The Art of Pitch Selection

Brett Cerenzio, Aidan Gurvitch, Danielle Napierski, Zach Silverstein, and Dylan Stafeil

Why Do We Care?

Importance of Pitch Selection

- Good Pitch Selection Gives Batters the Best Chance to Hit Bad Pitches
- Improves Hitter's Ability to Get Into a Favorable Count

Factors Influencing Pitch Selection

- Pitch Characteristics
 - Type, Location, Movement, Tunneling
- Game State/Situation
- Count (2 Strikes, 3 Balls, etc.)

Impact of Run Expectancy By Count

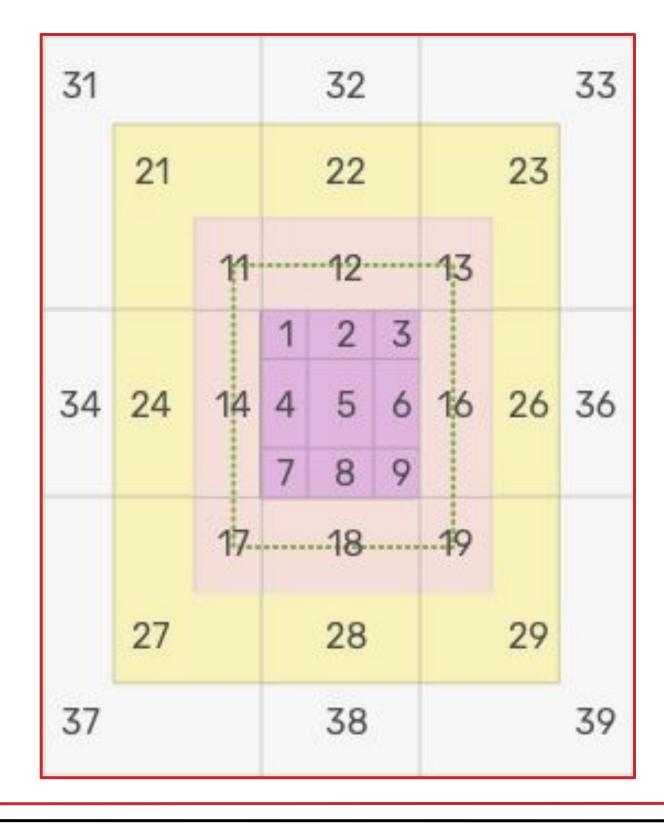
2	2024 Delta Run Expectancy By Count					
S\B	0	1	2	3		
0	0	0.032073	0.088068	0.186876		
1	-0.03758	-0.0156	0.030382	0.124648		
2	-0.08922	-0.06828	-0.03654	0.050445		



