

**The LOGISTIC Procedure**

Model Information	
Data Set	WORK.KOBE
Response Variable	shot_made_flag
Number of Response Levels	2
Model	binary logit
Optimization Technique	Fisher's scoring

Number of Observations Read	25697
Number of Observations Used	25697

Response Profile		
Ordered Value	shot_made_flag	Total Frequency
1	1	11465
2	0	14232

Probability modeled is shot\_made\_flag='1'.

## The LOGISTIC Procedure

[illegible]

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### Model Convergence Status

Quasi-complete separation of data points detected.

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**Warning:** The maximum likelihood estimate may not exist.

**Warning:** The LOGISTIC procedure continues in spite of the above warning. Results shown are based on the last maximum likelihood iteration. Validity of the model fit is questionable.

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	35327.083	31103.802
SC	35335.237	31723.516
-2 Log L	35325.083	30951.802

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	4373.2810	75	<.0001
Score	4032.9767	75	<.0001
Wald	2998.6343	75	<.0001

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
action_type	51	2206.7239	<.0001
period	6	23.1797	0.0007
minutes_remaining	1	13.7986	0.0002
seconds_remaining	1	18.8664	<.0001
shot_zone_area	5	36.6999	<.0001
shot_zone_basic	6	22.5584	0.0010
shot_zone_range	2	42.0992	<.0001
game_date	1	19.8546	<.0001
attendance	1	188.4634	<.0001
arena_temp	1	26.1973	<.0001

**Note:** The following parameters have been set to 0, since the variables are a linear combination of other variables as shown.

<b>shot_zone_range8-16 ft.</b> =	-0.78571 * Intercept + 2.5 * shot_zone_aBack Court(BC) - 0.5 * shot_zone_aCenter(C) - 0.5 * shot_zone_aLeft Side Center(LC) - 0.5 * shot_zone_aLeft Side(L) - 0.5 * shot_zone_aRight Side Center(RC) - 1.71429 * shot_zone_bAbove the Break 3 - 1.71429 * shot_zone_bBackcourt + 2.28571 * shot_zone_bIn The Paint (Non-RA) - 1.71429 * shot_zone_bLeft Corner 3 + 2.28571 * shot_zone_bMid-Range + 2.28571 * shot_zone_bRestricted Area - shot_zone_range16-24 ft. + 3 * shot_zone_range24+ ft.
<b>shot_zone_rangeBack Court Shot =</b>	- 0.2381 * Intercept + 1.66667 * shot_zone_aBack Court(BC) - 0.33333 * shot_zone_aCenter(C) - 0.33333 * shot_zone_aLeft Side Center(LC) - 0.33333 * shot_zone_aLeft Side(L) - 0.33333 * shot_zone_aRight Side Center(RC) - 0.42857 * shot_zone_bAbove the Break 3 - 0.42857 * shot_zone_bBackcourt + 0.57143 * shot_zone_bIn The Paint (Non-RA) - 0.42857 * shot_zone_bLeft Corner 3 + 0.57143 * shot_zone_bMid-Range + 0.57143 * shot_zone_bRestricted Area + shot_zone_range24+ ft.



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Warning: The validity of the model fit is questionable.

