Data Guides Frequently Asked Questions

How Should You Use the Charts?

As I mentioned in the article, these charts are more of a descriptive tool, not a predictive one. The primary purpose of the charts is to get a brief overview of where a pitcher's metrics lie within a specific range. For example, if Pitcher A has a dropball that has -8 inches of vertical break, that means the pitch has above-average sink. It does not mean the pitch will produce above-average results, but it is definitely worth knowing this characteristic to determine how the pitcher can develop a more complete repertoire that will ultimately produce above-average or better results. Remember, all MLB teams have access to the same ball-flight data but have different approaches when it comes to player evaluation and development, ultimately proving that the proper analysis of **all** the metrics is the true competitive edge, not just having access to a chart that describes whether a number is high or low on a scale. The predictive portion of the analysis involves using all of the information displayed on the chart to determine if a pitcher has or is close to an optimal velocity/spin/movement combination. For example, there are pitchers with low/average spin rates that have some of the best strikeout numbers of all-time, while there are other pitchers with above-average spin rates that struggle to make it through a lineup twice. By understanding how the different combinations of velocity, spin, and movement play off one another, you would be able to explain why pitchers with below-average characteristics can produce above-average results and vice-versa. To summarize, the predictive component of any analysis is the competitive advantage when incorporating data into your program, however, you can't get good at prediction or making decisions with the data until you understand how to properly describe each pitch, which is the entire purpose of sharing these charts.

What are the Important Differences between the High School and College Scales?

The most obvious difference you should notice between the two scales is the format. The college scales use a more traditional range format while the high school scales use "green" and "red" zones. The purpose of the green/red zones format for high school players is to focus more on quickly identifying characteristics on the extreme sides of the bell curve while not being overly harsh on the players whose metrics are mostly in the middle. Green signifies the metric is above-average on a **collegiate scale,** and red represents the metric is below-average on a **high school scale**.

When deciding how to evaluate each metric, the first step is to determine which metrics are more of a function of strength/age and which are more of a function of skill. We identify velocity and spin as strength/age-based metrics and vertical and horizontal break as skill-based metrics. For spin and velocity, there is a significant difference between the high school and college samples, and those differences are reflected in the data scales. When evaluating spin rates on younger pitchers, we prefer to use the normalized spin rate (spin rate divided by velocity) because it gives us a better understanding of what a low, average, above-average and high spin should be when controlling for velocity (i.e., for every 1 MPH, the pitcher produces 17 RPMs of spin). This approach makes it easier for us to compare a high school pitcher's ability to spin a ball to a college pitcher despite the significant velocity differential. If the high school pitcher's raw spin rates were already above-average on a college scale, she would be rewarded for that on our reports.

For vertical and horizontal break, the average difference in movement between high school and college pitchers is not that large (about 1-2 inches), which is why the below-average/above-average cutoffs remain relatively similar. The most notable difference is that the vertical break red zone in the high school scale is more forgiving than the "Low" vertical break range for the college scale. Please note that when drawing cutoffs for the "red" zone of the movement chart, we took into account how the pitch-type should move and did not overly rely on how the pitcher classified the pitch. For example, you could make the argument that the lower range of riseball vertical break could be extended into the -2/-3 range, but we would argue that a pitch with -2/-3 inches of sink is technically a fastball, therefore the start of the "red" zone for vertical break should be adjusted to -1. I also want to note that even though the overall difference in movement between high school and college pitchers is not significant from a pure averages standpoint, there is still a notable difference when you analyze how the pitches move relative to one another, specifically with regards to the better college pitchers. When you track a normal distribution of high school talent, you are still going to see the down-ballers, up-ballers, and everything in between just like you would in college, so when you analyze the samples, the college and high school movement numbers will be somewhat similar. But let it be known that there are noticeable movement differences with the more advanced college pitchers, and those differences become more apparent when we take into account the quality of the velocity/spin/movement combination as a whole.

How Do You Identify Data Errors?

