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Subdirección Académica
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Ingeniería en Sistemas Computacionales
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MINERÍA DE DATOS

BDD-1703SC9A

“Práctica 4”

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“Por una juventud integrada al desarrollo de México”

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Practice 4

Free Throws

You have been supplied data for two additional in-game statistics:

- Free Throws
- Free Throws Attempt

You need to create three plots that portray the following insights:

- Free Throws Attempts per game
- Accuracy of Free Throws
- Player playing style (2 vs 3 points preference) excluding Free Throws
- Each Free Throw is worth 1 Point

The data has been supplied in the form of vectors. You will have to create the matrices before you proceed with the analysis.

```
#Seasons
Seasons <-
c("2005", "2006", "2007", "2008", "2009", "2010", "2011", "2012", "2013", "
2014")

#Players
Players <-
c("KobeBryant", "JoeJohnson", "LeBronJames", "CarmeloAnthony", "Dwight
Howard", "ChrisBosh", "ChrisPaul", "KevinDurant", "DerrickRose", "Dwayn
eWade")

#Free Throws
KobeBryant_FT <- c(696, 667, 623, 483, 439, 483, 381, 525, 18, 196)
JoeJohnson_FT <- c(261, 235, 316, 299, 220, 195, 158, 132, 159, 141)
LeBronJames_FT <- c(601, 489, 549, 594, 593, 503, 387, 403, 439, 375)
CarmeloAnthony_FT <- c(573, 459, 464, 371, 508, 507, 295, 425, 459, 189)
DwightHoward_FT <- c(356, 390, 529, 504, 483, 546, 281, 355, 349, 143)
ChrisBosh_FT <- c(474, 463, 472, 504, 470, 384, 229, 241, 223, 179)
ChrisPaul_FT <- c(394, 292, 332, 455, 161, 337, 260, 286, 295, 289)
KevinDurant_FT <- c(209, 209, 391, 452, 756, 594, 431, 679, 703, 146)
DerrickRose_FT <- c(146, 146, 146, 197, 259, 476, 194, 0, 27, 152)
DwayneWade_FT <- c(629, 432, 354, 590, 534, 494, 235, 308, 189, 284)

#Matrix
FreeThrows <- rbind(KobeBryant_FT, JoeJohnson_FT, LeBronJames_FT,
CarmeloAnthony_FT, DwightHoward_FT, ChrisBosh_FT, ChrisPaul_FT,
KevinDurant_FT, DerrickRose_FT, DwayneWade_FT)
rm(KobeBryant_FT, JoeJohnson_FT, LeBronJames_FT,
CarmeloAnthony_FT, DwightHoward_FT, ChrisBosh_FT, ChrisPaul_FT,
KevinDurant_FT, DerrickRose_FT, DwayneWade_FT)
colnames(FreeThrows) <- Seasons
```

```
rownames(FreeThrows) <- Players
```

#Free Throw Attempts

```
KobeBryant_FTA <- c(819,768,742,564,541,583,451,626,21,241)
JoeJohnson_FTA <- c(330,314,379,362,269,243,186,161,195,176)
LeBronJames_FTA <- c(814,701,771,762,773,663,502,535,585,528)
CarmeloAnthony_FTA <- c(709,568,590,468,612,605,367,512,541,237)
DwightHoward_FTA <- c(598,666,897,849,816,916,572,721,638,271)
ChrisBosh_FTA <- c(581,590,559,617,590,471,279,302,272,232)
ChrisPaul_FTA <- c(465,357,390,524,190,384,302,323,345,321)
KevinDurant_FTA <- c(256,256,448,524,840,675,501,750,805,171)
DerrickRose_FTA <- c(205,205,205,250,338,555,239,0,32,187)
DwayneWade_FTA <- c(803,535,467,771,702,652,297,425,258,370)
```