The Attack Zone

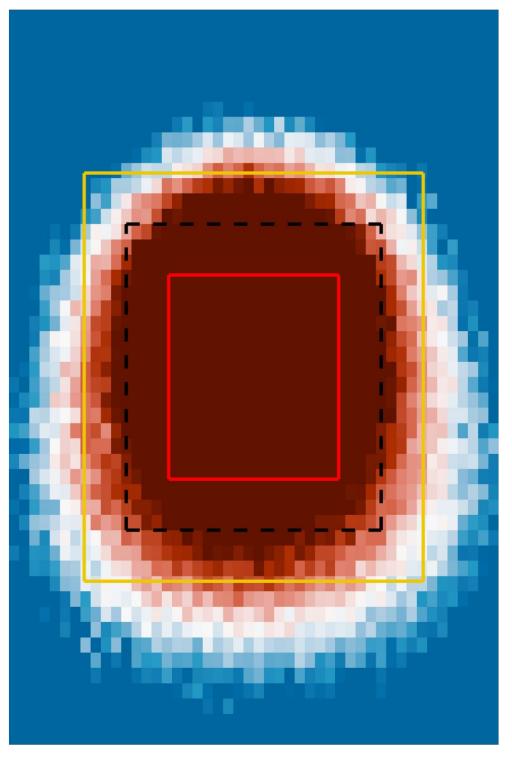
Implemented By Statcast in 2019

Further Divides Hitting Zones	Swing Rate	<u>Strike Rate</u>	
Heart of Zone:	72%	99%	
 Mistake Pitches 			
Shadow Zone	52%	47%	
 Edge of Strike Zone 			
 50/50 Strike/Ball 			
Chase	22%	<1º/o	
 Area Where Pitchers Throw 			
2 Strike Pitches			
Waste	5%	0%	
 Non-Competitive Pitches 			

