

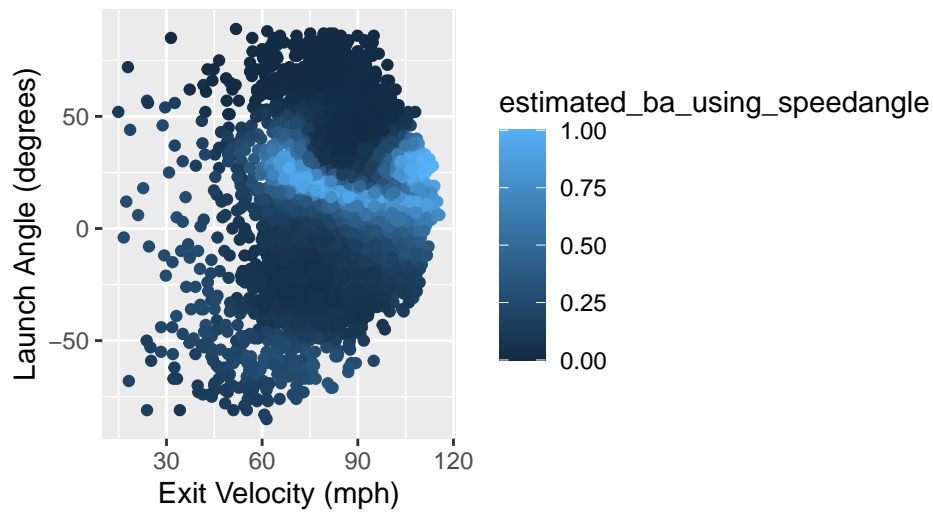
Quantifying The Effect of Pitching Metrics

