

MLB Pitching Strategy and Stolen Bases

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Three questions:

1. Do pitchers change their strategy when a runner is on first base?
2. Should they change their strategy in this situation? In other words, is this strategy optimal?
3. How can they make improvements to their current strategy to reach a more optimal strategy?

Data

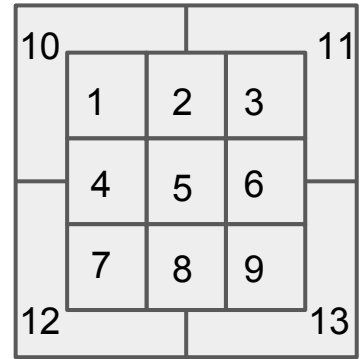
- PITCHf/x data for the **2015 season** was downloaded into a SQL database using the ‘pitchRx’ package in R.
 - Five tables: atbat, action, pitch, po, runner
 - We joined the atbat, pitch, and action tables in order to match steal attempts to pitches
- Taking events from just the **78 qualifying pitchers** across the MLB, we had **~236,000 observations** (pitches) to analyze.

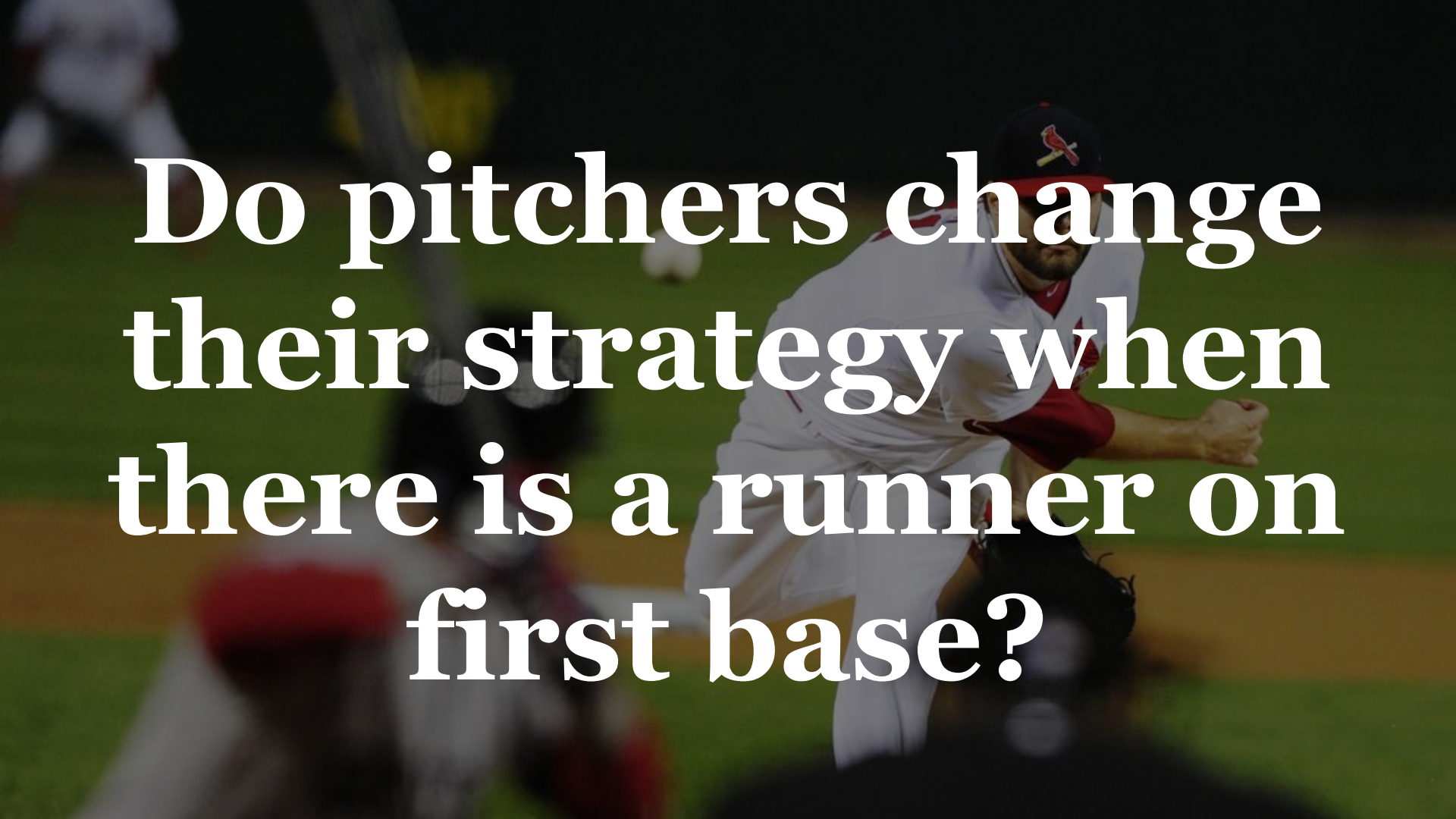
Strategy

In our research, we define a pitching strategy as a combination of pitch location in the strike zone and the type of the pitch.

Fastball = FA + FT + FC + FS + SI + FF

Off-Speed = SL + CU + KU + CH + KN + EP



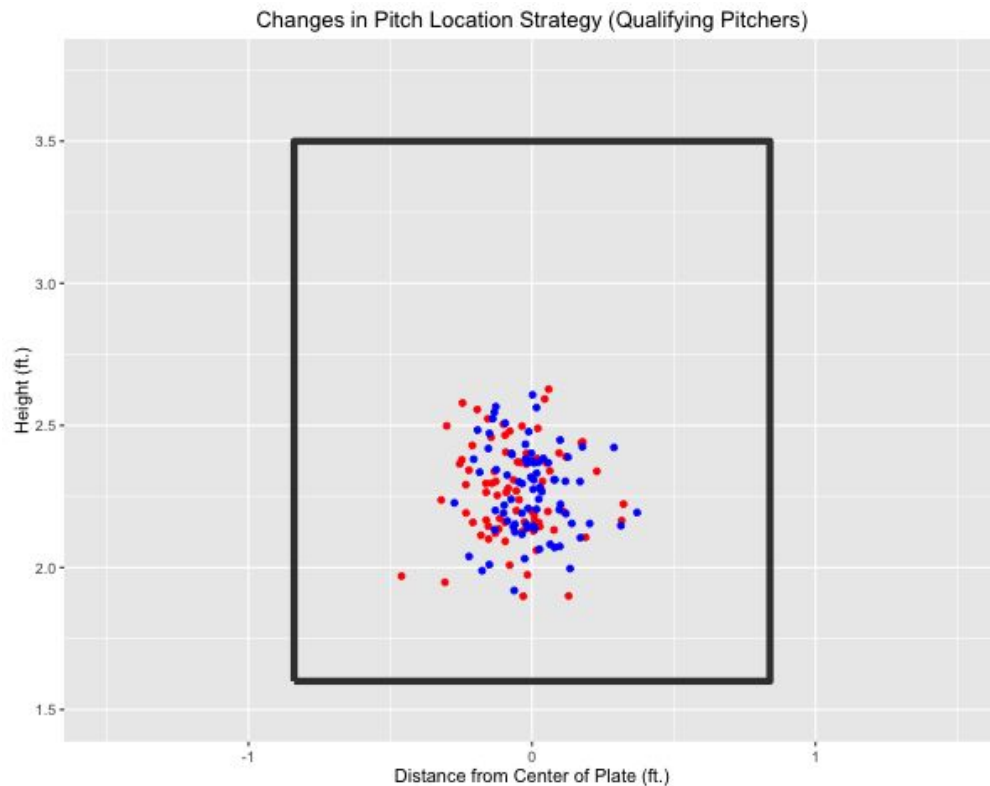


**Do pitchers change
their strategy when
there is a runner on
first base?**

No location change

We did not observe any difference in the location of pitches with a runner on first versus all other play events.