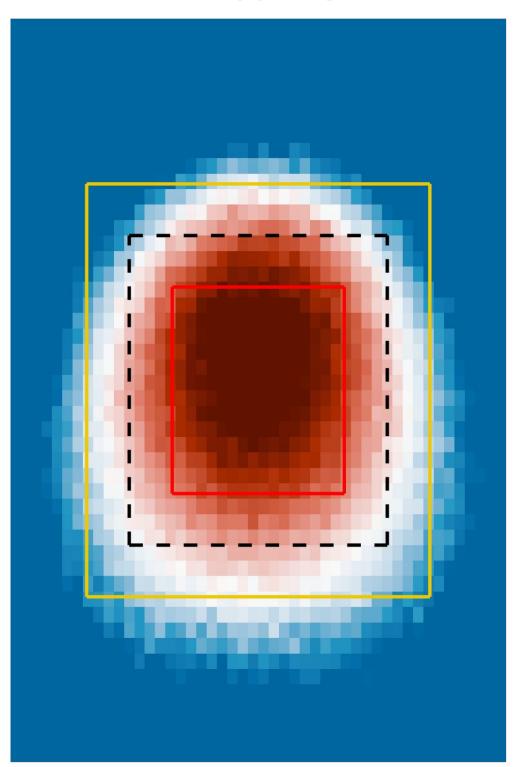


Swing Decision by Count

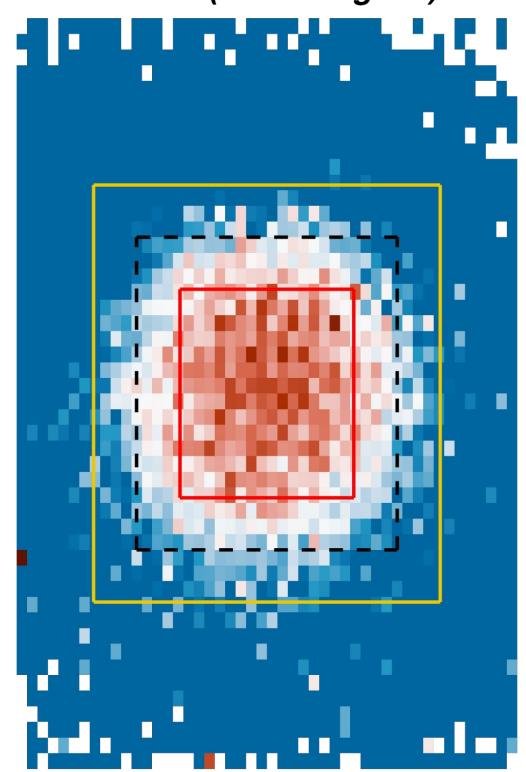




All Counts

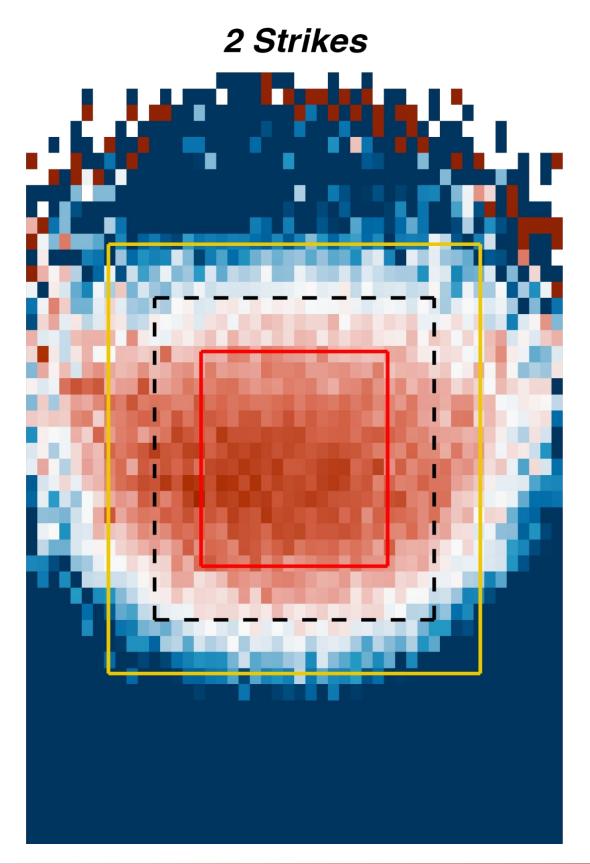


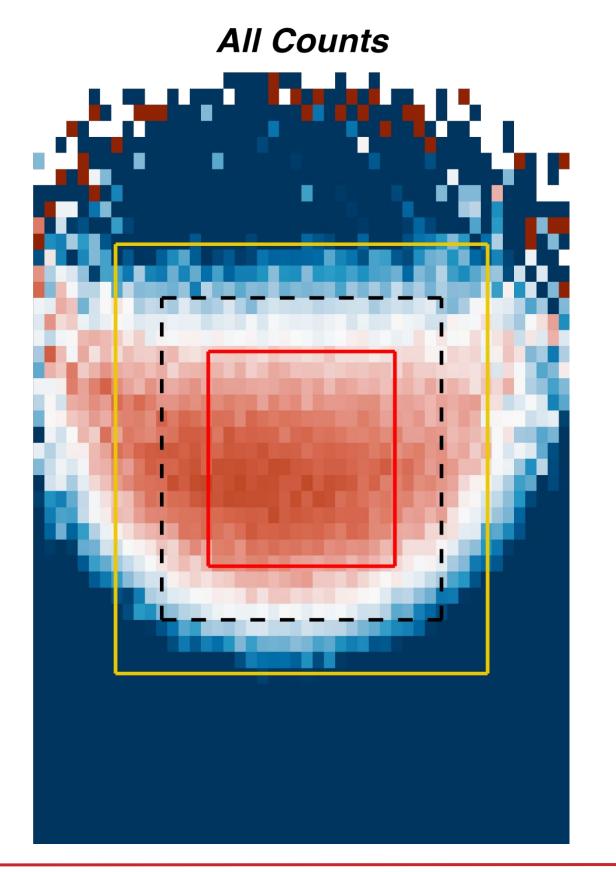
3 Balls (Excluding 3-2)