It is important to note that no matter how much money you spend on a ball-tracking device, they will always be prone to data errors. It is an **essential** responsibility of the data operator to identify data errors, or else you run the risk of providing a player or coach with an inaccurate analysis. The easiest way to identify data errors is to study the different ranges for each metric, particularly total spin, vertical break, and horizontal break so that the machine operator can quickly identify whether or not a data reading consistently falls out of a metric's expected range. For example, if a pitcher throws a riseball that has 8 inches of positive vertical break, but the majority of the riseball readings are between 0-2, that 8-inch reading is not an exceptionally good pitch, it is a data error. If you are on the fence of whether or not a data reading is legitimate, have the pitcher keep throwing the pitch until you get a better sense of her true data range. If you are still uncertain, play it conservative and delete what appears to be any extreme data point. In small sample situations like bullpens, a conservative approach is always better because you do not want the outlier measurements significantly affecting the averages/medians.

What is the Difference between Rapsodo 1.0 and 2.0 Scales?

For those who are unfamiliar with Rapsodo's product line, the 1.0 pitching unit is the radar that sits on top of a tripod six feet behind home plate, and their 2.0 pitching unit is placed inside a protective shell that sits on the ground 15.5 feet in front of home plate. When Rapsodo upgraded to their 2.0 unit, we started to see a slight uptick in movement since the 2.0 unit was tracking the ball out of the hand for approximately the **first** 27.5 feet, whereas the 1.0 unit was tracking the **last** 15/20 feet of ball flight. Both methods use a physics model to calculate the horizontal and vertical break for the full 43 feet. To calculate the average movement increase from 1.0 to 2.0, we had a significant amount of pitchers throw on both versions and filtered through pitches with groups of nearly identical velocity, spin rate, spin axis, and spin efficiency. Once we found comparable pitch pairings, we analyzed the changes in vertical and horizontal break. Take a look at two examples below.

Unit	Velocity	Spin Rate	True Spin	Spin Axis	Spin Eff	VB	HZ
1.0	51.5	1021	511	12:52	50.1	4.2	2.0
2.0	49.9	1110	582	12:52	52.4	4.4	3.3

Unit	Velocity	Spin Rate	True Spin	Spin Axis	Spin Eff	VB	HZ
1.0	63.3	1085	546	5:24	50.3	-4.2	1.5
2.0	63.9	1059	485	5:24	45.7	-4.2	2.2

After analyzing many pairs of similar pitches, we determined that horizontal break increased significantly more than vertical break. As a result, our generic movement adjustment from 1.0 to 2.0 is **a 0.3 increase in vertical break (increase in the direction the ball is spinning) and a 1-inch increase in horizontal break.** Please keep in mind that there is always give and take with these conversion numbers, but overall it serves as a safe estimate when comparing similar pitches from the different versions. Additionally, you might also see a slight increase in total spin from 1.0 to 2.0, but it was not significant enough for us to re-work our entire spin rate table.

Why are Spin Efficiencies Not Listed in a Range?

Before I answer this question, it is important to first define spin efficiency. Spin efficiency is a metric that reveals how much spin is actually contributing to movement of a pitch. A 100% spin efficiency means the pitch had no bullet spin, while a 0% spin efficiency represents a complete bullet spin pitch. It is important to note that softball pitchers generally have much lower spin efficiencies than baseball pitchers, so do not get overly worried if the numbers seem low.

The main reason why spin efficiencies are not listed in a range format is because different shapes of pitches require different spin efficiencies, therefore it is difficult to create exact cutoffs for the data range. For example, if a pitcher told you she wants to throw a better riseball, the coach needs to determine which shape best fits her repertoire. Take a look at three examples below. These three pitches represent a straight-up riseball (small amount of horizontal break), a normal above-average riseball, and a two-dimensional riseball (above-average vertical and horizontal break).

Pitch 1

VB	HZ	Spin Eff
2.1	-0.2	18.9

Pitch 2

VB	HZ	Spin Eff
2.1	-2.7	35.5

Pitch 3

VB	HZ	Spin Eff
2.1	-3.9	54.1

Here we have three different types of riseballs with three completely different levels of spin efficiency (low, average, and high), all of which perform at a very high level because the different riseball shapes complement each pitcher's movement profile very well. If you are curious, all three pitches come from three well-above-average pitchers that play in the SEC and PAC-12.