Max Brown

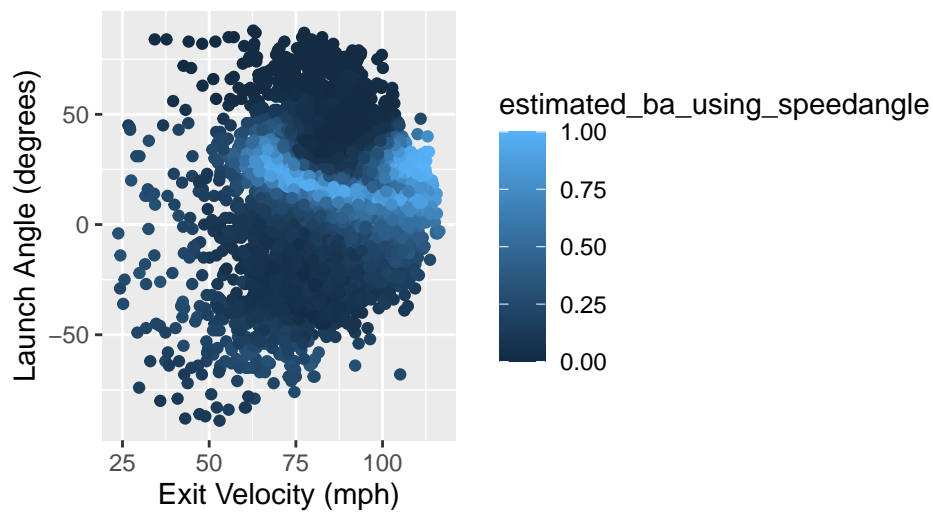
May 20, 2022

General EDA

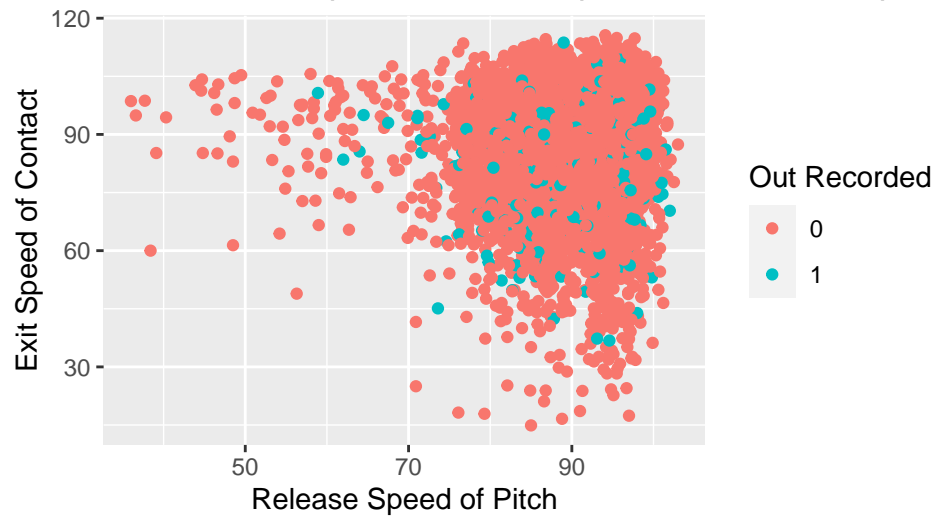
Right-Handed Speed/Angle Breakdown



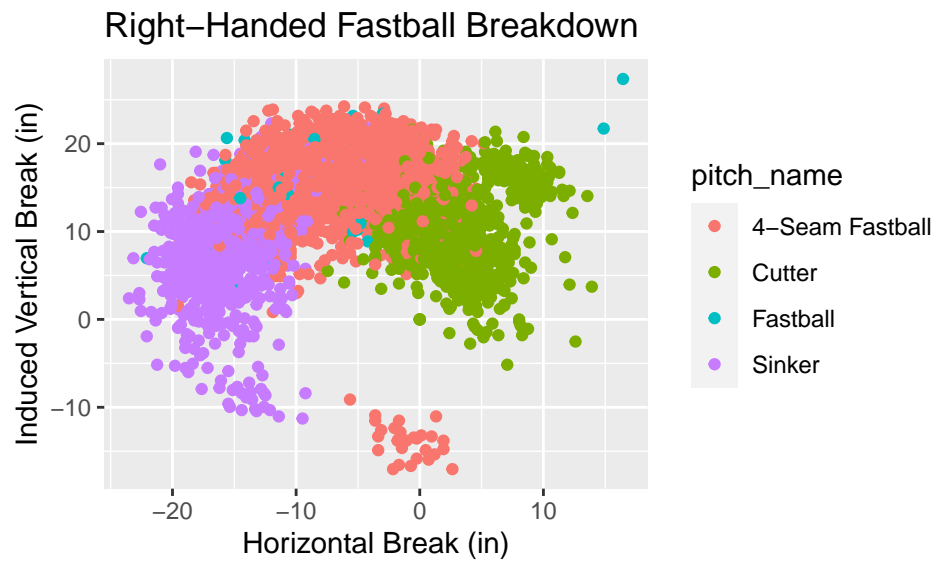
Left-Handed Speed/Angle Breakdown



No Relationship For Release Speed and Launch Speed/



Fastball EDA



Left-Handed Fastball Breakdown

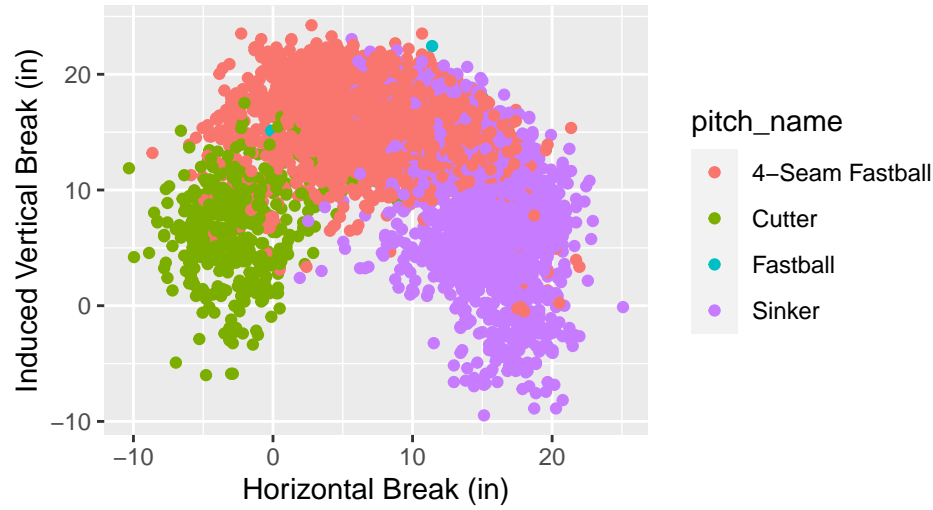


Table 1: Average RH Fastball Type Metrics

pitch_name	release_speed	release_spin	hor_break	vert_break	tilt
4-Seam Fastball	94.89	2304.33	-7.28	16.00	213.42
Cutter	91.86	2412.12	2.96	10.82	180.17
Fastball	69.79	1703.67	-8.79	15.02	221.85
Sinker	94.65	2167.59	-14.87	9.15	223.31