#Matrix

```
FreeThrowAttempts <- rbind(KobeBryant_FTA, JoeJohnson_FTA,
LeBronJames_FTA, CarmeloAnthony_FTA, DwightHoward_FTA,
ChrisBosh_FTA, ChrisPaul_FTA, KevinDurant_FTA, DerrickRose_FTA,
DwayneWade_FTA)
rm(KobeBryant_FTA, JoeJohnson_FTA, LeBronJames_FTA,
CarmeloAnthony_FTA, DwightHoward_FTA, ChrisBosh_FTA,
ChrisPaul_FTA, KevinDurant_FTA, DerrickRose_FTA, DwayneWade_FTA)
colnames(FreeThrowAttempts) <- Seasons
rownames(FreeThrowAttempts) <- Players
```

#Check the matrix

```
FreeThrows
```

```
> FreeThrows
```

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
KobeBryant	696	667	623	483	439	483	381	525	18	196
JoeJohnson	261	235	316	299	220	195	158	132	159	141
LeBronJames	601	489	549	594	593	503	387	403	439	375
CarmeloAnthony	573	459	464	371	508	507	295	425	459	189
DwightHoward	356	390	529	504	483	546	281	355	349	143
ChrisBosh	474	463	472	504	470	384	229	241	223	179
ChrisPaul	394	292	332	455	161	337	260	286	295	289
KevinDurant	209	209	391	452	756	594	431	679	703	146
DerrickRose	146	146	146	197	259	476	194	0	27	152
DwayneWade	629	432	354	590	534	494	235	308	189	284

#Check the matrix

```
FreeThrowAttempts
```

```
> FreeThrowAttempts
```

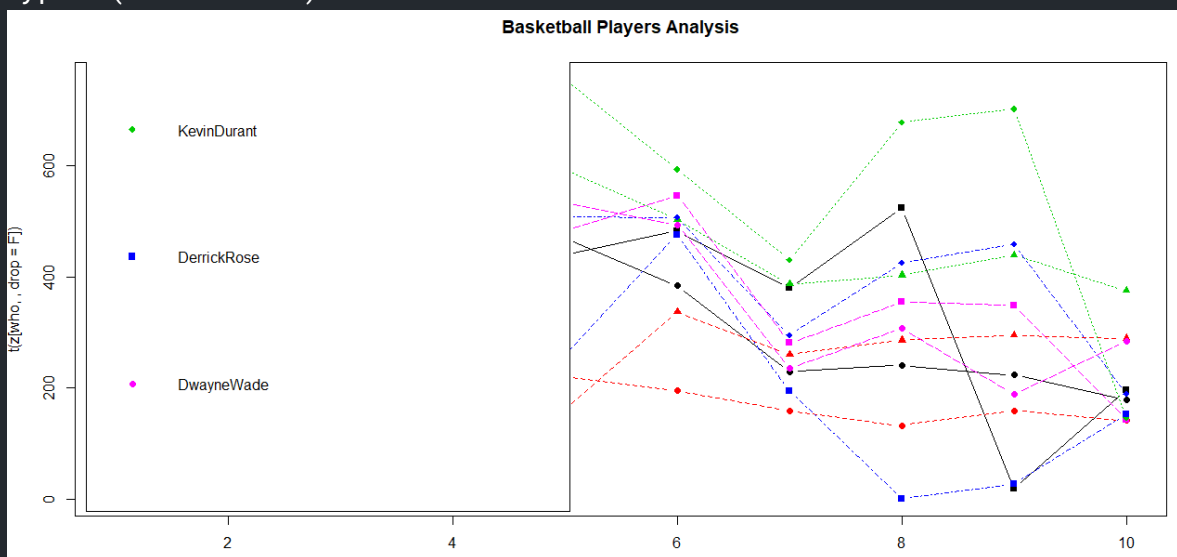
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
KobeBryant	819	768	742	564	541	583	451	626	21	241
JoeJohnson	330	314	379	362	269	243	186	161	195	176
LeBronJames	814	701	771	762	773	663	502	535	585	528
CarmeloAnthony	709	568	590	468	612	605	367	512	541	237
DwightHoward	598	666	897	849	816	916	572	721	638	271
ChrisBosh	581	590	559	617	590	471	279	302	272	232
ChrisPaul	465	357	390	524	190	384	302	323	345	321
KevinDurant	256	256	448	524	840	675	501	750	805	171
DerrickRose	205	205	205	250	338	555	239	0	32	187
DwayneWade	803	535	467	771	702	652	297	425	258	370