Analysis of Maximum Likelihood Estimates						
Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		1	-3.7186	14.7329	0.0637	0.8007
action_type	Alley Oop Dunk Sh	1	1.2667	14.4140	0.0077	0.9300
action_type	Alley Oop Layup s	1	-0.7523	14.4094	0.0027	0.9584
action_type	Cutting Layup Sho	1	-0.6506	14.4322	0.0020	0.9640
action_type	Driving Bank shot	1	-0.7338	14.4586	0.0026	0.9595
action_type	Driving Dunk Shot	1	2.0869	14.4126	0.0210	0.8849
action_type	Driving Finger Ro	1	0.2502	14.4092	0.0003	0.9861
action_type	Driving Floating	1	-1.2572	14.4417	0.0076	0.9306
action_type	Driving Hook Shot	1	-0.9857	14.4179	0.0047	0.9455
action_type	Driving Jump shot	1	-1.7863	14.4129	0.0154	0.9014
action_type	Driving Layup Sho	1	-0.5856	14.4070	0.0017	0.9676
action_type	Driving Reverse L	1	-0.4387	14.4091	0.0009	0.9757
action_type	Driving Slam Dunk	1	2.2043	14.4411	0.0233	0.8787
action_type	Dunk Shot	1	-0.4057	14.4078	0.0008	0.9775
action_type	Fadeaway Bank sho	1	0.6363	14.4196	0.0019	0.9648
action_type	Fadeaway Jump Sho	1	-1.3176	14.4072	0.0084	0.9271
action_type	Finger Roll Layup	1	-0.0427	14.4151	0.0000	0.9976
action_type	Finger Roll Shot	1	-1.7217	14.4121	0.0143	0.9049
action_type	Floating Jump sho	1	-0.5425	14.4088	0.0014	0.9700
action_type	Follow Up Dunk Sh	1	0.5965	14.4440	0.0017	0.9671
action_type	Hook Bank Shot	1	10.7030	197.0	0.0030	0.9567
action_type	Hook Shot	1	-2.0952	14.4089	0.0211	0.8844
action_type	Jump Bank Shot	1	-0.2741	14.4077	0.0004	0.9848
action_type	Jump Hook Shot	1	-0.4696	14.4160	0.0011	0.9740
action_type	Jump Shot	1	-2.4466	14.4070	0.0288	0.8652
action_type	Layup Shot	1	-2.0958	14.4070	0.0212	0.8843
action_type	Pullup Bank shot	1	-1.2913	14.4195	0.0080	0.9286
action_type	Pullup Jump shot	1	-0.6719	14.4074	0.0022	0.9628
action_type	Putback Dunk Shot	1	-1.0260	14.4578	0.0050	0.9434
action_type	Putback Layup Sho	1	-0.7234	14.4237	0.0025	0.9600
action_type	Putback Slam Dunk	1	-1.6647	14.4735	0.0132	0.9084
action_type	Reverse Dunk Shot	1	0.7569	14.4142	0.0028	0.9581
action_type	Reverse Layup Sho	1	-1.0844	14.4073	0.0057	0.9400
action_type	Reverse Slam Dunk	1	10.6332	114.7	0.0086	0.9261