Table 2: Average LH Fastball Type Metrics

pitch_name	release_speed	release_spin	hor_break	vert_break	tilt
4-Seam Fastball	93.78	2288.18	7.36	16.04	150.43
Cutter	88.41	2377.43	-2.67	6.82	189.76
Fastball	65.52	1708.58	7.61	15.01	134.47
Sinker	93.70	2137.25	14.34	9.54	129.77

EDA Breaking Balls

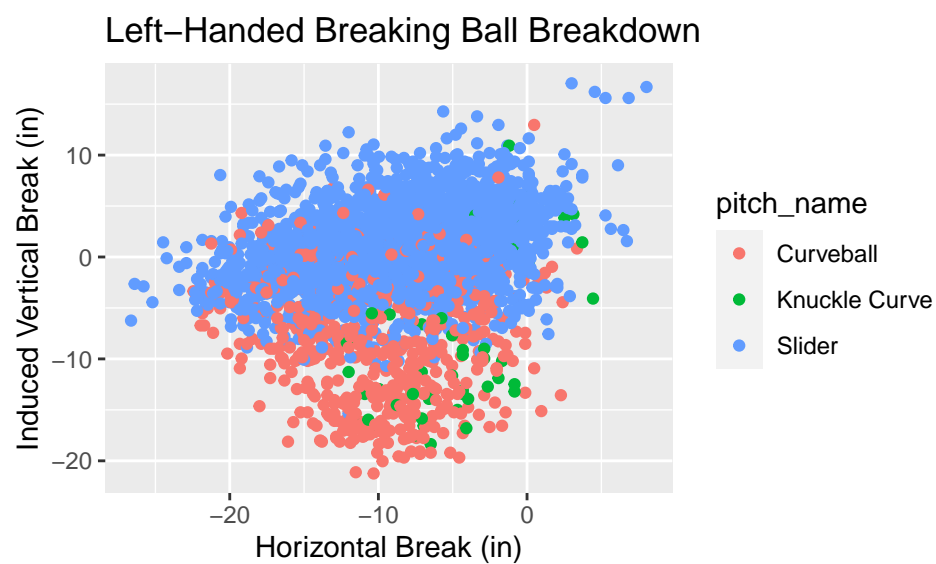
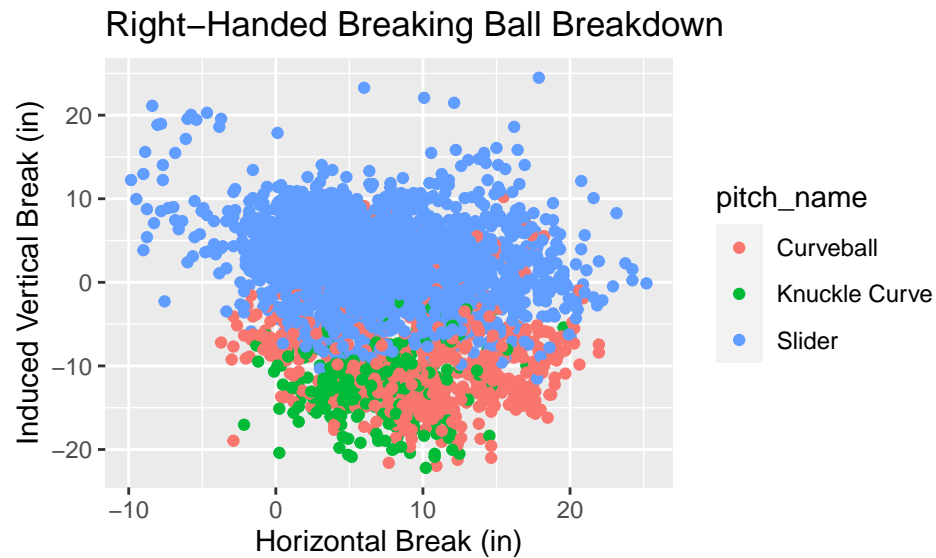


