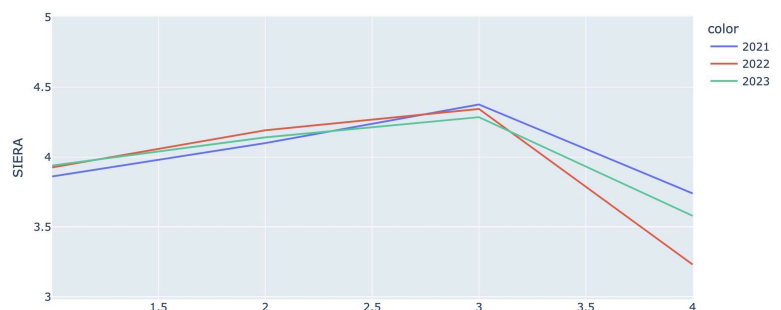


One of the hardest parts of constructing a roster is defining which players will have specific roles on the pitching staff. There are usually a few locks for starting pitchers - based on previous results - and a few locks for pitchers who will be coming out of the bullpen - failed starters who have had success in the bullpen, or pitchers who have had long term success coming out of the pen. If being able to quantify which pitchers should be in each role, that would make both current and future roster construction easier. Managers, coaches, and front office personnel would be able to make a decision based on set parameters, instead of going on a case by case basis.

For starters, we wanted our baseline stat to be results based. A lot of surface level stats for pitchers are highly influenced by factors that the pitcher can not control, such as poor defense, poor contact quality resulting in a hit (ex. bloopers), or pitching in a hitter-friendly stadium as their home ballpark. To work around that, we decided to focus on SIERA as our result we wanted to predict. While it does not entirely factor out uncontrollable factors, it is still centralized around walks and strikeouts, the two outcomes a pitcher has complete control over. It also gives more credit for a pitcher inducing a ground ball, flyball, or popup - the three types of balls put into play that most often result in an out.

Our next step was using SIERA to measure a pitcher's effectiveness throughout the course of a game. A popular trend lately has been pulling a starter before he can get to the opposing batting order for a 3rd time. This is due to a pitcher having a decrease in performance as he faces a batter multiple times throughout the game. To measure this, we used the SIERA formula found on Fangraphs to derive a pitcher's SIERA for each time through the order in each season. We then found the correlation of SIERA as a pitcher goes through the order multiple times. As expected, SIERA increases as a pitcher goes through the order multiple times, with the exception of the fourth time through the order. This is due to a small sample size, and is not seen to be significant in our findings.



Another characteristic of a starting pitcher is the capacity to throw at least three pitches to attack hitters. We measured this ability in two ways: entropy and a way to measure the strength of a pitch. Entropy is how difficult it is for a batter to predict a pitcher's pitch usage and tendencies. The higher the entropy, the more unpredictable a pitcher is. A higher entropy is influenced by a pitcher having a deeper arsenal, a pitcher constantly mixing up his pitches, and a combination of the two. We then split it based on batter handedness due to some pitchers having different usages based on if the batter is right handed or left handed. A strong candidate for a starter will have high entropy for both RHH and LHH, meaning they will have strong, neutral platoon splits. With Stuff+, we took the mean Stuff+ for each pitch, and added one half of a standard deviation to create a threshold for an "above average pitch". We then went through each pitcher, and determined how many "above average" pitches they had based on the threshold.

Once we set all of our variables, we split our data into relievers and starters, based on the classification given to us by Fangraphs. We standardized all of our variables to preserve negatives, and set

weights to each variable. We also set different weights for starters and relievers based on what is more important for each role. Once the weights were set, we calculated  $r\_score$  (reliever potential), and  $s\_score$  (starter potential). After calculating the differences between the two, we picked our candidates to switch roles.

The three pitchers we think should move from relievers to starters are Jaime Barria, Alex Lange, and Isaiah Campbell.

The three pitchers we think should move from starters to relievers are Tyler Wells, Sean Manaea, and Jordan Wicks.