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Analysis of Maximum Likelihood Estimates						
Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
action_type	Running Bank shot	1	0.2078	14.4127	0.0002	0.9885
action_type	Running Dunk Shot	1	0.4751	14.4258	0.0011	0.9737
action_type	Running Finger Ro	1	-1.8065	14.4220	0.0157	0.9003
action_type	Running Hook Shot	1	0.4551	14.4165	0.0010	0.9748
action_type	Running Jump Shot	1	-0.5140	14.4072	0.0013	0.9715
action_type	Running Layup Sho	1	-0.7189	14.4101	0.0025	0.9602
action_type	Running Pull-Up J	1	-0.8701	14.4573	0.0036	0.9520
action_type	Running Reverse L	1	-1.2741	14.4267	0.0078	0.9296
action_type	Running Slam Dunk	1	10.4737	442.5	0.0006	0.9811
action_type	Running Tip Shot	1	-13.9449	441.9	0.0010	0.9748
action_type	Slam Dunk Shot	1	2.3141	14.4126	0.0258	0.8724
action_type	Step Back Jump sh	1	-1.1143	14.4084	0.0060	0.9384
action_type	Tip Layup Shot	1	-1.6274	14.4746	0.0126	0.9105
action_type	Tip Shot	1	-2.2985	14.4079	0.0255	0.8733
action_type	Turnaround Bank s	1	-0.0874	14.4105	0.0000	0.9952
action_type	Turnaround Fadeaw	1	-1.2102	14.4074	0.0071	0.9331
action_type	Turnaround Finger	1	10.2887	312.4	0.0011	0.9737
action_type	Turnaround Hook S	1	-1.5760	14.4240	0.0119	0.9130
period	1	1	0.1045	0.1343	0.6057	0.4364
period	2	1	0.0567	0.1345	0.1777	0.6734
period	3	1	0.0379	0.1343	0.0799	0.7775
period	4	1	-0.0782	0.1345	0.3385	0.5607
period	5	1	0.0204	0.1734	0.0138	0.9064
period	6	1	-0.1700	0.3708	0.2101	0.6467
minutes_remaining		1	0.0150	0.00405	13.7986	0.0002
seconds_remaining		1	0.00341	0.000784	18.8664	<.0001
shot_zone_area	Back Court(BC)	1	-9.4226	106.1	0.0079	0.9292
shot_zone_area	Center(C)	1	1.9895	21.2194	0.0088	0.9253
shot_zone_area	Left Side Center(LC)	1	1.9311	21.2194	0.0083	0.9275
shot_zone_area	Left Side(L)	1	1.6881	21.2195	0.0063	0.9366
shot_zone_area	Right Side Center(RC)	1	2.0308	21.2194	0.0092	0.9238
shot_zone_basic	Above the Break 3	1	-1.5021	18.1888	0.0068	0.9342
shot_zone_basic	Backcourt	1	6.8411	109.1	0.0039	0.9500
shot_zone_basic	In The Paint (Non-RA)	1	-1.0751	18.1888	0.0035	0.9529

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Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
shot_zone_basic	Left Corner 3	1	-0.9640	18.1891	0.0028	0.9577
shot_zone_basic	Mid-Range	1	-1.1631	18.1888	0.0041	0.9490
shot_zone_basic	Restricted Area	1	-0.8793	18.1892	0.0023	0.9614
shot_zone_range	16-24 ft.	1	0.1346	0.0534	6.3592	0.0117
shot_zone_range	24+ ft.	1	0.2978	0.0953	9.7558	0.0018
shot_zone_range	8-16 ft.	0	0	.	.	.
shot_zone_range	Back Court Shot	0	0	.	.	.
game_date		1	-0.00004	8.32E-6	19.8546	<.0001
attendance		1	0.000177	0.000013	188.4634	<.0001
arena_temp		1	0.0347	0.00678	26.1973	<.0001

Odds Ratio Estimates				
Effect		Point Estimate	95% Wald Confidence Limits	
action_type	Alley Oop Dunk Sh vs Turnaround Jump S	12.301	4.786	31.618
action_type	Alley Oop Layup s vs Turnaround Jump S	1.633	0.895	2.982
action_type	Cutting Layup Sho vs Turnaround Jump S	1.808	0.321	10.187
action_type	Driving Bank shot vs Turnaround Jump S	1.664	0.144	19.247
action_type	Driving Dunk Shot vs Turnaround Jump S	27.935	11.850	65.855
action_type	Driving Finger Ro vs Turnaround Jump S	4.451	2.495	7.941
action_type	Driving Floating vs Turnaround Jump S	0.986	0.133	7.322
action_type	Driving Hook Shot vs Turnaround Jump S	1.293	0.412	4.057
action_type	Driving Jump shot vs Turnaround Jump S	0.581	0.248	1.358
action_type	Driving Layup Sho vs Turnaround Jump S	1.930	1.431	2.603
action_type	Driving Reverse L vs Turnaround Jump S	2.235	1.262	3.957
action_type	Driving Slam Dunk vs Turnaround Jump S	31.414	4.235	233.028
action_type	Dunk Shot vs Turnaround Jump S	2.310	1.507	3.541
action_type	Fadeaway Bank sho vs Turnaround Jump S	6.549	1.946	22.034
action_type	Fadeaway Jump Sho vs Turnaround Jump S	0.928	0.766	1.125
action_type	Finger Roll Layup vs Turnaround Jump S	3.321	1.217	9.064
action_type	Finger Roll Shot vs Turnaround Jump S	0.620	0.276	1.389
action_type	Floating Jump sho vs Turnaround Jump S	2.015	1.246	3.258
action_type	Follow Up Dunk Sh vs Turnaround Jump S	6.293	0.781	50.735
action_type	Hook Bank Shot vs Turnaround Jump S	>999.999	<0.001	>999.999
action_type	Hook Shot vs Turnaround Jump S	0.426	0.257	0.707