Table 3: Average RH Breaking Ball Type Metrics

pitch_name	release_speed	release_spin	hor_break	vert_break	tilt
Curveball	80.03	2591.57	10.05	-9.54	41.78
Knuckle Curve	82.49	2489.44	6.79	-11.70	33.16
Slider	85.19	2422.75	6.58	2.16	110.67

Table 4: Average LH Breaking Ball Type Metrics

pitch_name	release_speed	release_spin	hor_break	vert_break	tilt
Curveball	78.15	2447.33	-10.12	-8.13	310.40
Knuckle Curve	80.13	2259.08	-4.30	-7.36	283.60

pitch_name	release_speed	release_spin	hor_break	vert_break	tilt
Slider	83.20	2422.00	-8.47	1.17	260.14

EDA Change Ups

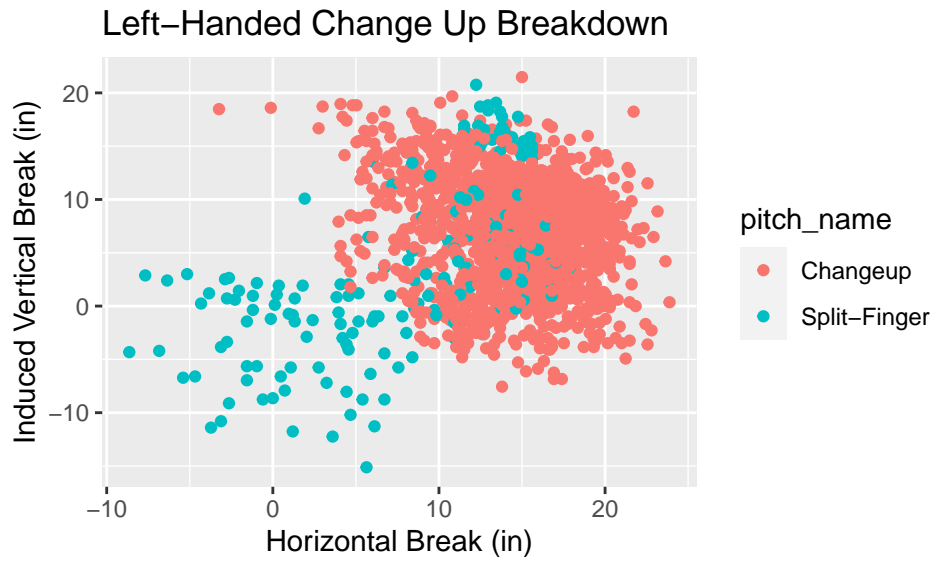
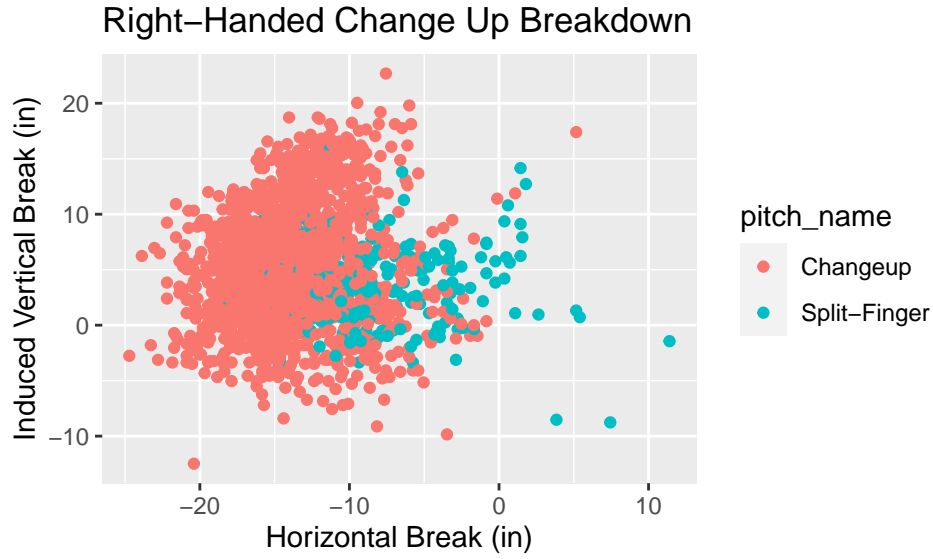


