball, gymnastics, and ballet—were also effective when combined with other types of exercise, such as resistance training.[3,4]

In another study—this one looking at premenopausal women—resistance training and high-impact exercises produced 1%-2% gains at the lumbar spine and femoral neck.[4] (Much less research has been done on men, who are at lower risk for osteoporosis, but the few studies that have been done suggest that their bones would benefit from the same kinds of exercise.)

"People who do high-impact might have 20%-30% stronger bones in their lower-extremities," says Dr Nikander. "And animal experiments have shown that it should include movement—and, if possible, quite rapid movement. It's been said that this is due to a fluid flow inside the bone that starts a cascade of events that leads to stronger bones."

Traditional Low-Impact Recommendations

By contrast, recommendations for osteoarthritis tend to emphasize low-impact exercise. The American Academy of Orthopaedic Surgeons (AAOS) recommends "strengthening, low-impact aerobic exercises, and neuromuscular education" in its treatment guidelines for osteoarthritis of the knee.[5]

And in an AAOS website for consumers, the organization says that an osteoarthritis diagnosis "may mean switching from high-impact activities
(such as aerobics, running, jumping, or competitive sports) to low-impact exercises (such as stretching, walking, swimming, or cycling).”[6]

In a list of dos and don'ts, the Arthritis Foundation recommends against high-impact exercises including "sports such as basketball or racquetball that involve jumping and quick changes of direction"—in other words, precisely the types of exercises that might strengthen bone mineral density the most.[7]

Among the exercises the Arthritis Foundation recommends instead are swimming and bicycling—two non–weight-bearing exercises that have been shown to have lesser benefits for bone mineral density.[8,9]

The low-impact exercise recommendation for osteoarthritis may derive from studies showing that many people who participate in high-impact sports also suffer from osteoarthritis, possibly as a result of cartilage damage incurred in joint injuries.[10]

"It's kind of a U-shaped curve," says Dr Nikander. "If you exercise too little, you're overweight and your muscles aren't strong. It's a huge risk for osteoarthritis. But even if you're very fit, if you train too much, you're at risk for osteoarthritis."

What About Patients With Both Diseases?

What if your patient is showing some signs of both osteoarthritis and osteoporosis? Must they forego the bone-strengthening benefits of high-impact exercise in order to protect cartilage? Some of Dr Nikander's colleagues at the University of Jyväskylä looked into precisely this question.[11]

The investigators recruited 80 women 50-66 years of age with mild knee osteoarthritis and divided them into two even groups. The asked one group to maintain their usual activities and gave them the opportunity to join a social group that met every third month.

The other group did supervised exercises for 55 minutes three times a week. They alternated weeks between jump-aerobic exercise and step-aerobic exercise. In both step-aerobics and jump-aerobics, participants accelerated and decelerated through forward and backward movements, stopping and turning, in time to music.

During the first 3 weeks, the trainees accustomed themselves to jumping without obstacles. After that, in the jump-aerobic program, they jumped over foam fences that were raised in 5-cm increments up to 20 cm over a 3-month period. And in the step-aerobic program, they stepped up onto benches that were incrementally raised from 10 cm to 20 cm from one week to the next.

The exercisers sometimes hurt themselves. Six of them had to take a break in training because of symptoms such as knee swelling, ankle pain, or asthma-like symptoms. But then they went back to the program. The mean training compliance was 68%; the mean training frequency was 2.1 times per week.

People in the control group made two visits to the attending physician due to previous meniscal tear injury and cardiac dysrhythmia. The difference in the number of physician visits between the two groups was not statistically different (P=.15).

On the whole, the high-impact exercisers fared better.

Using dual-energy X-ray absorptiometry, the researchers found that after 12 months, the bone mineral content (a key factor in bone mineral density) of the femoral neck was 1.6% greater in the exercise group than in the control group. The difference was statistically significant (P=.005), even after adjusting for baseline values and change in body mass index. There were no significant differences between the two groups in the trochanter or lumbar spine bone mineral content.
(Typically these benefit more from upper-body exercises.)[4]

Participants in the exercise group improved their isometric leg extension force by 11% ($P=.009$) more than participants in the control group. They improved dynamic balance by 3% more ($P=.022$) and cardiorespiratory fitness by 4% more ($P=.027$).

Using MRI, the researchers found no significant changes in cartilage in either group. And no differences between the two groups emerged in knee pain, stiffness, or self-rated physical functioning.

"If an osteogenic bone response is desired, bone-favorable exercises can be incorporated into an [osteoarthritis] patient's exercise program," the researchers concluded. They cautioned, however, that the findings might not apply to older or obese patients or those with severe knee joint conditions—or even to men, who might jump more vigorously.

Age Alone Should Not Be a Barrier

Even if research eventually shows that people with more severe arthritis should not do high-impact exercise, these patients can still do something to improve their bone mineral density, says Peter Rich, PhD, a senior lecturer at RMIT University in Bundoora, Australia.

A careful program of resistance training can improve bone strength at least to some degree, Dr Rich says. "There is evidence that the pull of the muscles on the skeleton can help improve bone geometry (structure) as well as bone mass," he adds.

But age alone should not prevent someone from doing moderate- to high-impact exercise, Dr Nikander says. One of his frequent opponents on the tennis court is his mother, who is almost 70 years old. She often wins.

References


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