

Basketball III





Produced by Dr. Mario UNC STOR 390

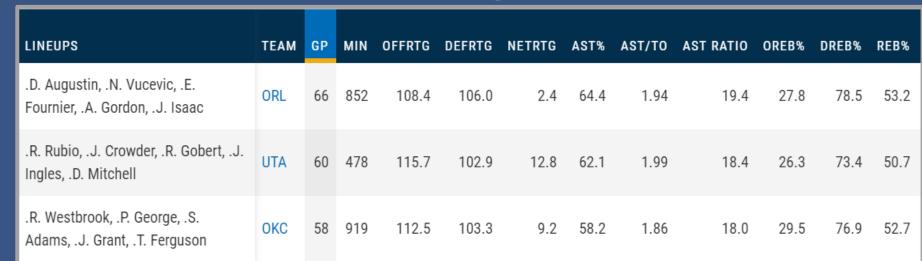




Facts About Lineups

- Few Players on NBA Teams are Traded
- Important Coach Decision: Lineups
- What Players Should Play Together
- What Players Should Play Against Opponents
- Approximately 300-600 Unique Lineups in a Season















Statistics Measured on the Lineup (82games.com)









#	Team	Unit	Min	Off	Def	Net	W	L	W %
1	SA	Parker-Jackson-Bowen-Duncan-Robinson	16.40%	97.7	83.8	+13.9	35	15	70.0
2	DAL	Nash-Finley-Griffin-Nowitzki-Bradley	6.39%	100.2	88.3	+11.9	16	14	53.3
3	MIN	Hudson-Peeler-Szczerbiak-Garnett-Nesterovic	14.24%	105.5	94.7	+10.8	23	14	62.1
4	UTA	Stockton-Cheaney-Harpring-Malone-Ostertag	21.92%	95.5	85.2	+10.3	41	23	64.0
5	SAC	Bibby-Christie-Stojakovic-Webber-Divac	21.20%	108.1	98.0	+10.1	26	11	70.2
6	TOR	Williams-Carter-Peterson-WilliamsJ-Davis	7.68%	99.1	89.2	+10.0	14	6	70.0
7	POR	Anderson-Wells-Pippen-Wallace-Davis	17.15%	98.8	88.9	+9.8	23	12	65.7
8	LAL	Fisher-Bryant-Fox-Horry-O'Neal	13.57%	105.6	97.1	+8.6	34	16	68.0
9	NO	Davis-Wesley-Mashburn-Brown-Magloire	18.17%	97.9	89.3	+8.6	24	12	66.6
10	BOS	Delk-Pierce-Williams-Walker-Battie	12.97%	95.8	89.4	+6.4	23	16	58.9
11	HOU	Francis-Mobley-Posey-Griffin-Ming	18.03%	95.9	89.7	+6.2	22	17	56.4
12	IND	Tinsley-MillerR-Artest-O'Neal-Miller	13.77%	100.2	95.6	+4.6	22	14	61.1
13	NJ	Kidd-Kittles-Jefferson-Martin-Collins	16.17%	93.1	88.6	+4.6	29	15	65.9
14	WAS	Hughes-Stackhouse-Jordan-Laettner-Haywood	14.98%	94.6	89.9	+4.6	20	17	54.0
15	ATL	Terry-Glover-Robinson-Abdur-Rahim-Ratliff	16.82%	97.7	93.3	+4.3	27	16	62.7













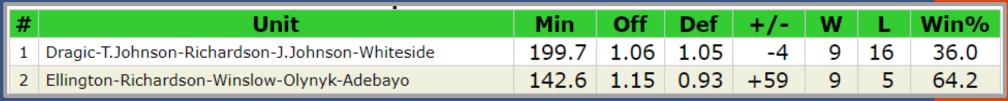
- Example: Adjusted +/- for the NBA Lineup
 - Pacers Lineup A={JO,DG,JT,TM,MD} Played 326 Minutes
 - This is Equivalent to 6.79 Full Games
 - Outscored Opponents by 11 Points (Pure +/-)
 - Scaled to 48 Minutes

