Stuff+: New Metric Changing Baseball Pitching

GRACE BURNS, GRAHAM DYNIS, KALEB JORDAN, & ISAIAH KUEHL

Introduction to Stuff+

Stuff+ is an advanced baseball metric used to evaluate a pitcher's raw stuff, focusing on pitch quality rather than outcomes.

Developed by Eno Sarris at The Athletic, Stuff+ quantifies how well a pitch's physical characteristics compare to league averages.

Stuff+ is measured on a pitch-to-pitch basis, measuring the physic attributes such as: **Velocity**, **Spin Rate**, **Vertical and Horizontal Break**, **and Release Point**.

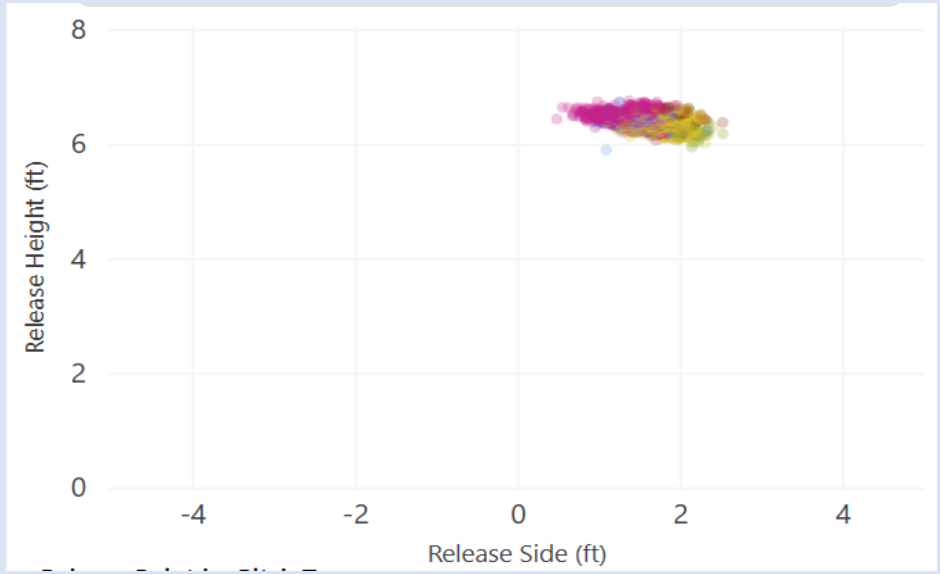
Scaled so that 100 is league average:

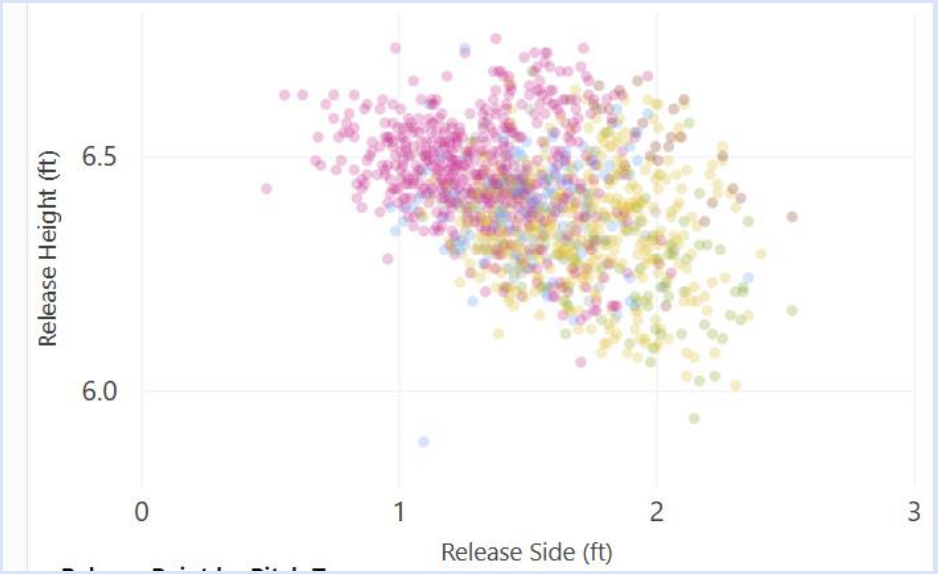
>100: Above-average stuff

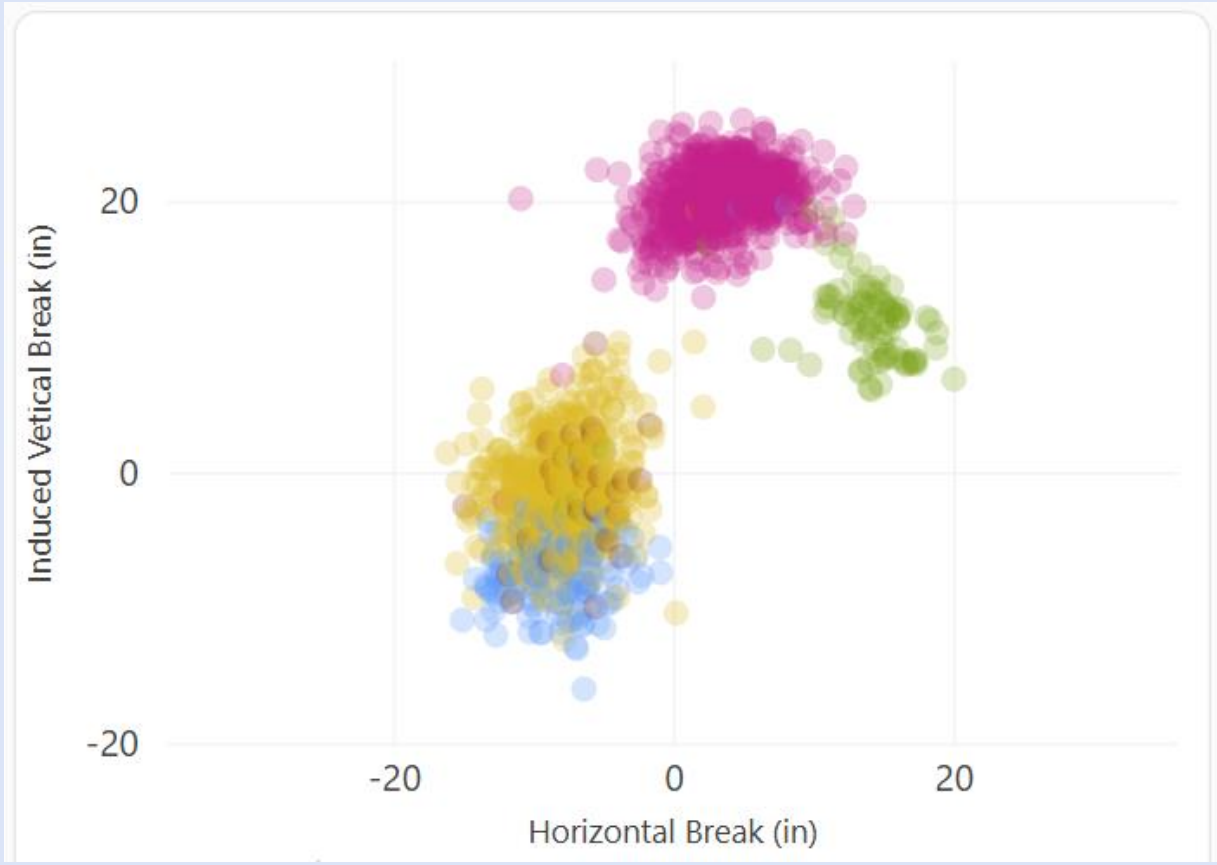
<100: Below-average stuff

Stuff+ Inputs

- Velocity: The speed that the pitch is traveling when the ball is released from the pitcher's hand (in miles per hour).
- Spin Rate: The speed that the pitch is spinning when the ball is released from the pitcher's hand (in revolutions per minute).
- Induced Vertical Break (IVB): Distance, measured in inches, that represents the amount of vertical movement a pitched ball experiences due to the spin imparted on it by the pitcher. It specifically refers to the upward or downward deviation from the expected trajectory of the pitch caused by the spin.
- Horizontal Break (HB): Distance, measured in inches, of lateral movement that a pitcher imparts on a pitched ball through spin. It measures the deviation from the expected straight-line trajectory of the pitch in the horizontal (side-to-side) direction.
- Spin Efficiency: The percentage of spin that is lined up with the axis (spin-based spin direction) of the ball. Generally, the higher the percentage is, the more movement a pitch will have.