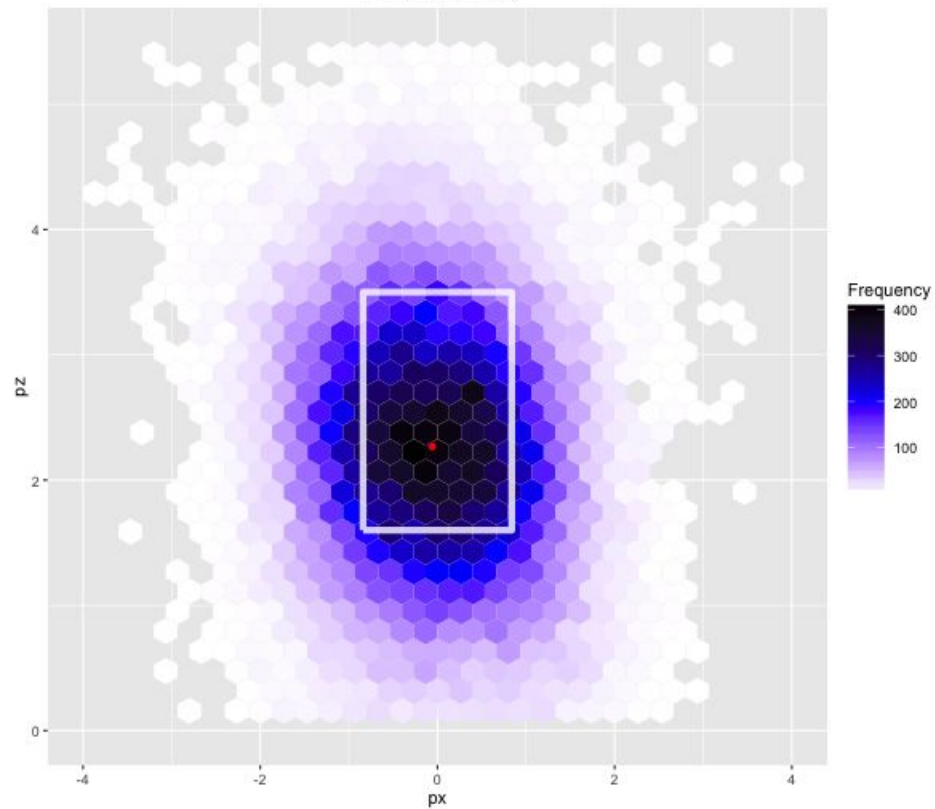
- Mean distance between situation centers = 1.2 in.



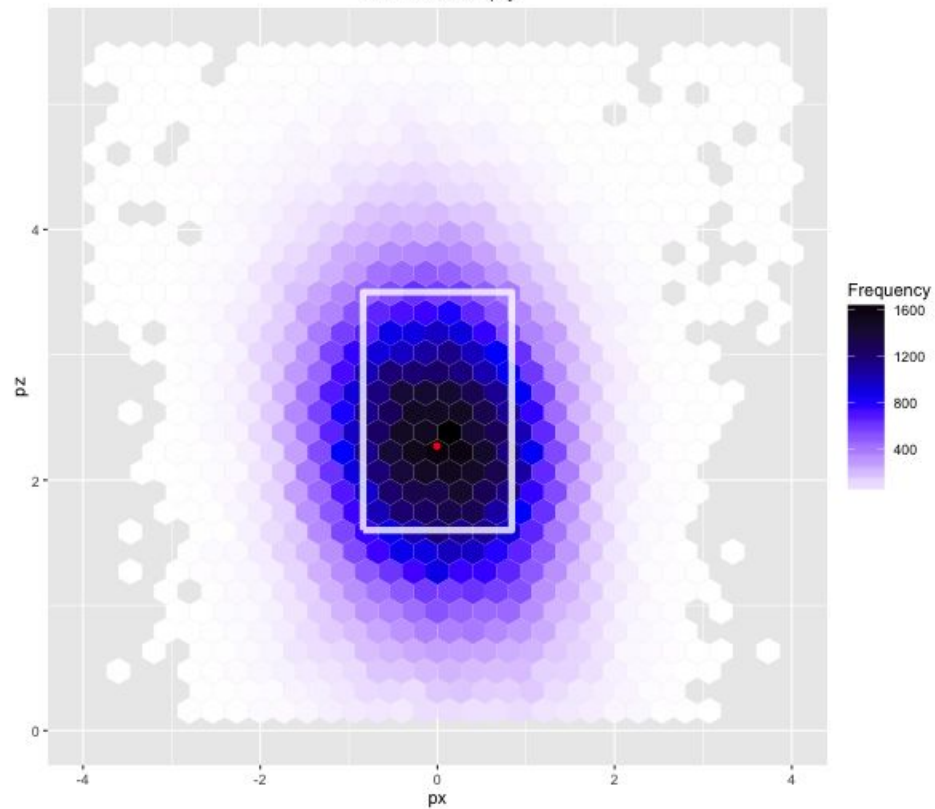
Red = “Runner on first” situation
Blue = Non-“Runner on first” situation