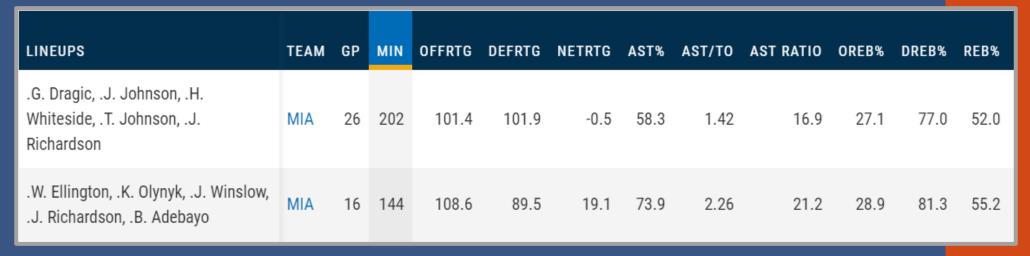
$$\frac{11}{6.79} = +1.61 Points Per 48 Minutes$$

- Lineup Played Against Opposition Lineups Averaging +1.89 Points **Better Than Average Team**
- Pacers Lineup A has Adjusted +/- of 1.61+1.89=+3.5 Points Better Than Average Lineup

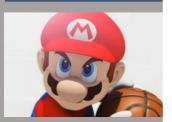


- Examples of Poor Lineup Decision Making
 - Miami Heat (2017-2018)





• Which Lineup Should Play More?











- Problem's With Lineup Analysis
 - Many Lineups Don't Play Many Minutes (High Variability)
 - Less Than 10% of All Lineups Have More than 27 Offensive Possessions
 - Median Number of Possessions Across All Lineups = 6 Possessions



- Superiority Hypothesis Testing
 - Null Hypothesis: Lineups are Equal
 - Alternative Hypothesis: Lineup 1 is Superior to Lineup 2
 - P-Value < 0.05: Indicates Team 1 Superior to Team 2
 - Estimate of Lineup's Ability Above Average Team = Adjusted +/-
 - Standard Error of Estimate





Needs Justification





- Lineup 1 {DG,LH,LJ,SP,AV} with Adjusted +/- of -14
- Lineup 2 {DG,LH,LJ,ES,AV} with Adjusted +/- of +25
- Lineup 1 Played 124 Minutes or 2.6 Games
- Lineup 2 Played 156 Minutes or 3.3 Games
- Question: Was Lineup 1 Significantly Better than Lineup 2?

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Hughes/Varejao/James/Gooden/5th Player									
5th Player	Lineup#	Rating	Minutes	Games					
Pavlovic	1	25	124	2.583333333					
Snow	2	-14	156	3.25					
Difference	Variance difference	Sigma difference	Probability Lineup 1 is better						
39	100.0496278	10.00248108	0.999980064						



- Lineup Chemistry
 - How Would You Define Good Chemistry?
 - Let LAPM Represent Lineup Adjusted +/- Rating
 - Let PAPM Represent Player Adjusted +/- Rating for Player

Chemistry =
$$LAPM - \sum_{i=1}^{5} PAPM_i$$

Example (2006-2007):

Team						Chemistry
Detroit	Billups	Hamilton	Maxiell	Prince	Webber	25.6
Golden State	Barnes	Biedrins	Davis	Ellis	Pietrus	-10.1
Memphis	Gasol	Jones	Miller	Roberts	Stoudamire	-20.1
Atlanta	Childress	Johnson	Pachulia	J. Smith	M. Williams	19.6
Boston	Jefferson	Perkins	Pierce	Scalabrine	West	-16.2
Charlotte	Carroll	Felton	Morrison	Okafor	G. Wallace	20.2
Chicago	Deng	Duhon	Hinrich	Thomas	B. Wallace	-21.7
Cleveland	Hughes	Ilgauskas	James	Pavlovic	Varejao	-23.6
Dallas	Diop	Harris	Howard	Nowitzki	Stackhouse	27.4
Denver	Hilario	Kleiza	Najera	J. R. Smith	Iverson	-14.5
Phoenix	Barbosa	Bell	Diaw	Marion	Stoudemire	18.5
San Antonio	Bowen	Duncan	Ginobili	Horry	Parker	-9.3