Contact Probability by Count





Contact%

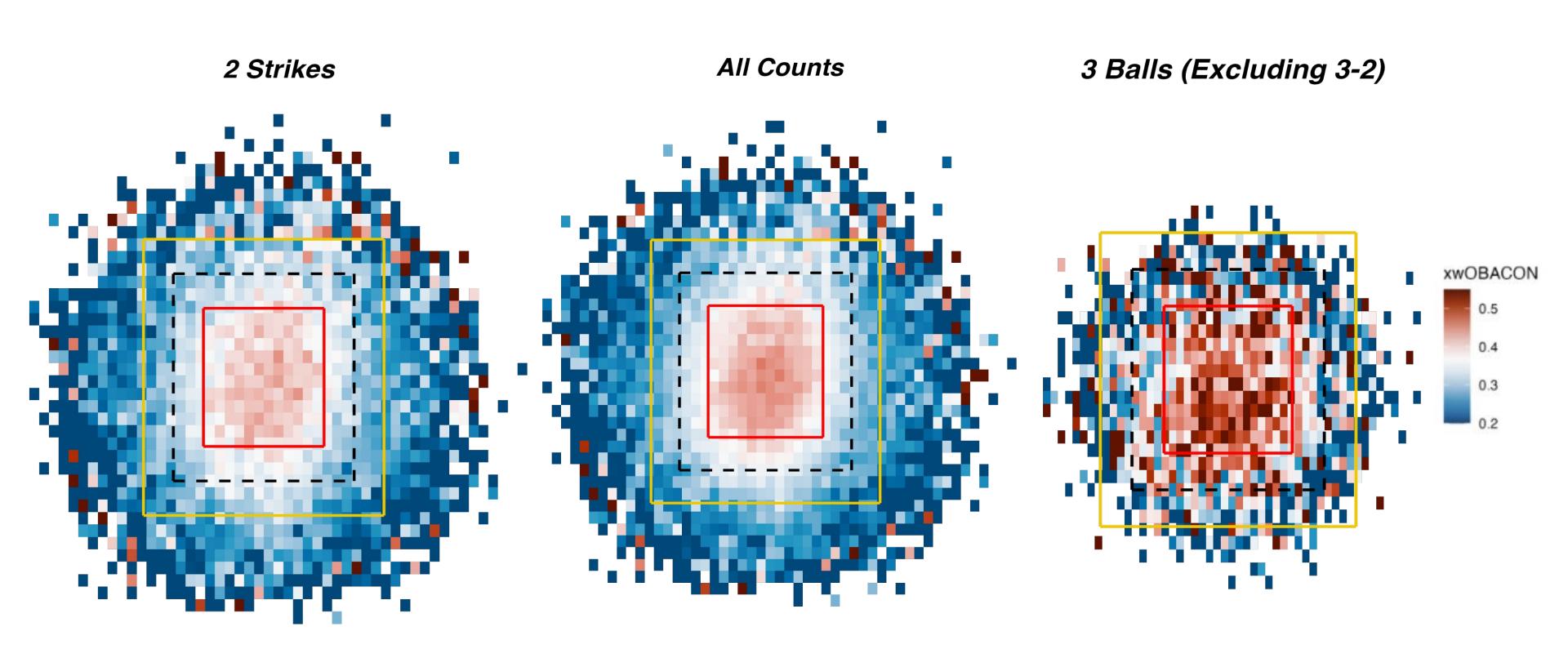
0.85

0.75

0.65

0.55

xw0BACON by Count



Methodology

Making a Good Pitch Selection Requires:

- 1. Contact ------ Run Value
- 2. Damage **xW0BAC0N**

Quantifying Traits:

- 1. Model Swing & Contact Probability
- 2. Model xWOBACON

Pitch Characteristics

- Pitch Type
- Break/Acceleration
- Velocity
- Spin Rate/Axis

Location

- Pitch Coordinates
- Attack Zones (Heart, Shadow, etc.)

Sequencing

- Previous Type
- Diff. in Break
- Previous Location

Other Key Variables

- Season Contact and Swing Rates
- Season wOBA
- Park Factor

 $\Delta RE = RE$ (of next count) - RE (if pitch taken)

Building the Metric

ΔRE = RE (of next count) - RE (of current count)