Pitch Location Differences for Qualifying Pitchers

Runners on First

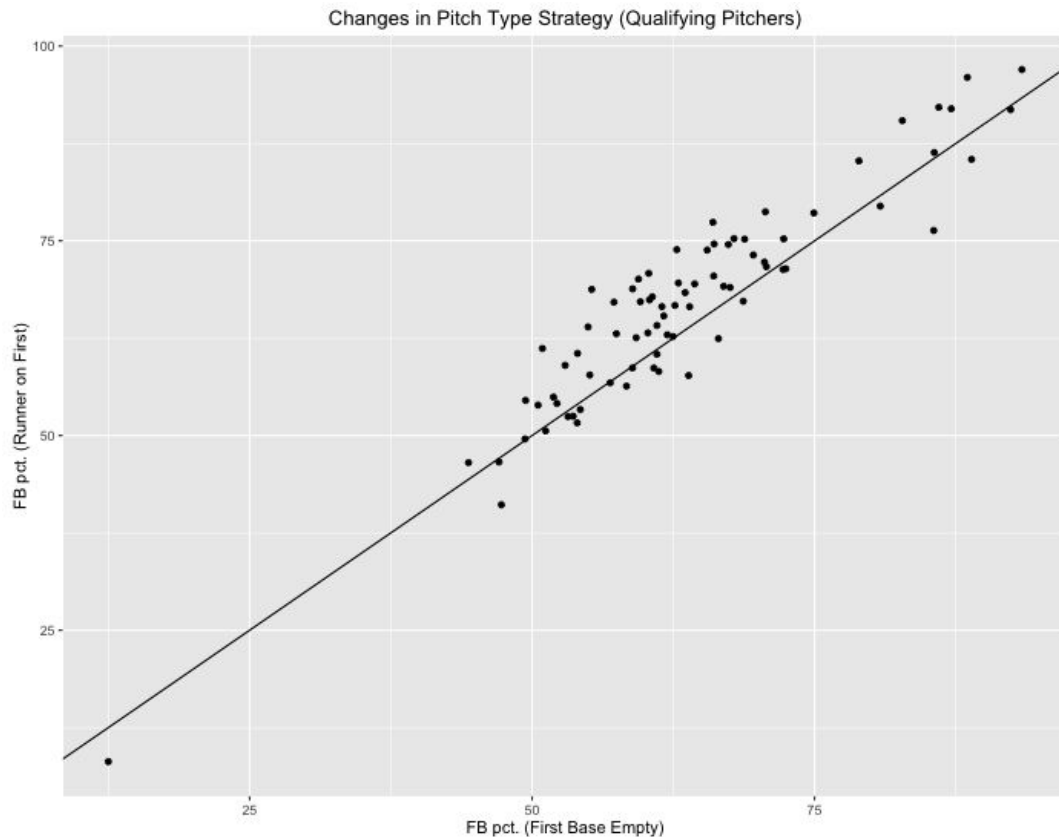


First Base Empty



Change in pitch type

Mean Difference in FB%: +4.7%
55 pitchers above line, 23 below



Biggest Changers:

Some Pitchers do Change Strategy

Top 9

NAME	%FB Change
Kyle Gibson	24.4
Chris Sale	20.2
Matt Harvey	18
Rick Porcello	17.6
Anthony DeSclafani	17.4
Jose Quintana	17.3
Danny Salazar	17.2
Chris Heston	16.9
Carlos Martinez	16.4

Bottom 9

Rubby de la Rosa	-3.5
John Lackey	-3.9
Tyson Ross	-4.4
Jimmy Nelson	-4.9
Dallas Keuchel	-6.1
Alex Wood	-9.6
Bartolo Colon	-10.8
Colby Lewis	-13
R.A. Dickey	-34.9