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Odds Ratio Estimates					
Effect			Point Estimate	95% Wald Confidence Limits	
action_type	Jump Bank Shot	vs Turnaround Jump S	2.635	1.931	3.596
action_type	Jump Hook Shot	vs Turnaround Jump S	2.167	0.768	6.119
action_type	Jump Shot	vs Turnaround Jump S	0.300	0.260	0.346
action_type	Layup Shot	vs Turnaround Jump S	0.426	0.318	0.571
action_type	Pullup Bank shot	vs Turnaround Jump S	0.953	0.285	3.182
action_type	Pullup Jump shot	vs Turnaround Jump S	1.770	1.362	2.300
action_type	Putback Dunk Shot	vs Turnaround Jump S	1.242	0.108	14.224
action_type	Putback Layup Sho	vs Turnaround Jump S	1.681	0.407	6.949
action_type	Putback Slam Dunk	vs Turnaround Jump S	0.656	0.040	10.642
action_type	Reverse Dunk Shot	vs Turnaround Jump S	7.388	2.833	19.270
action_type	Reverse Layup Sho	vs Turnaround Jump S	1.172	0.819	1.677
action_type	Reverse Slam Dunk	vs Turnaround Jump S	>999.999	<0.001	>999.999
action_type	Running Bank shot	vs Turnaround Jump S	4.266	1.866	9.754
action_type	Running Dunk Shot	vs Turnaround Jump S	5.574	1.240	25.046
action_type	Running Finger Ro	vs Turnaround Jump S	0.569	0.149	2.176
action_type	Running Hook Shot	vs Turnaround Jump S	5.463	1.893	15.770
action_type	Running Jump Shot	vs Turnaround Jump S	2.073	1.669	2.575
action_type	Running Layup Sho	vs Turnaround Jump S	1.689	0.871	3.273
action_type	Running Pull-Up J	vs Turnaround Jump S	1.452	0.130	16.201
action_type	Running Reverse L	vs Turnaround Jump S	0.969	0.209	4.502
action_type	Running Slam Dunk	vs Turnaround Jump S	>999.999	<0.001	>999.999
action_type	Running Tip Shot	vs Turnaround Jump S	<0.001	<0.001	>999.999
action_type	Slam Dunk Shot	vs Turnaround Jump S	35.061	14.899	82.506
action_type	Step Back Jump sh	vs Turnaround Jump S	1.137	0.745	1.735
action_type	Tip Layup Shot	vs Turnaround Jump S	0.681	0.041	11.291
action_type	Tip Shot	vs Turnaround Jump S	0.348	0.224	0.540
action_type	Turnaround Bank s	vs Turnaround Jump S	3.176	1.651	6.109
action_type	Turnaround Fadeaw	vs Turnaround Jump S	1.033	0.804	1.329
action_type	Turnaround Finger	vs Turnaround Jump S	>999.999	<0.001	>999.999
action_type	Turnaround Hook S	vs Turnaround Jump S	0.717	0.176	2.925
period	1 vs 7		1.079	0.217	5.356
period	2 vs 7		1.028	0.207	5.107
period	3 vs 7		1.009	0.203	5.011
period	4 vs 7		0.899	0.181	4.462

