Researchers find physical activity in youth leads to stronger bones in old age

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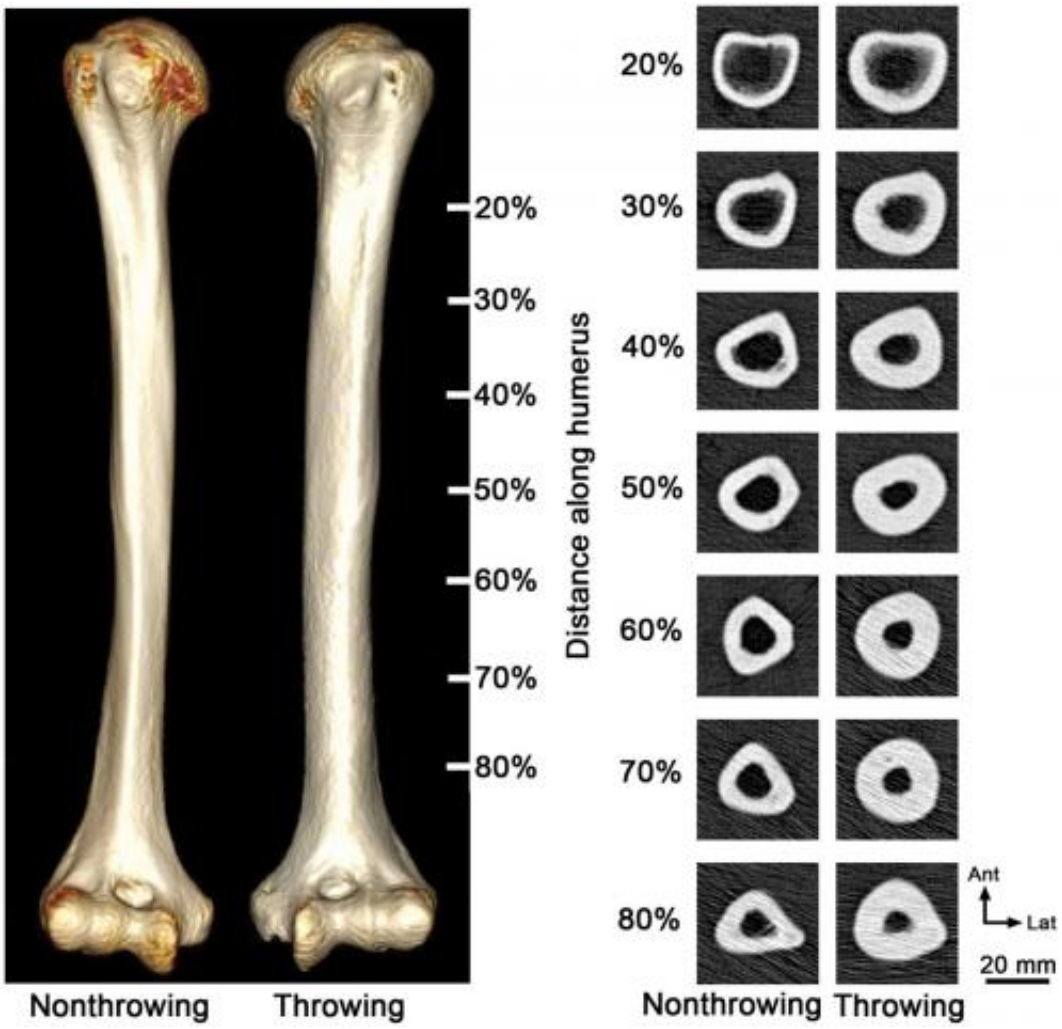

Reconstructed CT images of the humerii of a professional baseball player reveal a bigger bone in the throwing arm than on the non-throwing arm when the bone is viewed from the front (left images). Cross-sectional images (right) displayed greater total and cortical bone areas, greater cortical thickness, and smaller medullary area in the throwing arm than in the non-throwing arm. The net result

was a stronger bone in the throwing arm, with one-third of the bone strength benefit lasting lifelong in retired players despite throwing being completed more than 50 years earlier. Credit: Stuart Warden

(Medical Xpress)—A team of researchers with members from the U.S. and Australia has found that people who exercise when young tend to increase the size and strength of their bones, which appears to make for lifelong benefits. In their paper published in *Proceedings of the National Academy of Sciences*, the team describes how they studied the bones in the arms of professional baseball players over the course of their lives and how their activities impacted bone size and strength.

Everyone knows that exercise causes muscles to grow bigger and leaner, now it appears it offers similar benefits for bones as well. In this new study, the research team enlisted the assistance of 103 professional baseball players to learn more about the impact of exercise on bones.

In their study, the researchers found that the ball players had up to twice the bone strength in their throwing arms (humeral diaphysis bone) as in their non-throwing arm—as measured by bone size and density.

Once their careers ended, some players continued an active lifestyle, while others did not. Bone mass in those that stopped throwing reverted back to matching the other arm, but bone size did not (dropping to just 56 percent of its previous size on average), which meant that even in the absence of continued activity, the players all maintained some bone strength attributes for the rest of their lives. For those that continued to use their arms after retiring from baseball the benefits were even greater—they maintained higher bone density levels, though not as high as when they were playing of course (28 percent on average), which resulted in them retaining up to 50 percent of added bone strength as

they aged into becoming senior citizens.

The results of this study indicate that exercise during youth is perhaps even more important than has been previously thought. People breaking bones in their declining years is very common, if today's young people could be coaxed into exercising enough to increase the size and density of their bones, it appears likely they will be less susceptible to bone breakage when they grow older.

More information: Physical activity when young provides lifelong benefits to cortical bone size and strength in men, Stuart J. Warden, *PNAS*, DOI: 10.1073/pnas.1321605111

Abstract
The skeleton shows greatest plasticity to physical activity-related mechanical loads during youth but is more at risk for failure during aging. Do the skeletal benefits of physical activity during youth persist with aging? To address this question, we used a uniquely controlled cross-sectional study design in which we compared the throwing-to-nonthrowing arm differences in humeral diaphysis bone properties in professional baseball players at different stages of their careers (n = 103) with dominant-to-nondominant arm differences in controls (n = 94). Throwing-related physical activity introduced extreme loading to the humeral diaphysis and nearly doubled its strength. Once throwing activities ceased, the cortical bone mass, area, and thickness benefits of physical activity during youth were gradually lost because of greater medullary expansion and cortical trabecularization. However, half of the bone size (total cross-sectional area) and one-third of the bone strength (polar moment of inertia) benefits of throwing-related physical activity during youth were maintained lifelong. In players who continued throwing during aging, some cortical bone mass and more strength benefits of the physical activity during youth were maintained as a result of less medullary expansion and cortical trabecularization. These data

indicate that the old adage of "use it or lose it" is not entirely applicable to the skeleton and that physical activity during youth should be encouraged for lifelong bone health, with the focus being optimization of bone size and strength rather than the current paradigm of increasing mass. The data also indicate that physical activity should be encouraged during aging to reduce skeletal structural decay.