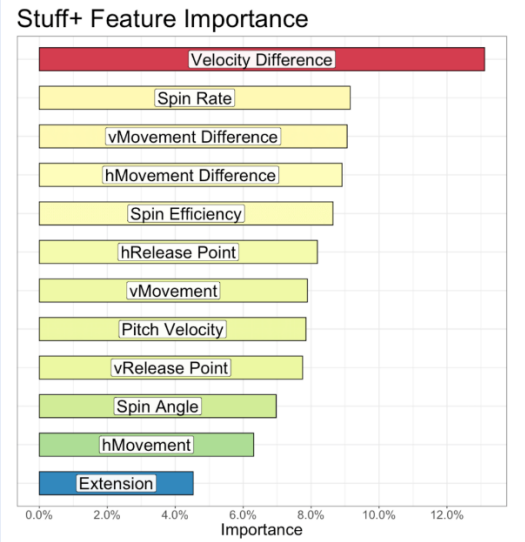


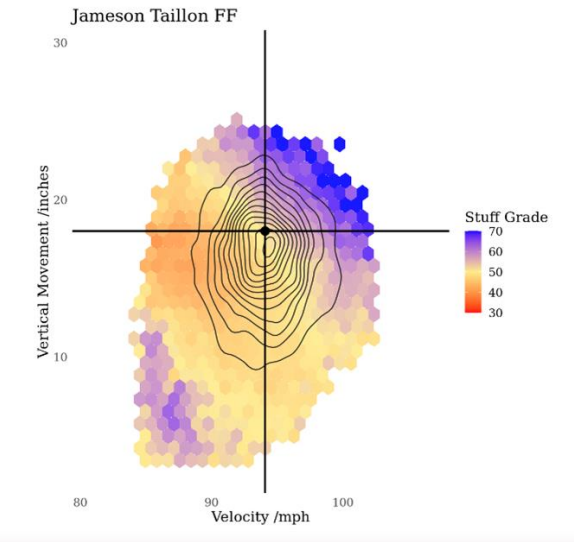


n Types	Pitches	Usage	Velocity	Spin Rate	IVB	HB	Extension
Fastballs							
Four-Seam	620	46.24 %	97.83	2640	20.27	3.57	6.56

How to Evaluate Stuff+

Stuff+ uses numerous different variables to provide accurate and significant insights to a pitcher's performance on pitch-by-pitch basis. For Cameron Grove's model, he uses a 20-80 model rather than the standard model. Grove's model is evaluated on 20-80 scale with an average of 50.





Metric	4-Seam	Cutter	Sweeping Slider	Curveball	Changeup
Velo	82.5	76.8	70.8	67.5	71.3
Spin	2022	2084	2296	2147	1250
H_Break	-3.8	2.6	16.4	14.2	-5.4
V_Break	19.8	10.3	-4.5	-10.5	13.2
V_Release	5.7	5.5	5.6	5.7	5.4
Stuff+ Grade	55	51	52	47	48
Primary Fastball	4-Seam				

This shows a bullpen session of a pitcher where Stuff+ is on a scale of 20-80.

What is Stuff+ Used For?

- Useful for teams & analysts with how they view player acquisition, player development, and in-game strategy
  - Sliders outperformed every other pitch in the model (Specifically the Sweeper)
- Predicting future performance by assessing pitch quality
  - Higher usage rates for Sweepers, Cutters, Sinkers
  - All can be optimized using seam effects to increase horizontal and vertical movements
- Complementing other metrics like ERA and FIP
  - Knowing how to optimize a pitcher's performance for every pitch, we can see an optimization in outcome-based metrics as well

Revisiting Stuff+: An Update on Driveline's Methodology to Quantifying Pitch Design (Lambert, 2024)

- Regularly evaluate and modify the stuff model using newest data to ensure highest accuracy of model, especially important as hitters will eventually adapt to trends
  - Recent trends: ever-growing velocity and increasing significance of the Sweeper
- Two new, major changes to the model include altering the meaning of a pitcher's primary pitch and incorporating an adjusted approach angle metric
  - Primary pitch is now dependent on whether the pitcher is facing a same or opposite-handed hitter
- After the model was retrained, it was discovered that Cutters showed the most improvement while 4-seam Fastballs and Sweepers fell off a bit
  - Important to note that Sweepers are still the greatest performers, as discussed before; their ratings have just dropped since the previous model
  - Though they have not dropped below average and still particularly high

Shown by this table, we can very easily see how Stuff+ can be used by teams to analyze a pitcher's performance.

From this table, both teams are effectively able to use something like this to determine what pitch would be most likely to be thrown to a given batter.

Part of sports is obviously mental, so both teams can utilize this to gain any sort of edge over their competition.

All Pitchers			
Pitch Type	New Stuff+	Old Stuff+	Improvement
CT	102	91	11
SL	101	98	3
CB	93	91	2
CH	99	98	1
SI	104	104	0
FS	106	106	0
FF	98	105	-7
ST	106	114	-8

Pitch Design: What is Stuff+, Location+, and Pitching+? (Pourciau, 2024)

- Location+ is the direct result of a pitcher's throw, where the pitch lands whether it be in or outside of the strike zone.
  - Location+ only cares about where the strike actually ended and is used to measure control and precision
  - Mental vs Physical
- Pitching+ combines factors from Stuff+ and Location+ and adds a few other factors to give an extremely detailed analysis of a pitcher's performance.
  - One other factors used by Pitching+ is batter handedness, which can help pitchers decide what to throw or not throw depending on what hand the batter swings with preference to.
  - Pitching+ is mostly used for it's predictive capabilities

Talking Stuff+

Analytics Questions

- When an organization is scouting pitchers, do you think metrics like Stuff+, Location+, and Pitching+ are more important, or would the traditional metrics like ERA, SO, and WHIP be more useful?
- What limitations does Stuff+ have as a predictive metric and how could it be improved?

Sources

- https://www.nytimes.com/athletic/6048449/2025/02/05/mlb-statistic-stuff-plus-changing-game/
- https://rocklandpeakperformance.com/what-is-stuff-and-how-can-it-help-you/
- https://www.drivelinebaseball.com/2024/05/revisiting-stuff-plus/?srsltid=AfmBOortNFoY2K8hKoDT34U1-UZ-ZneGF4JosUYz4NX010wLUfieRZNN
- https://www.mlbpitchprofiler.com/blogs/metrics_blog
- https://teamportal.trackmanbaseball.com/