# For young baseball players, light bats don't hit too fast

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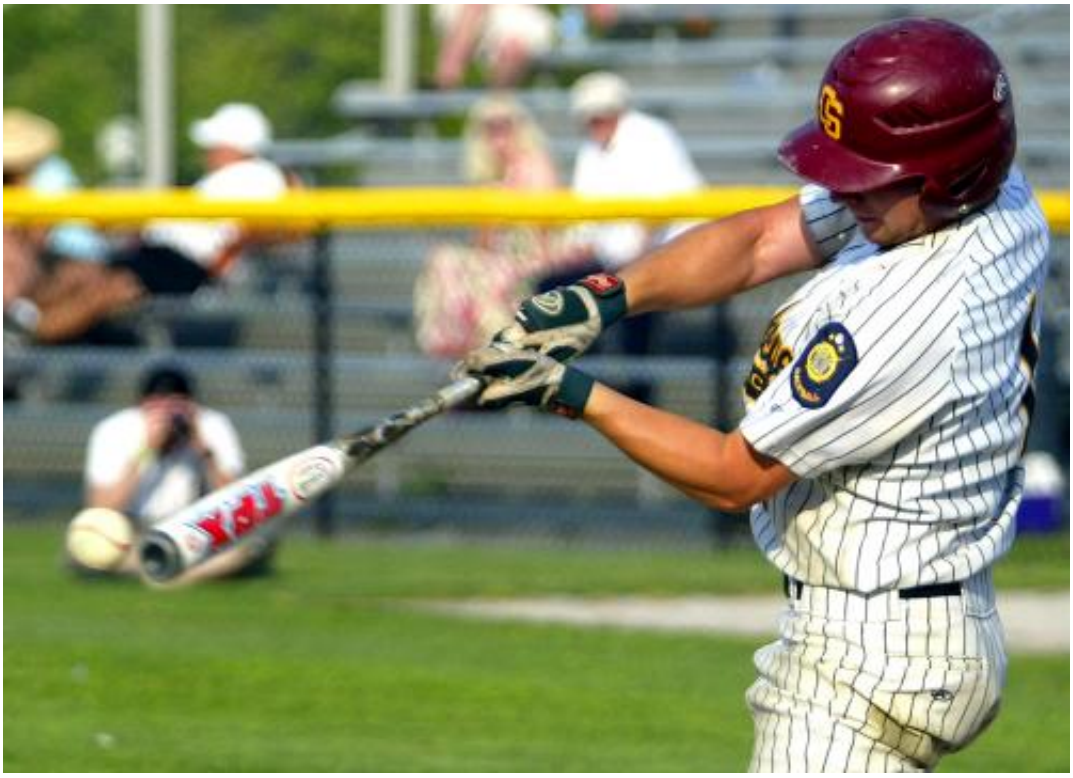

Many young baseball players use bats made from something other than wood. These bats are tightly regulated in high school and college. A new study of bat performance in the hands of younger teens will inform bat rules for that age group. Credit: Mike Cohea/Brown University

The use of non-wood bats in youth baseball has spurred decades of controversy about whether they propel the ball too fast, in part because of their higher bat-to-ball energy transfer—the "trampoline effect." A

study at Brown University finds that in some cases non-wood bats do not hit the ball any faster. In the hands of young teen players, for example, lighter non-wood bats hit the ball at wood-like speeds.

With some fierce pitching on display, this year's World Series featured its share of shattered wood bats. That's a problem many youth baseball players avoid by using metal or composite carbon fiber bats. But ever since those bats entered the game, people have debated whether and when non-wood bats make the ball fly faster. That's because non-wood bats transfer energy to the ball better, a phenomenon called the "trampoline effect."

The concern is that faster hits not only make the game harder for the defense but also more dangerous. Such concerns have led to uniform bat regulations in college and high school baseball, but amid uncertainty about how non-wood bats perform in the hands of younger players, the rules are less consistent for that age group.

"Everyone wants baseball to be safe and enjoyable," said biomechanics scientist Glenn Fleisig, chair of the medical and safety advisory committee of USA Baseball, the nation's governing body for all amateur and youth baseball. "The time has come for us to have coordinated rules for bat performance in youth baseball, but the bat regulations for high school and up cannot be simply applied to youth baseball."

What's needed is more scientific data relevant to younger teens. In a study now online in the *Journal of Applied Biomechanics*, researchers at Brown University and the Lifespan health system took a swing at gathering some. In fact, Joseph "Trey" Crisco, professor of orthopaedics, and colleagues recruited 22 volunteer hitters aged 13 to 18 to take about 3,400 swings with 13 different youth baseball bats (all of the non-wood bats tested were too light to be allowed in high school or college play).

What the research team found is that while non-wood bats did hit the ball faster overall, that varied widely based on the bat model and the batter's age. Among the 10 non-wood bats studied, only three allowed players to hit the ball significantly faster than the three wood bats. One bat produced significantly slower hits, and six other bats produced hits of essentially the same speed as wood.

For the youngest teen baseball players, many of whom need lighter bats to participate at all, one of the most significant findings was that lighter non-wood weight bats did not launch the ball at significantly higher speeds than wood bats.

"Professor Crisco's work is going to be the foundation of data for making regulations and recommendations for youth baseball bats going forward," said Fleisig, who is also research director of the American Sports Medicine Institute.

## Weight, energy and strength

At a given pitch speed, three independent factors influence the speed of a batted ball: the bat's mass and its distribution along its length, called the "moment of inertia" (MOI); the bat's degree of energy transfer, or its "trampoline effect"; and the speed of the swing, a consequence of the hitter's strength and biomechanics.

To measure these factors, Crisco and his team set up a batting cage and a pitching machine in a Brown gym. They used an array of eight cameras shooting 300 frames a second to capture the complete motions of specially marked bats and balls. The video systems tracked the pitch speed, the bat speed, the ball speed and the place on the bat where the ball made contact.

Among the younger ballplayers in the study, lighter non-wood bats

allowed them to swing somewhat faster than with wood, but the balls didn't go any faster, despite their higher trampoline effect. For these players, the much lower bat mass meant much less ball momentum overall.

"At the youth level for the bats that we studied, even though there was a trampoline effect, the loss of momentum overcompensated for it so no matter how hot the trampoline effect was, the bats were so light they still were not outperforming wood substantially," Crisco said.

Among 13- to 15-year-olds, swing speed slowed significantly as bat mass increased, Crisco found. That meant that even the fastest-hitting bat was not as potent in the hands of the younger players as the older ones.

The non-wood bat that launched the ball fastest, called "Model A," had a weight and MOI that was on par with a light wood bat, but it had a much higher trampoline effect than the wood bats. The ball speed advantage it gave each hitter depended on the hitter's age. The 13-year-old players hit balls 7.4 miles an hour faster with model A than with the wood bats, but the 18-year-old hitters whacked the ball 11.6 miles an hour faster with model A (which they could never use in a real game), than with wood.

Although the study, first published Oct. 11, helps resolve the effect of the interplay between bat physics and batter biomechanics in youth baseball, the work of monitoring bats and their performance will likely continue, Crisco said.

"I think we have a very good handle on what's going on now with these bats," Crisco said. "The challenge is [that manufacturers] are going to come up with a new material and a new construction that our assumptions may or may not be valid for."

In other words, the bat goes on.

Provided by Brown University