Table 5: Average RH Change Up Type Metrics

pitch_name	release_speed	release_spin	hor_break	vert_break	tilt
Changeup	86.01	1807.24	-14.04	5.51	240.19
Split-Finger	86.84	1162.40	-8.58	3.66	236.59

Table 6: Average LH Change Up Type Metrics

pitch_name	release_speed	release_spin	hor_break	vert_break	tilt
Changeup	84.24	1833.81	14.62	6.90	117.86
Split-Finger	85.21	1241.81	8.23	3.85	127.06

Methodology

Creating Breaking Ball Models

Right-Hand

effect	group	term	estimate	std.error	statistic	p.value
fixed	NA	(Intercept)	0.639	0.816	0.783	0.434
fixed	NA	release_speed	-0.002	0.009	-0.160	0.873
fixed	NA	hor_break	0.003	0.008	0.397	0.691
fixed	NA	ind_vert_break	0.017	0.006	3.056	0.002
fixed	NA	mean_centered_axis	0.000	0.001	0.442	0.658
ran_pars	player_name	sd__(Intercept)	0.000	NA	NA	NA

Left-Hand

effect	group	term	estimate	std.error	statistic	p.value
fixed	NA	(Intercept)	1.041	1.104	0.943	0.346
fixed	NA	release_speed	-0.009	0.013	-0.656	0.512
fixed	NA	hor_break	-0.012	0.008	-1.538	0.124
fixed	NA	ind_vert_break	0.008	0.008	0.943	0.346
fixed	NA	mean_centered_axis	0.000	0.001	-0.043	0.966
ran_pars	player_name	sd__(Intercept)	0.052	NA	NA	NA

Creating Change Up Models

Right-Handed

effect	group	term	estimate	std.error	statistic	p.value
fixed	NA	(Intercept)	-0.359	1.333	-0.269	0.788
fixed	NA	release_speed	0.010	0.015	0.616	0.538
fixed	NA	hor_break	0.010	0.012	0.798	0.425
fixed	NA	ind_vert_break	0.009	0.011	0.850	0.395
fixed	NA	mean_centered_axis	0.004	0.005	0.885	0.376
ran_pars	player_name	sd__(Intercept)	0.210	NA	NA	NA

Left-Handed

effect	group	term	estimate	std.error	statistic	p.value
fixed	NA	(Intercept)	1.029	1.340	0.768	0.442

effect	group	term	estimate	std.error	statistic	p.value
fixed	NA	release_speed	-0.007	0.016	-0.420	0.674
fixed	NA	hor_break	-0.013	0.013	-0.986	0.324
fixed	NA	ind_vert_break	0.011	0.011	1.002	0.317
fixed	NA	mean_centered_axis	-0.001	0.002	-0.255	0.798
ran_pars	player_name	sd__(Intercept)	0.247	NA	NA	NA

Creating RH Fastball Models

RH Sinker

effect	group	term	estimate	std.error	statistic	p.value
fixed	NA	(Intercept)	-2.266	2.294	-0.988	0.323
fixed	NA	release_speed	0.029	0.025	1.152	0.249
fixed	NA	hor_break	-0.015	0.022	-0.671	0.502
fixed	NA	ind_vert_break	0.005	0.014	0.331	0.741
fixed	NA	mean_centered_axis	0.004	0.010	0.406	0.684
ran_pars	player_name	sd__(Intercept)	0.152	NA	NA	NA

RH 4-Seam Fastball

effect	group	term	estimate	std.error	statistic	p.value
fixed	NA	(Intercept)	1.431	1.293	1.106	0.269
fixed	NA	release_speed	-0.014	0.014	-0.962	0.336
fixed	NA	hor_break	-0.005	0.009	-0.584	0.559
fixed	NA	ind_vert_break	0.031	0.009	3.365	0.001
fixed	NA	mean_centered_axis	-0.003	0.007	-0.378	0.705
ran_pars	player_name	sd__(Intercept)	0.000	NA	NA	NA