- Example of Coaching Decision
 - Spurs Versus Mavericks in 2006 Playoffs
 - Mavericks Beat Spurs in 7 Games
 - Replaced Adrian Griffin with Devin Harris
 - Mavericks' Season Information









		Production			On Court/Off Court			
Player	Min	Own	Орр	Net	On	Off	Net	
<u>Nowitzki</u>	78%	30.1	17.0	+13.1	+7.9	-0.6	+8.5	
<u>Terry</u>	70%	19.7	14.8	+4.9	+8.1	+0.9	+7.2	
<u>Howard</u>	48%	20.8	13.2	+7.6	+7.9	+4.2	+3.6	
<u>Stackhouse</u>	38%	15.6	13.1	+2.5	+4.5	+6.9	-2.5	
<u>Daniels</u>	44%	15.9	12.9	+3.0	+4.4	+7.3	-2.9	
<u>Dampier</u>	49%	14.8	16.2	-1.4	+5.9	+6.1	-0.2	
<u>Harris</u>	32%	18.6	15.4	+3.2	+6.3	+5.8	+0.5	
<u>Diop</u>	38%	12.2	16.5	-4.3	+7.7	+4.9	+2.7	
<u>Griffin</u>	31%	12.4	14.6	-2.2	+7.1	+5.5	+1.6	
<u>Van Horn</u>	27%	14.9	18.7	-3.8	+4.1	+6.7	-2.5	
Armstrong	16%	7.9	19.9	-12.0	-1.0	+7.3	-8.3	



- Example of Coaching Decision
 - Mavericks' Playoff Information







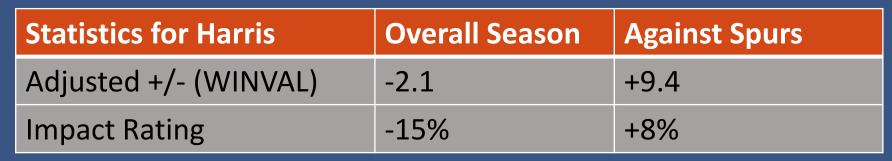


	Production			On Court/Off Court			
Player	Min	Own	Орр	Net	On	Off	Net
<u>Nowitzki</u>	87%	28.5	13.8	+14.8	+5.3	-4.8	+10.1
<u>Howard</u>	73%	17.5	12.4	+5.1	+7.2	-4.6	+11.8
<u>Terry</u>	75%	17.3	13.2	+4.1	+5.2	+0.5	+4.7
<u>Stackhouse</u>	63%	13.6	11.8	+1.8	+5.5	+1.5	+4.0
<u>Griffin</u>	31%	13.7	16.4	-2.7	+3.2	+4.4	-1.2
<u>Dampier</u>	40%	14.1	24.4	-10.2	+6.8	+2.2	+4.6
<u>Harris</u>	50%	12.4	16.6	-4.2	+0.8	+7.2	-6.4
<u>Daniels</u>	20%	12.3	18.4	-6.1	+1.7	+4.6	-2.8
<u>Diop</u>	36%	12.0	19.0	-7.0	+1.4	+5.5	-4.1
<u>Van Horn</u>	15%	6.6	16.8	-10.1	-12.8	+7.1	-19.9
<u>Powell</u>	2%	-8.2	12.4	-20.7	-3.9	+4.2	-8.1
<u>Mbenga</u>	2%	-1.1	23.6	-24.7	+13.5	+3.8	+9.7
Armstrong	4%	2.4	38.4	-36.0	-8.3	+4.5	-12.9





• Why Was This a Good Decision?