**Should pitchers
change their
strategy?**

$$RE_{pitch} = wOBA + RE_{Ball/Strike} + RE_{SB/CS}$$

$$wOBA = \frac{\sum RE_{BattedBall}}{\text{count}(BattedBalls)} * \frac{\text{count}(BattedBalls)}{\text{count}(Pitches)}$$

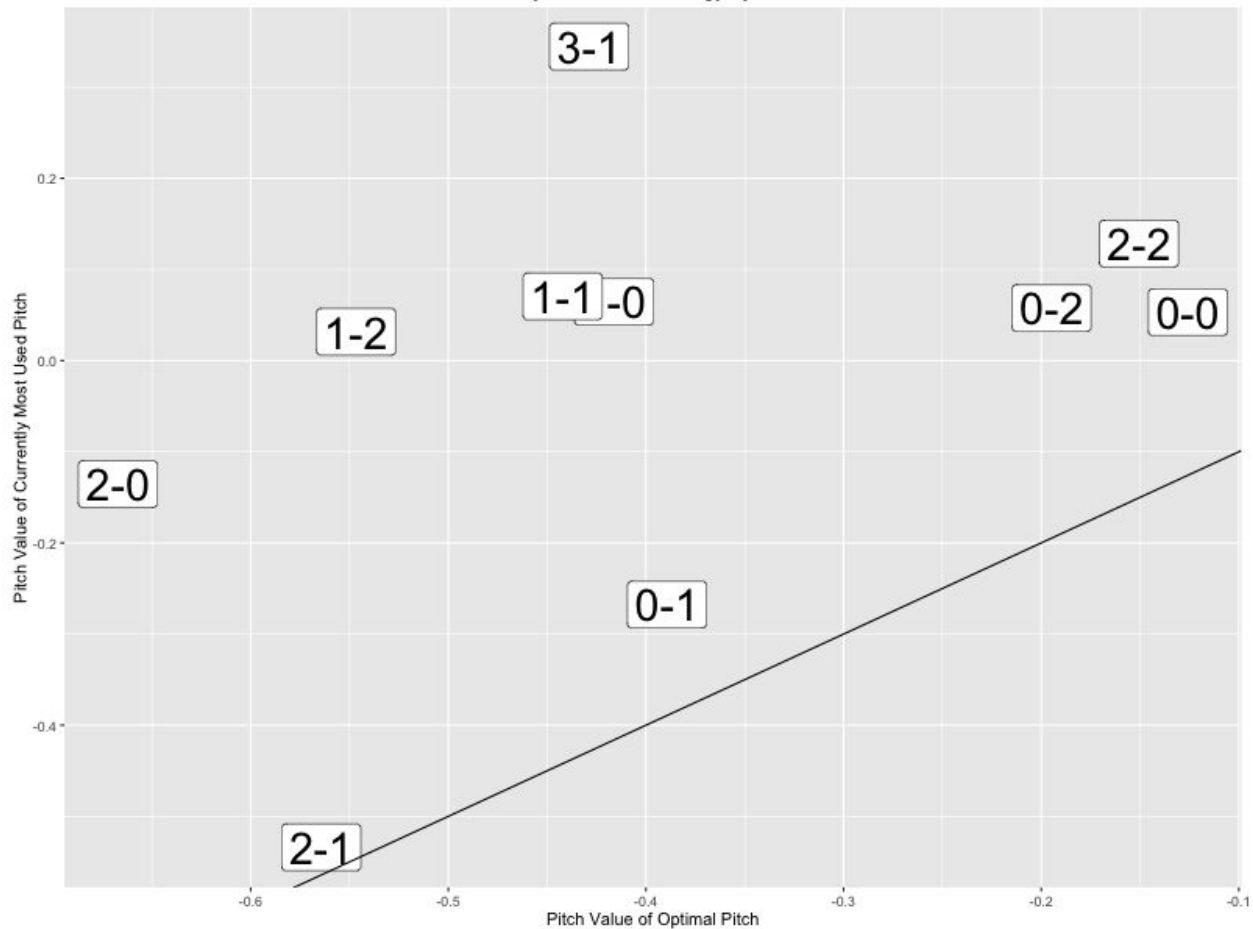
$$RE_{Ball/Strike} = \frac{\sum RE_{Ball} + \sum RE_{Strike}}{\text{count}(Ball + Strike)} * \frac{\text{count}(Ball + Strike)}{\text{count}(Pitches)}$$

$$RE_{SB/CS} = \frac{\sum RE_{AfterAttempt} - RE_{BeforeAttempt}}{\text{count}(Attempts)}$$