RH Cutter

effect	group	term	estimate	std.error	statistic	p.value
fixed	NA	(Intercept)	-6.715	3.630	-1.850	0.064
fixed	NA	release_speed	0.084	0.042	2.016	0.044
fixed	NA	hor_break	0.004	0.033	0.128	0.898
fixed	NA	ind_vert_break	-0.020	0.026	-0.781	0.435
fixed	NA	mean_centered_axis	0.003	0.006	0.562	0.574
ran_pars	player_name	sd__(Intercept)	0.246	NA	NA	NA

Creating LH Fastball Models

LH Sinker

effect	group	term	estimate	std.error	statistic	p.value
fixed	NA	(Intercept)	0.042	2.134	0.020	0.984
fixed	NA	release_speed	0.010	0.023	0.420	0.674
fixed	NA	hor_break	-0.017	0.021	-0.796	0.426

effect	group	term	estimate	std.error	statistic	p.value
fixed	NA	ind_vert_break	-0.009	0.013	-0.717	0.473
fixed	NA	mean_centered_axis	-0.007	0.005	-1.431	0.152
ran_pars	player_name	sd__(Intercept)	0.194	NA	NA	NA

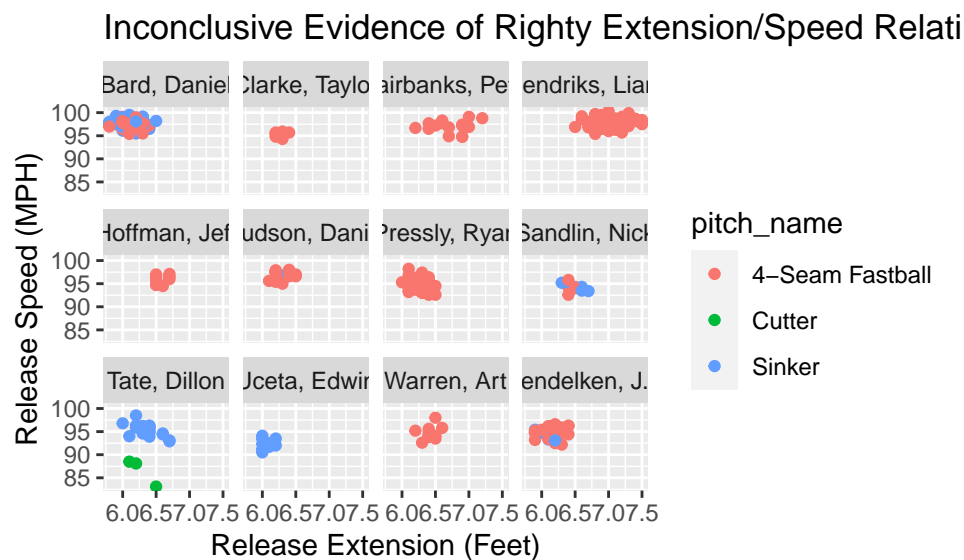
LH 4-Seam Fastball

effect	group	term	estimate	std.error	statistic	p.value
fixed	NA	(Intercept)	-1.002	1.394	-0.719	0.472
fixed	NA	release_speed	0.014	0.015	0.915	0.360
fixed	NA	hor_break	-0.001	0.009	-0.122	0.903
fixed	NA	ind_vert_break	0.020	0.013	1.504	0.133
fixed	NA	mean_centered_axis	0.005	0.005	1.119	0.263
ran_pars	player_name	sd__(Intercept)	0.000	NA	NA	NA

LH Cutter

effect	group	term	estimate	std.error	statistic	p.value
fixed	NA	(Intercept)	-6.715	3.630	-1.850	0.064
fixed	NA	release_speed	0.084	0.042	2.016	0.044
fixed	NA	hor_break	0.004	0.033	0.128	0.898
fixed	NA	ind_vert_break	-0.020	0.026	-0.781	0.435
fixed	NA	mean_centered_axis	0.003	0.006	0.562	0.574
ran_pars	player_name	sd__(Intercept)	0.246	NA	NA	NA

Appendix



Inconclusive Evidence of Lefty Extension/Speed Relation

