

Proving That Sliders and Curveballs Are Not Responsible for Breaking Pitchers

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Sliders are bad, says conventional wisdom. It's not hard to do a quick web search and find [article](#) after [article](#) that says exactly that. With Brandon Beachy the latest pitcher to be headed to the surgeon's table, according to [Fox Sports South](#), many are questioning whether his slider and curve contributed to his elbow injury.

I called three scouts I know and asked them if they worry when they see a high school pitcher who relies on the slider. They responded "yes" quickly, though one asked how good the slider was.

But what if this is wrong? What if the scientific data shows us that sliders are no worse and perhaps less dangerous than a fastball? Because that's exactly what several well-respected researchers have shown over the last decade in published studies.

[Jon Roegele](#) of Beyond the Box Score did an amazing job documenting much of this in his [article on pitch types](#). I cannot recommend this article and the rest of his series highly enough, but be warned, Roegele discusses the topic at a very high level. I'd like to make it a bit more clear to a broad audience.

First, let me be clear about one thing: When I am discussing things in this article, I am speaking about physically mature professional pitchers. I do not recommend that any pitcher who does not have closed growth plates throws breaking balls (curves or sliders).



Dr. James Andrews *Nick Wass/Associated Press/Associated Press*

The recommendations of both Dr. James Andrews and former Cy Young Award winner Dr. Mike Marshall are in line with my thinking. Andrews often says that a pitcher shouldn't throw curves until he shaves regularly, which is a simple indication of physical maturity. Marshall is [much more technical](#) and looks to X-ray images of the growth plates themselves.

In 2006, [Dr. Glenn Fleisig](#), the preeminent biomechanist in baseball from the American Sports Medicine Institute (ASMI), led a study that was a [kinetic comparison between pitch types](#). He used collegiate pitchers, which is not unusual for these types of studies, as [MLB](#) teams are loath to risk their own valuable investment for science.

What Fleisig found is that the joint loads for the fastball and curveball were very similar, while the changeup had less of a load on the joint. This and later studies suggest that velocity is more important than

pitch type, exploding the myth of "pitch cost," or that one type of pitch was harder on the arm than another.

It is common sense that the harder the pitch (more velocity), the more force on the joint. Study after study backs this up.

As Roegele shows in his work, there is much more of a correlation to velocity rather than type. He addressed frequency as well, though for the most part, there are few pitchers who rely on a breaking ball for a majority of their pitches. MLB hitters set a minimum fastball, with few right-handed pitchers able to succeed for an extended period with a fastball under 90 mph. A lefty can get away with a bit less but needs more movement as he drops velocity.



Kris MedlenKevin C. Cox/Getty Images

If we look at a few of the pitchers headed for Tommy John surgery this week—Kris Medlen, Brandon Beachy and Jarrod Parker—there's little in the pitch-type data indicating that repertoire was a real issue.

Medlen doesn't rely heavily on his breaking ball, [according to FanGraphs](#). He has a show-me slider that is barely used, relying instead on two fastballs, a change and a curve that is used as a speed variant. The curve is actually slower than his change, getting hitters off balance and making an average fastball passable. It's the change that works on hitters, with the curve used less than that great change.

Beachy does have a slider, but he [reduced his usage of the pitch in 2013](#) to 8 percent. He did have a small increase in his curveball, which could be a recognition issue, but it does suggest that Beachy was switching his repertoire somewhat. What's more telling is that the pitch value—how effective the slider was—dropped way off in 2013. It's more likely that contributed to his changes rather than injury.

Parker tends to use his slider only about [13 percent of the time](#), though there was some increase in 2013. His fastball velocity did drop slightly in each year, so while there may have been more issue with that pitch, there was also likely slow, steady damage to the ligament.

In two of these examples at least, the reality matches up in some ways with the studies. While Medlen and Parker weren't fireballers on the order of an Aroldis Chapman or a Kerry Wood, there's no clear relation between the types of pitches they threw and their injuries.



Interesting mechanics, Yordano. *Tony Gutierrez/Associated Press*

Another example is if we look at sliders specifically and draw down to those pitchers who have thrown [the highest percentage](#) of sliders in the last three seasons, we see only four of these pitchers—Francisco Liriano, John Lackey, Ryan Dempster and Jordan Zimmermann—have had Tommy John surgery. There are other physical issues, but there's no clear smoking gun here in the hands of the slider. To be fair, there are [mixed signs from fastball velocity](#) as well, but this is anecdotal at best in both cases. Yordano Ventura might end up a [big test case this year](#) with his heat.

To be sure, neither the current studies nor the anecdotal evidence settle the question entirely. Far from it. There are a number of questions not settled by these or any known extant studies.



Jarrold Parker *Christian Petersen/Getty Images*

The first major question is whether there is such a thing as a "good" curveball and a "bad" curveball and whether the kinematics are significantly different. If you haven't been to a high school game recently, maybe you won't know what I'm talking about, but this is one of the issues I have with teaching young players to throw breaking balls.

Kids are going to learn, so I would rather they learn properly and limit its usage rather than little Bobby down the street teaching someone a "doorknob slider" or some other elbow-breaker. This is much less an issue at higher levels, but even there, individual pitchers will have individual force production and resistance.

The next question is a major one that poses a problem for nearly every current study. Is there a difference in game conditions? It's one thing to strap on the markers and throw someone in a lab, but when

the lights are on and the crowd is cheering, do mechanics, and therefore kinematics, change?

There are major changes in physiological response, such as breathing, heart rate and adrenal response, so there are likely to be some changes in force production as well, if not mechanics. Unfortunately, there's no current way to test this, though there are possibilities on the horizon.

There are also several anatomic and kinematic questions that are interrelated. There may be more to elbow injuries than simple varus force. There could well be genetic predisposition. Some ligaments may be stronger than other ligaments, but there have been no large-scale or specific studies that test this scientifically.

The last major anatomical and biomechanical question is whether MLB pitchers are simply physically different. While a significant amount of pitchers are injured in any given year and many have been forced to have reconstructive surgeries on their elbow or shoulder, they are still extreme outliers in terms of skill. There could be something as simple as a survivor effect in place, or there could be factors that are discernible and predictable for injury proclivity.

There are still many questions to answer, but currently, the preponderance of scientific study points to pitch cost being a myth. The worry appears to be more the force or velocity generated. There's plenty more research to be done, but MLB hasn't done much to further this. The state of the art is coming from outside, largely led by groups associated with physician groups like ASMI, which is in the Andrews complex, and at orthopaedic clinics Kerlan-Jobe and Steadman.

Until MLB or at least some of its constituent teams get serious, we won't get to the answers we need to make the game better.