SWING

ΔRE * (1 - Swing Prob) * (1 - Contact Prob)

xDamage - League Average xw0BAC0N

NO SWING

ΔRE * Swing Prob * Contact Prob

League Average xw0BACON - xDamage

WEIGHTS

2 Strikes Shadow: 0

3 Balls Shadow: 1.2

WEIGHTS

2 Strikes Shadow: 1.2
Heart: 1.5
FF in Heart: 2

3 Balls Shadow: 0.75 FF in Heart: 1.2

^{*} For Both Equations, Weights are Applied AFTER Calculations

^{* 3-2} Counts are UNWEIGHTED

How the Metric Works

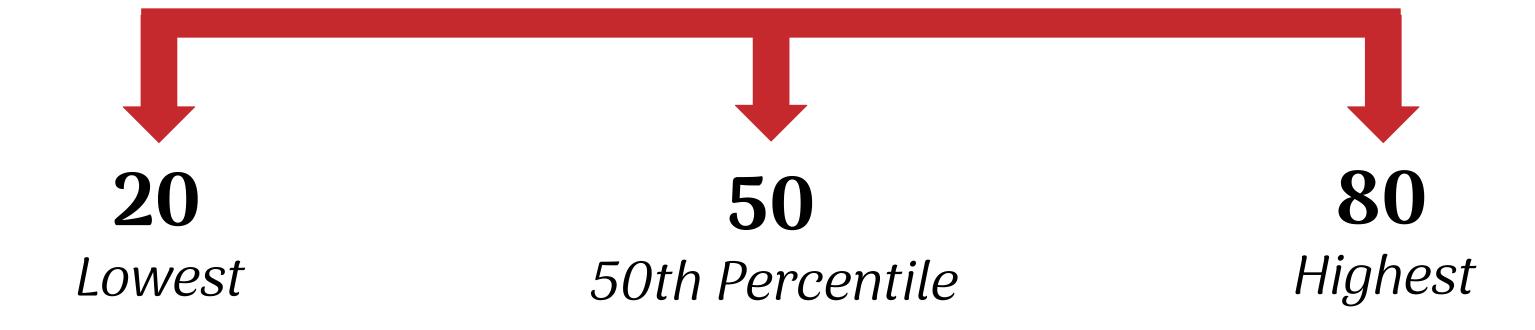
Once Each Statistic is Predicted:

- 1. Find Z-Scores of Contact & Damage Metrics
- 2. Find the Weighted Average of Each Score

0.6 * Contact + 0.4 * Damage since contact is more important

3. Convert to 20-80 Scouting Scale

these steps are on a per season basis



Introducing:

Báez-Arráez Scale (BAS)

The Founding Fathers



Luis Arráez

Season	PA	Contact	xDamage	BAS
2021	488	80	49	68
2022	603	78	47	65
2023	615	80	46	66
2024	694	72	41	59



Javier Báez

Season	PA	Contact	xDamage	BAS
2021	547	44	22	35
2022	584	41	18	32
2023	547	43	23	35
2024	286	39	21	31

