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Fancy Stats • Analysis

The statistical revelation that has MLB hitters bombing more home runs than the steroid era

By Neil Greenberg June 1

Dingers. Taters. Bombs. Blasts. Moon shoots. Everyone digs the long ball, and Major League Baseball has plenty to go around.

At no point in baseball's history was the home run more of a focal point than during the long-ball era (1994 to 2005). We saw record-setting years by Mark McGwire (70 home runs in 1998), Barry Bonds (73 home runs in 2001) and a 66-homer season from Sammy Sosa (1998), with 11.8 percent of all hits leaving the yard during this 12-year span. Of course, that span also carries another more dubious nickname: the steroid era.

It was thought that after the implementation of strict leaguewide drug testing, such offensive fireworks would be an anomaly of a PED-fueled past. But it turns out that homer heyday pales in comparison to what we are seeing today: 14.2 percent of all hits in 2017 are home runs, the highest rate in baseball history. This time, it appears statistical analysis deserves some of the credit.

In 2015 the league introduced Statcast, a "state-of-the-art tracking technology capable of measuring previously unquantifiable aspects of the game," giving teams, scouts and players access to detailed data which is used to make the physics of hitting a lot clearer.

The biggest change brought about by the Statcast data is illustrating the importance of an uppercut swing that results more often in fly balls and line drives rather than groundballs. According to MLB's Statcast data, the average launch angle in 2015, the first year data is available, was 10 degrees. That has jumped to 10.8 degrees in 2016 and

10.9 degrees in 2017, causing the frequency of extra-base hits, also known as isolation percentage (ISO), to spike to .165 in 2017, which is closing in on the record mark set in 2000 (.167).

It appears that having a risk-free method of improvement available to all players has had an obvious effect: more players are hitting more home runs. In 1994, 32 players hit 20 or more home runs, a trend that peaked in 1999 and 2000 with 103 and 102 players, respectively. Then, in 2016, 111 players hit 20 or more home runs, with hitters belting the second-most home runs (5,610) in baseball history. Elias notes 125 players hit at least four home runs during the past month of May, nine more than any other month in baseball history.

The jump since 2014, which saw a 20-year low for home runs (4,186), was so incredible it begged for a deep investigation into what caused the power surge. After all, from 2006, the year baseball instituted leaguewide drug testing, to 2015, only once did we see 5,000 or more baseballs fly over the fence. The results were inconclusive since there didn't appear to be any single factor causing the spike, though some suggested how hitters were altering their approach at the plate as one reason. It now appears to be a significant reason.

In May 2017, hitters belted 1,060 home runs, the second-most in any calendar month in major league history according to Elias, falling just short of the all-time record set in May 2000 (1,069). That puts the league on pace to set *another* seasonal record, projected at 5,924 total home runs as of June 1. Three years is a trend.

Before anyone dismisses the science as mere mumbo-jumbo, it's worth noting how many players are buying into this physics-driven philosophy.

"I know 10 degrees is about the point where infielders cannot catch it," Washington Nationals second baseman Daniel Murphy told Travis Sawchik of FanGraphs. "And then 25, 27 is the sweet spot for home runs."

Murphy switched up his approach at the plate in 2015 as a member of the New York Mets, moving closer to the plate with a smaller gap between his elbows. The result was a spike in his average launch angle from 12.1 degrees in 2015 to 16.9 degrees in 2016 to 17.6 degrees in 2017. In that time, his home run rate increased from one every 38 plate appearances in 2015 (2.6 percent) to one out of every 21 plate appearances (4.4 percent) over the past two seasons. His batting average, on-base, slugging and isolation percentages also improved.

Season	BA	OBP	SLG	OPS	ISO	Launch angle	HR/PA
2015	.281	.322	.449	.770	.168	12.1	2.6%
2016	.347	.390	.595	.985	.248	16.9	4.3%
2017	.325	.380	.555	.935	.230	17.0	4.3%

However, simply adopting an uppercut swing isn't enough — a ball hit at the optimal angle in the air still has to be hit hard to become a home run. A hit that strikes the sweet spot, labeled a "barrel" by MLB's Mike Petriello, identifies an instance with an exit velocity of 98 mph or greater and a launch angle of 26-30 degrees, the best mix to produce a home run. During the 2016 regular season, balls assigned the "barreled" classification had a batting average of .822 and a 2.386 slugging percentage.

And that's why Murphy's teammate, Ryan Zimmerman, is having a bounce-back year.

So much of Zimmerman's approach in 2017 is similar to his struggle-filled 2016 season. Zimmerman is swinging at a similar percentage of pitches in the strike zone (58.5 percent in 2016 compared to 61.4 percent in 2017) and making contact at nearly the same rate on those pitches (84.9 percent vs. 83.9 percent). But his launch angle increased from 7.9 degrees in 2015 to 10.3 degrees this season, pushing his groundball-to-flyball rate down from 1.38 to 1.20 over that same span. Add to that a slight increase in his average exit velocity improved (from 91.8 mph to 92.9 mph) and you have a higher quality of contact being made. Zimmerman's 23 barrels in 192 plate appearances is tied for the third-most in the majors this season among batters with at least 100 batted-ball events. He had just 23 barrels over 467 plate appearances in 2016.

The results show up clearly in his slash line as well, leaping from .218/.272/.370 to .368/.409/.709. That increase is nothing short of miraculous. Zimmerman had the worst offensive wins against replacement mark of any major league batter with over 400 plate appearances last season. This season, he's seventh, with MVP candidates like Mike Trout and Bryce Harper ahead of him. While improved health and Zimmerman's natural talent certainly played a role, one change to a swing plane helped make one of the league's worst batters into one of its best.

But the swing plane can only do so much. Just ask Jason Heyward. The Chicago Cubs outfielder hit a third of batted balls in play in the air in 2016, but saw his slugging percentage dip to a career low (.325) due to his exit velocity dropping from 89.3 mph to 86.6 mph in one season. This year his exit velocity is back up to 88.3 mph, with a corresponding rise in slugging (.407) and home-run rate (3.2 percent vs. 1.1 percent in 2016).

It remains to be seen what adjustments pitchers will make to combat so many baseballs leaving the yard, but for now we can all enjoy a new golden age of home runs, fueled at least in part by data.

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