Statistics for Griffin	Overall Season	Against Spurs
Adjusted +/- (WINVAL)	NA	-5.0
Impact Rating	NA	-18%

 Adrian Griffin Had a -18 Offensive WINVAL Which Means He Had a +23 Defensive WINVAL (Horrible Impact on the Mavericks' Offense)













- Summarizes Result of Any Combination of Team's Players On or Off the Court Versus Any Combination of Opponent's Players On or Off the Court
- Calculation For Mavericks and Spurs Indicated Devin Harris Could Outperform Tony Parker



- Harris and Parker On Court = 2 Points Over Spurs
- Harris Off Court and Parker On Court = 15 Points Under Spurs











Lineup Calculation for the Mavericks in Playoffs









						Rating	Minutes	Simple	Raw+/-
Dall	as Mavericks								
1	Diop	Harris	Howard	Nowitzki	Terry	16.36	41.04	1.18	1
2	Dampier	Howard	Nowitzki	Stackhouse	Terry	29.24	31.06	15.45	10
3	Dampier	Harris	Nowitzki	Stackhouse	Terry	60.55	21.34	49.47	22
4	Dampier	Harris	Howard	Nowitzki	Terry	-1.78	15.89	-18.12	-6
5	Dampier	Harris	Howard	Nowitzki	Stackhouse	-20.83	14.19	-33.80	-10
6	Diop	Harris	Nowitzki	Stackhouse	Terry	15.54	11.48	4.18	1
7	Dampier	Daniels	Howard	Stackhouse	Terry	-65.28	8.92	-75.26	-14
8	Diop	Howard	Nowitzki	Stackhouse	Terry	-26.13	8.79	-43.62	-8
9	Diop	Harris	Howard	Nowitzki	Stackhouse	81.91	8.02	65.92	11
10	Daniels	Harris	Howard	Nowitzki	Stackhouse	78.79	7.82	67.55	11
11	Diop	Howard	Nowitzki	Terry	Griffin	-9.51	6.92	-34.70	-5
12	Harris	Howard	Nowitzki	Stackhouse	Terry	44.11	6.78	35.43	5
13	Dampier	Daniels	Nowitzki	Stackhouse	Terry	-42.30	6.37	-52.81	-7



Lineup Calculation for the Mavericks in Playoffs









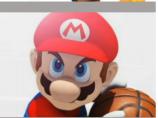
						Rating	Minutes	Simple	Raw+/-
San.	Antonio Spu	rs							
1	Bowen	Duncan	Finley	Ginobili	Parker	21.08	45.83	6.29	6
2	Barry	Bowen	Duncan	Finley	Parker	37.90	33.42	20.12	14
3	Bowen	Duncan	Ginobili	Horry	Parker	17.94	28.23	5.10	3
4	Barry	Bowen	Duncan	Horry	Parker	-26.88	10.05	-47.75	-10
5	Barry	Duncan	Finley	Ginobili	Parker	71.11	9.52	60.37	12
6	Barry	Bowen	Duncan	Ginobili	Parker	-25.71	8.48	-45.28	-8
7	Barry	Duncan	Finley	Ginobili	Van Exel	46.74	7.70	37.35	6
8	Bowen	Duncan	Finley	Ginobili	Van Exel	32.55	7.67	18.79	3
9	Duncan	Finley	Ginobili	Horry	Van Exel	-22.46	5.84	-24.68	-3
10	Barry	Bowen	Duncan	Finley	Van Exel	-53.95	5.66	-59.24	-7
11	Barry	Finley	Ginobili	Horry	Parker	-14.32	5.53	-26.06	-3
12	Bowen	Duncan	Ginobili	Horry	Van Exel	46.51	4.13	34.84	3
13	Barry	Bowen	Finley	Horry	Parker	-179.83	4.11	-186.96	-16



- Non-Transitivity of NBA Matchups
 - What is Transitivity?
 - Player A > Player B
 - Player B > Player C
 - Then, Player A > Player C
 - Be Careful Not To Assume Transitive Property in Sports
 - Example in 2005-2006 Season
 - Devin Harris > Tony Parker
 - Devin Harris + Jason Terry Against Steve Nash (-23 Points)
 - Jerry Stackhouse + Jason Terry Against Steve Nash (+20 Points)
 - Steve Nash > Devin Harris
 - Does This Imply, Steve Nash > Tony Parker
 - Across Season, Steve Nash Impact was +28%
 - Against Spurs, Steve Nash Impact was 0%
 - Across Season, Tony Parker Impact was -3%
 - Against Suns, Tony Parker Impact was +35%











Final Inspiration

If you are going to foul, foul hard.

- My Father