Pitches grouped by Count, Zone, PitchType


count	zone	binary_type	freq	sb_value	wOBA	NIP_value	pitch_value
0-0	1	FB	435	-0.092	0.082	-0.027	-0.037
0-0	1	OS	103	0.095	0.065	-0.029	0.132
0-0	2	FB	449	-0.013	0.066	-0.032	0.021
0-0	2	OS	118	0.029	0.057	-0.034	0.052
0-0	3	FB	370	-0.105	0.057	-0.026	-0.074
0-0	3	OS	96	-0.025	0.045	-0.030	-0.010
0-0	4	FB	647	0.047	0.101	-0.031	0.118
0-0	4	OS	190	0.241	0.091	-0.035	0.297
0-0	5	FB	727	0.016	0.143	-0.030	0.130
0-0	5	OS	227	0.115	0.122	-0.034	0.203
0-0	6	FB	594	0.123	0.065	-0.032	0.156
0-0	6	OS	205	0.009	0.084	-0.033	0.059
0-0	7	FB	569	-0.013	0.072	-0.029	0.030
0-0	7	OS	222	-0.065	0.069	-0.030	-0.026

Analysis of Pitch Strategy by Count



Best Value Pitch vs. Most Used Pitch

count	rec_type	rec_zone	rec_value	freq_type	freq_zone	freq_value
0-0	FB	10	-0.13	FB	13	0.05
0-1	FB	11	-0.39	FB	12	-0.27
0-2	FB	11	-0.19	FB	10	0.06
1-0	OS	4	-0.42	FB	12	0.06
1-1	OS	2	-0.44	FB	12	0.07
1-2	OS	1	-0.55	OS	13	0.03
2-0	OS	2	-0.67	FB	12	-0.14
2-1	OS	12	-0.56	FB	12	-0.53
2-2	FB	11	-0.15	OS	13	0.13
3-0	FB	4	0.02	FB	12	NaN
3-1	FB	9	-0.43	FB	4	0.34



**How should players
make improvements
to their current
strategy?**

0-0 Count Pitch Value

Count	Zone	Pitch Type	Pitch Value
0-0	10	FB	-0.1257412
0-0	3	FB	-0.0742766
0-0	1	FB	-0.0371552
0-0	7	OS	-0.0263108
0-0	9	FB	-0.0149205
0-0	3	OS	-0.0100417
0-0	13	OS	-0.0009116
0-0	11	OS	0.0166525
0-0	12	FB	0.0197576
0-0	2	FB	0.0208645
0-0	7	FB	0.0301951
0-0	9	OS	0.043186
0-0	2	OS	0.0519209
0-0	13	FB	0.0531164
0-0	6	OS	0.0594854
0-0	0	FB	0.0657125
0-0	11	FB	0.0743714
0-0	0	OS	0.0792293
0-0	12	OS	0.1017401
0-0	4	FB	0.1179624
0-0	8	OS	0.121214
0-0	5	FB	0.1295268
0-0	1	OS	0.1316602
0-0	10	OS	0.1459091
0-0	6	FB	0.1558297
0-0	5	OS	0.2030969
0-0	8	FB	0.2288444
0-0	4	OS	0.2973895

Recommendations for 0-0 Count

Count	Zone	Type	Frequency	Percentage	Suggested Percentage
0-0		10 FB	872	34.9%	43.6%
0-0		3 FB	370	14.8%	25.8%
0-0		1 FB	435	17.4%	12.9%
0-0		7 OS	222	8.9%	9.1%
0-0		9 FB	506	20.2%	5.2%
0-0		3 OS	96	3.8%	3.5%

Extensions

1. Cluster analysis to classify pitchers into categories to provide more targeted recommendations
2. Granularize definition of types of pitches to show a nuanced analysis of pitch selection
3. Identify first base runners with high SB% to see how pitchers respond to these runners as compared to all others