Study: Impact Exercise Increases Bone Mass, Decreases Fracture Risk

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Two new studies conducted by Oregon State University researchers show that jumping exercises conducted over a single school year during early childhood resulted in significant bone mass increases ranging between 3 percent and 8 percent.

The studies present four- and eight-year follow-ups of two separate cohorts of children and report that the benefits they experienced from a single year of jumping exercises in the school environment are maintained four to seven years after the exercise was stopped. If the benefits persist into adulthood this may reduce their fracture risk as adults as much as 25 percent.

The studies, which will be published in forthcoming editions of the *Journal of Bone and Mineral Research* and *BONE*, suggest that impact exercise may be a key factor in preventing osteoporosis, a skeletal disease in which loss of bone strength often leads to fragility fractures in older adults.

Lead author Kathy Gunter, an assistant professor in the Department of Nutrition and Exercise Sciences and an Extension specialist at OSU, said that according to a recent report by the Centers for Disease Control, annual medical costs related to osteoporosis are expected to approach $200 billion by 2040. Thus identifying effective strategies to offset the risk of this growing epidemic is important.

Gunter's research was funded by a grant from the National Institutes of

Health. Referred to as the Building Growing Skeleton in Youth, or BUGSY program, at OSU the project includes two separate but similar intervention studies conducted in the Corvallis, Ore. school district. The first is an eight-year study examining the long-term effects of impact exercises in 89 school-age children. The second is a four-year study involving 205 students. All the participants were pre-pubertal at the beginning of the intervention.

“We know that a loss of 10 to 15 percent of skeletal mass doubles a person’s chance of fracture risk,” Gunter said. “Our studies show between 7 and 8 percent of the total change in bone mass over a year was attributed to having participated in the jumping program. That’s a significant buffer for the children who jumped compared to those who did not.”

The children did 100 jumps off a two-foot platform box three times per week for one year. The results were astounding, according to Gunter, who added that there were no reported injuries attributable to the jumping intervention in either of the studies.

“We found that the one year of jumping had measurable effects for up to eight years after they stopped doing the exercise,” she pointed out. “We were ecstatic to find persistent effects. The fact that it sticks is really meaningful and exciting and has implications for fracture risk in later life.”

Gunter said a large proportion of total adult bone mass is accrued during puberty. By the time a person reaches adulthood, most of their bone mass will be set. Developing a lifestyle factor, such as exercise, that might positively affect bone growth has been a key component to the research done at OSU. And not all jumping is created equal. Gunter said the jumping exercises used in their interventions were selected because they result in the greatest “ground reaction forces,” in this case, eight

times the participant's body weight.

This is not to say however, that jumping exercises wouldn't have a benefit to adults as well. Gunter said an earlier OSU study of post-menopausal women compared a group who did weight-bearing exercise with those who did not exercise. The women who exercised for one year showed improvements in balance and strength, but did not increase their bone mass. After five years, the women who did not exercise showed a bone loss of 4.5 percent compared to no loss among the exercisers.

"The average woman loses bone mass at an average rate of up to 1 percent a year after menopause," Gunter said. "So anything that can be done to slow that rate is significant."

"While there are certainly effective pharmacologic agents that are also very effective," she added, "they do not provide the benefits in strength, balance, mobility and function that are gained from doing exercise. Ultimately these are the factors that may determine whether someone experiences a fracture. It's not just about the bone."

The next step for Gunter and her OSU colleagues is to find out if the benefits of the impact exercise continue into adulthood for these children. She also wants to study the biological side to find out what mechanisms are causing these jumping exercises to have such an impact.

"We have found that the benefits persist up to eight years after the exercise training," she said. "Whether it persists enough to truly influence adult fracture risk is still unclear. However, animal models suggest that benefits are sustained, and I'm optimistic that this is the case in humans as well."

Source: Oregon State University