Leaderboard

Minimum 150 PAs per Season

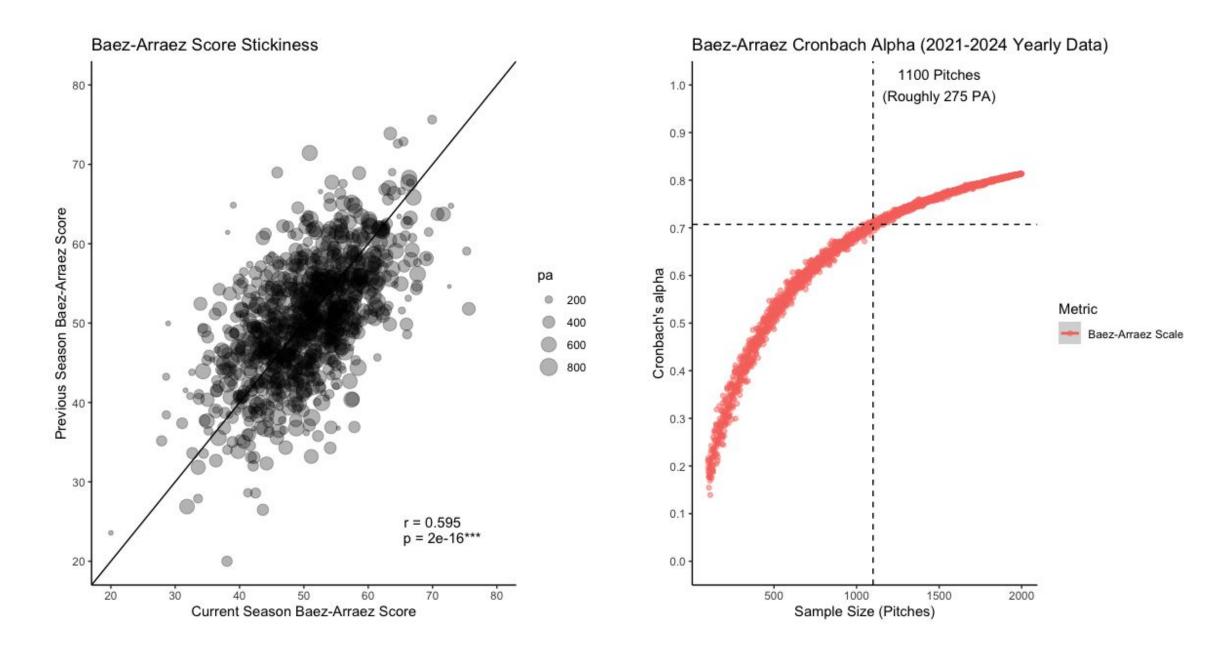
Top 10 BAS

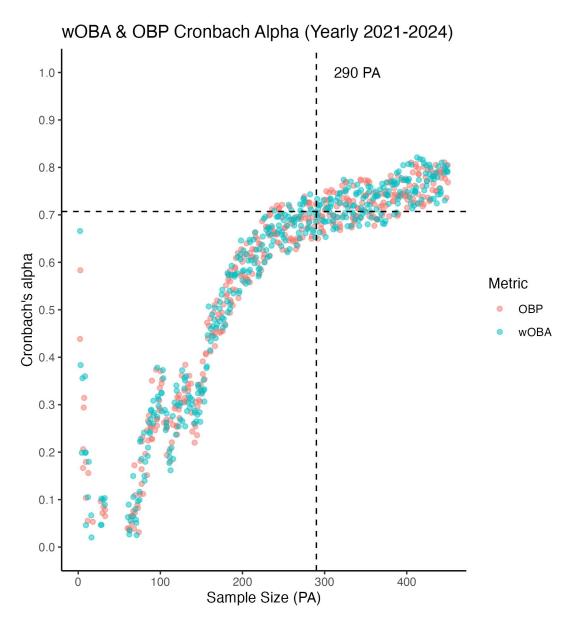
Season PA Contact xDamage BAS Player Ozzie Albies **Kyle Tucker Corey Seager Corey Seager** Mike Tauchman **Brandon Belt** Freddie Freeman Luis Arráez **Corey Seager** Corey Seager

Bottom 10 BAS

Player	Season	PA	Contact	xDamage	BAS
Edmundo Sosa,	2022	191	31	30	31
Elehuris Montero	2022	185	27	35	30
Johan Rojas	2023	200	35	21	30
Tomás Nido	2021	160	49	20	29
Nelson Cruz	2023	156	21	37	27
Oneil Cruz	2022	359	24	30	26
Jose Barrero	2022	170	27	25	26
Elehuris Montero	2023	309	24	27	25
Alex Jackson	2024	154	22	25	23
Alex Jackson	2021	151	20	30	23

Reliability





Limitations

Didn't Remove Hitters who Pitched and Pitchers who Hit

Doesn't Account for Game State

Doesn't Account for Pitcher Quality

Work Cited

- "Statcast Data." Baseballsavant.Com, baseballsavant.mlb.com/statcast_search. Accessed 9 Feb. 2025.
- Tango, Tom "Tangotiger." "Statcast Lab: Working the Count." *Tangotiger Blog*, 20 July 2017, tangotiger.com/index.php/site/comments/statcast-lab-working-the-count.

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