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Odds Ratio Estimates				
Effect		Point Estimate	95% Wald Confidence Limits	
period	5 vs 7	0.992	0.196	5.021
period	6 vs 7	0.820	0.137	4.918
minutes_remaining		1.015	1.007	1.023
seconds_remaining		1.003	1.002	1.005
shot_zone_area	Back Court(BC) vs Right Side(R)	<0.001	<0.001	>999.999
shot_zone_area	Center(C) vs Right Side(R)	1.229	1.098	1.376
shot_zone_area	Left Side Center(LC) vs Right Side(R)	1.159	1.025	1.311
shot_zone_area	Left Side(L) vs Right Side(R)	0.909	0.817	1.012
shot_zone_area	Right Side Center(RC) vs Right Side(R)	1.281	1.138	1.442
shot_zone_basic	Above the Break 3 vs Right Corner 3	0.783	0.604	1.015
shot_zone_basic	Backcourt vs Right Corner 3	>999.999	<0.001	>999.999
shot_zone_basic	In The Paint (Non-RA) vs Right Corner 3	1.200	0.856	1.682
shot_zone_basic	Left Corner 3 vs Right Corner 3	1.341	0.930	1.935
shot_zone_basic	Mid-Range vs Right Corner 3	1.099	0.794	1.522
shot_zone_basic	Restricted Area vs Right Corner 3	1.460	0.938	2.272
shot_zone_range	16-24 ft. vs Less Than 8 ft.	1.763	1.482	2.097
shot_zone_range	24+ ft. vs Less Than 8 ft.	2.076	1.508	2.857
game_date		1.000	1.000	1.000
attendance		1.000	1.000	1.000
arena_temp		1.035	1.022	1.049

Association of Predicted Probabilities and Observed Responses			
Percent Concordant	71.2	Somers' D	0.423
Percent Discordant	28.8	Gamma	0.423
Percent Tied	0.0	Tau-a	0.209
Pairs	163169880	c	0.712

Partition for the Hosmer and Lemeshow Test					
Group	Total	shot_made_flag = 1		shot_made_flag = 0	
		Observed	Expected	Observed	Expected
1	2570	619	594.19	1951	1975.81
2	2570	702	720.79	1868	1849.21
3	2570	765	789.23	1805	1780.77
4	2570	851	850.57	1719	1719.43

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Partition for the Hosmer and Lemeshow Test					
Group	Total	shot_made_flag = 1		shot_made_flag = 0	
		Observed	Expected	Observed	Expected
5	2570	936	914.55	1634	1655.45
6	2570	1004	988.21	1566	1581.79
7	2570	1078	1104.60	1492	1465.40
8	2570	1470	1463.31	1100	1106.69
9	2570	1828	1834.10	742	735.90
10	2567	2212	2205.45	355	361.55

Hosmer and Lemeshow Goodness-of-Fit Test		
Chi-Square	DF	Pr > ChiSq
5.6971	8	0.6811

Classification Table									
Prob Level	Correct		Incorrect		Percentages				
	Event	Non-Event	Event	Non-Event	Correct	Sensitivity	Specificity	False POS	False NEG
0.000	11465	0	14232	0	44.6	100.0	0.0	55.4	.
0.020	11464	67	14165	1	44.9	100.0	0.5	55.3	1.5
0.040	11464	70	14162	1	44.9	100.0	0.5	55.3	1.4
0.060	11464	70	14162	1	44.9	100.0	0.5	55.3	1.4
0.080	11464	71	14161	1	44.9	100.0	0.5	55.3	1.4
0.100	11464	72	14160	1	44.9	100.0	0.5	55.3	1.4
0.120	11464	72	14160	1	44.9	100.0	0.5	55.3	1.4
0.140	11463	73	14159	2	44.9	100.0	0.5	55.3	2.7
0.160	11463	78	14154	2	44.9	100.0	0.5	55.3	2.5
0.180	11458	103	14129	7	45.0	99.9	0.7	55.2	6.4
0.200	11434	197	14035	31	45.3	99.7	1.4	55.1	13.6
0.220	11368	463	13769	97	46.0	99.2	3.3	54.8	17.3
0.240	11191	961	13271	274	47.3	97.6	6.8	54.3	22.2
0.260	10902	1716	12516	563	49.1	95.1	12.1	53.4	24.7
0.280	10510	2802	11430	955	51.8	91.7	19.7	52.1	25.4
0.300	9961	4195	10037	1504	55.1	86.9	29.5	50.2	26.4
0.320	9309	5661	8571	2156	58.3	81.2	39.8	47.9	27.6
0.340	8602	7101	7131	2863	61.1	75.0	49.9	45.3	28.7
0.360	7893	8393	5839	3572	63.4	68.8	59.0	42.5	29.9