Additionally, a spin efficiency cannot be analyzed without looking at the spin direction and spin rate numbers simultaneously. If a pitcher throws a riseball with high spin efficiency, but the direction is pointing down, that high spin efficiency number is entirely useless. On the other end, you could have a pitcher with a perfect spin direction but very low spin efficiency, ultimately costing the pitcher more movement. Regarding spin rate, if a pitcher has a low spin rate and wants to throw a riseball with above-average rise, she needs to get more underneath the ball and produce a higher spin efficiency than a pitcher with a high spin rate. A high spin pitcher would not need as high as a spin efficiency to reach the above-average vertical break threshold because she is naturally generating more force underneath the ball. To simplify, the main takeaway from these examples is to emphasize that the amount of spin efficiency needed is dependent upon which direction the ball is pointing and how much total spin the pitch has, thereby making it difficult to evaluate this metric on a standard scale. The chart is simply meant to give coaches an understanding of how the metric varies for each pitch-type. To use this chart correctly, identify the pitcher's target movement profile for the pitch, and determine whether that profile requires spin efficiencies in the low, average, or high range. **If you want an oversimplified formula to semi-evaluate spin efficiency, good rising pitches are generally around 35%, and good sinking pitches are 85% and above.**

Note: The reason why the FB spin efficiency row has a large variance is because fastballs are typically a worse version of the pitcher's primary movement pitch, which can represent a wide array of pitch shapes. For example, if a pitcher is primarily a down-ball pitcher, the FB would typically be a slightly worse version of the dropball. If the pitcher is mainly an up-ball pitcher, the fastball generally is a slightly worse version of a riseball.

Why are Changeups Graded Differently?

Changeups are what I refer to as a relative movement pitch, meaning their performance is heavily dictated on the quality of a complementary pitch. When evaluating sink, a quality changeup can either have good total sink or sink under the primary hard sink pitch. When evaluating horizontal break, changeups are most effective if their horizontal break is similar to their primary sink pitch, so the smaller the differential in horizontal break between the CH and FB/DB, the better. Finally, when evaluating spin rate, we favor low spin changeups over high spin changeups because we want to avoid over-spinning the slowest pitch in the repertoire and give the hitter an obvious clue a changeup is coming (i.e., a flip changeup).

Why Do Rise Pitches Have Similar Scales? Why Do Sink Pitches Have Similar Scales?

Short answer—because all rise pitches move very similarly, and all sink pitches move very similarly. From a data standpoint, it is most logical to classify pitches into three categories: up-pitches, down-pitches, and slow pitches. There is some slight variance between the different pitch-types within each category (i.e., curveballs are more prone to slight sink than riseballs), but overall the movement profiles for each group are very similar.

Why Does the "Red" Column of the Horizontal Break High School Table Not List Numbers?

For both college and high school reports, we do not flag below-average horizontal break numbers (changeup being the exception—those are horizontal blend numbers) because the majority of softball pitches do not have a lot of horizontal movement to begin with, making it difficult to draw a cutoff for the below-average threshold. As a result, we decided it was necessary only to flag the above-average thresholds. The "Low" range on the college sheet is simply meant to show how the sample varies for each pitch-type.

Can You Use These Charts for Other Ball-Tracking Technologies?

Unfortunately, you cannot. Each technology has a different method of tracking a softball, so the data will always have some sort of variance between the various devices. Other optical products produce similar results to Rapsodo, but they are not an apples to apples comparison.

Are These Charts Likely to Change?

Yes, but we do not anticipate making any drastic changes. Every August before I start college assessments, we do an in-depth analysis of the updated database and determine if there should be any changes to the scales. The most likely minor change to the scales will probably be on the horizontal break table, especially since the new Rapsodo software updates on the 2.0 data seem to show an increase in horizontal movement. As you can tell from all the information listed above, summarizing all this information into a single document is one of the most challenging parts of my job, but we are continually evaluating new data and our statistical techniques to make a data guide that best represents the high school and college softball populations.

Questions?

Feel free to reach out to me via email (nhwalker34@gmail.com) or Twitter (@DomiNate34).