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Young Arms and Curveballs: A Scientific Twist

By **BILL PENNINGTON**

For decades, it has been an article of faith for parents of young pitchers: Do not let them throw curveballs. The reason was simple. Contorting elbows — all in the service of ever more competitive baseball at ever younger ages — puts more strain on the joint than arms can handle.

But as the research into the biomechanics of pitching has evolved, the debate has grown more robust, and more perplexing. A recent major study shows curveballs pose no greater risk than that of other pitches. And many studies lately have shown that the greatest threat to young arms is not throwing curves but making too many pitches of any kind.

“Science is banging heads with intuition and gut instinct,” said Glenn Fleisig, the research director of the American Sports Medicine Institute, who has conducted studies on breaking balls and young arms since 1996. “For years, we told people that curveballs were bad. Then we set out to prove it. We **did not prove** curveballs are safe, but we could not prove they were dangerous.”

Like a pitcher and a catcher disagreeing on pitch selection, the opposing sides in the debate could not be more closely allied. Dr. James Andrews, the orthopedic surgeon to many athletes, is a founder of the American Sports Medicine Institute and has written with Fleisig [some of the studies](#) that have failed to prove that curveballs are hazardous to young arms. It has not stopped Andrews from challenging the results.

“What we found out in the lab is true,” Andrews said. “For pitchers with proper mechanics, the force of throwing a curveball is no greater than for a fastball. But that’s not what happens in reality on the baseball field. Many kids don’t have proper mechanics or enough neuromuscular control, or they are fatigued when throwing curveballs. Things break down.

“Those are the kids I’m seeing every day in my operating room.”

Little League Baseball imposed strict per-game pitch limits five years ago, but Andrews said

he performed about seven times the number of arm operations on young pitchers that he did 15 years ago.

Last year, the findings of a [study conducted on more than 1,300 pitchers](#) from 8-year-olds to college students, were released by Little League Baseball, which had commissioned it with USA Baseball. Three University of North Carolina researchers surveyed the pitchers over five years, annually assessing multiple factors: number of innings pitched, kinds of pitches thrown, number of teams played for and any arm pain or injuries experienced. The answers were analyzed to judge which factors influenced injury risk. The test group included 410 Little League pitchers.

“There was no association between throwing curveballs and injuries or even arm pain,” said Johna Mihalik, who wrote the study. “It was surprising in a sense because of the conventional thinking about curveballs, but we were well aware that the studies by Dr. Andrews and Glenn Fleisig had come to similar conclusions. That’s what fueled our study.”

Stephen D. Keener, the president and chief executive of Little League International, said that deliberations among youth baseball leaders about banning, by rule, all breaking pitches had led to the commissioning of the study. When the findings did not link curveballs to injury, he said, Little League felt compelled to maintain the status quo.

“It doesn’t mean we’re advocating throwing breaking balls,” Keener said. “We don’t promote it. We just think it’s very difficult to regulate it out of the game, and there is no data to show that throwing breaking balls is at the root of arm injuries.”

Dr. Timothy Kremchek, an Ohio orthopedic surgeon who is the Cincinnati Reds’ physician and whose practice frequently treats youth pitchers, called Little League’s stance irresponsible.

“They have an obligation to protect these 12-year-old kids and instead, they’re saying, ‘There’s no scientific evidence curveballs cause damage, so go ahead, kids, just keep throwing them,’” Kremchek said. “It makes me sick to my stomach to watch the Little League World Series and see 12-year-olds throwing curve after curve. Those of us who have to treat those kids a few years later, we’re pretty sure there is a cause and effect.”

Kremchek said he performed 150 elbow ligament reconstructions a year, a complex operation named after the former major league pitcher Tommy John, who had the surgery when it was developed in the 1970s.

“Seventy percent of those surgeries are pitchers who haven’t hit college yet,” Kremchek said. “I ask each one the same question: when did you start throwing curveballs? And they say: ‘I

was 10. I was 11.' Sometimes, it's 9."

Kremchek coaxed about eight Ohio youth leagues to prohibit breaking pitches. The umpire issues a warning the first time he suspects a pitcher has thrown a curveball, slider or other breaking pitch. A second offense means the player must stop pitching.

"The mothers in those leagues are the biggest fans of those rules," Kremchek said. "It's not a hard call for the umpires. A 12-year-old trying to throw a breaking ball is pretty demonstrative as he does it. You can tell."

But Keener said that rule, if enacted by Little League, would be hard to enforce across its more than 7,000 leagues.

"I applaud people for trying to do it," Keener said. "But we often have volunteer umpires in a Little League trying to make balls-and-strikes calls and basepath calls, and it would be a very hard thing to ask them to also decide if a pitcher intentionally tried to throw a breaking pitch. What if that pitcher just has natural movement on his fastball?"

One aspect of the curveball debate, and the studies it has spawned, that everyone agrees on is that throwing too many pitches of any type is the biggest danger.

As surprised as Mihalik might have been about her study's findings on curveballs, what alarmed her most was the number of pitches thrown.

"So many were playing for three teams at once," she said. "And the data was extremely clear that overuse led to injury more than any other factor."

That, too, is consistent with the findings of more than 15 years of research at the American Sports Medicine Institute, and similar studies around the country.

"Maybe asking whether the curveball is safe is the wrong question," Fleisig said. "Maybe the question should shift to this: Are you overdoing it? Because there is no question, scientifically or anecdotally, that too much throwing leads to injury, and often it's serious injury."

Little League instituted pitch limits based on research conducted by Andrews and Fleisig. This season, the limits are 85 pitches a day for 11- to 12-year-olds and 75 pitches for 9- to 10-year-olds. Rules also mandate days off between pitching appearances. Other recommendations by Andrews, who is on Little League's board, and Fleisig, who acts as a Little League adviser, include a break of months from overhand throwing and competitive pitching, a 100-inning annual limit, avoiding radar guns and barring pitchers from playing catcher.

In 2007, the first year of the Little League pitch restrictions, Tyler Richards and Kyle Cotcamp logged many innings as their Hamilton, Ohio, team reached the World Series. They also pitched for a travel team.

Two years later, Richards had Tommy John surgery. Kremchek performed the operation, as he did for Cotcamp last year.

“I just pitched way too much,” said Richards, now a high school junior who has resumed pitching.

He added: “I should have just said no. I should have rested my arm.”