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Classification Table									
Prob Level	Correct		Incorrect		Percentages				
	Event	Non- Event	Event	Non- Event	Correct	Sensi- tivity	Speci- ficity	False POS	False NEG
0.380	7196	9542	4690	4269	65.1	62.8	67.0	39.5	30.9
0.400	6608	10445	3787	4857	66.4	57.6	73.4	36.4	31.7
0.420	6164	11084	3148	5301	67.1	53.8	77.9	33.8	32.4
0.440	5814	11582	2650	5651	67.7	50.7	81.4	31.3	32.8
0.460	5595	11895	2337	5870	68.1	48.8	83.6	29.5	33.0
0.480	5426	12086	2146	6039	68.1	47.3	84.9	28.3	33.3
0.500	5302	12230	2002	6163	68.2	46.2	85.9	27.4	33.5
0.520	5188	12319	1913	6277	68.1	45.3	86.6	26.9	33.8
0.540	5083	12435	1797	6382	68.2	44.3	87.4	26.1	33.9
0.560	4955	12547	1685	6510	68.1	43.2	88.2	25.4	34.2
0.580	4772	12660	1572	6693	67.8	41.6	89.0	24.8	34.6
0.600	4590	12803	1429	6875	67.7	40.0	90.0	23.7	34.9
0.620	4390	12906	1326	7075	67.3	38.3	90.7	23.2	35.4
0.640	4184	13014	1218	7281	66.9	36.5	91.4	22.5	35.9
0.660	3963	13130	1102	7502	66.5	34.6	92.3	21.8	36.4
0.680	3704	13258	974	7761	66.0	32.3	93.2	20.8	36.9
0.700	3391	13389	843	8074	65.3	29.6	94.1	19.9	37.6
0.720	3057	13521	711	8408	64.5	26.7	95.0	18.9	38.3
0.740	2661	13669	563	8804	63.5	23.2	96.0	17.5	39.2
0.760	2232	13839	393	9233	62.5	19.5	97.2	15.0	40.0
0.780	1815	13977	255	9650	61.5	15.8	98.2	12.3	40.8
0.800	1476	14070	162	9989	60.5	12.9	98.9	9.9	41.5
0.820	1226	14135	97	10239	59.8	10.7	99.3	7.3	42.0
0.840	1052	14159	73	10413	59.2	9.2	99.5	6.5	42.4
0.860	961	14170	62	10504	58.9	8.4	99.6	6.1	42.6
0.880	878	14186	46	10587	58.6	7.7	99.7	5.0	42.7
0.900	821	14194	38	10644	58.4	7.2	99.7	4.4	42.9
0.920	766	14203	29	10699	58.3	6.7	99.8	3.6	43.0
0.940	712	14211	21	10753	58.1	6.2	99.9	2.9	43.1
0.960	650	14215	17	10815	57.8	5.7	99.9	2.5	43.2
0.980	350	14221	11	11115	56.7	3.1	99.9	3.0	43.9
1.000	0	14232	0	11465	55.4	0.0	100.0	.	44.6