#Re-create the plotting function

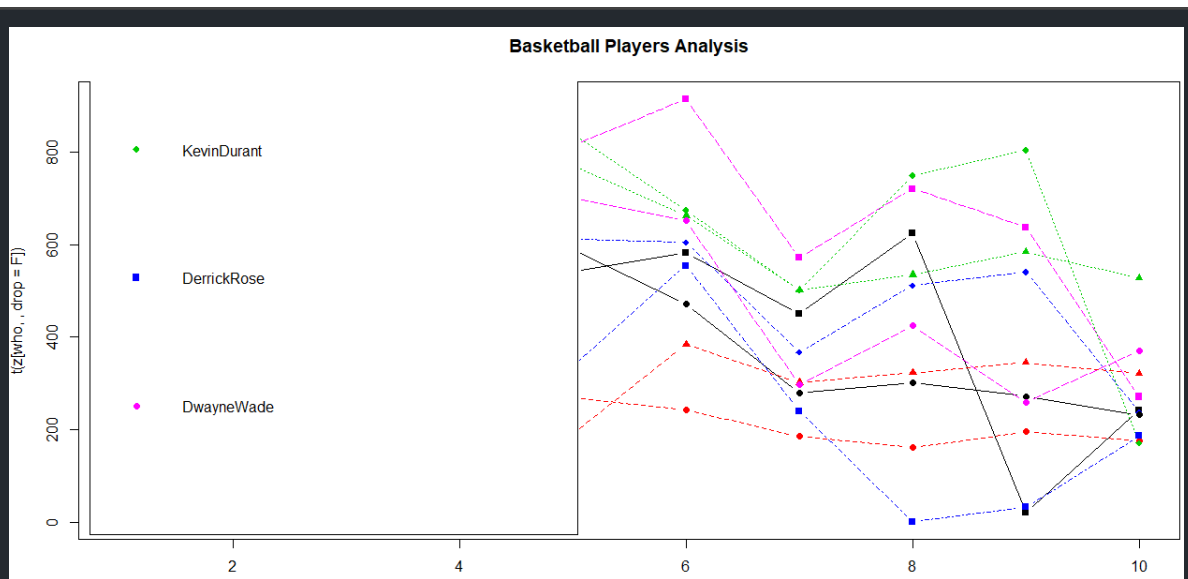
```
myplot <- function(z, who=1:10) {
  matplot(t(z[who,,drop=F]), type="b", pch=15:18, col=c(1:4,6),
    main="Basketball Players Analysis")
  legend("bottomleft", inset=0.01, legend=Players[who],
    col=c(1:4,6), pch=15:18, horiz=F)
}
```

#Visualize the new matrices

```
myplot(FreeThrows)
```



```
myplot(FreeThrowAttempts)
```



##THIS IS GAMES

```
KobeBryant_G <- c(80,77,82,82,73,82,58,78,6,35)
JoeJohnson_G <- c(82,57,82,79,76,72,60,72,79,80)
LeBronJames_G <- c(79,78,75,81,76,79,62,76,77,69)
CarmeloAnthony_G <- c(80,65,77,66,69,77,55,67,77,40)
DwightHoward_G <- c(82,82,82,79,82,78,54,76,71,41)
ChrisBosh_G <- c(70,69,67,77,70,77,57,74,79,44)
ChrisPaul_G <- c(78,64,80,78,45,80,60,70,62,82)
KevinDurant_G <- c(35,35,80,74,82,78,66,81,81,27)
DerrickRose_G <- c(40,40,40,81,78,81,39,0,10,51)
DwayneWade_G <- c(75,51,51,79,77,76,49,69,54,62)
```

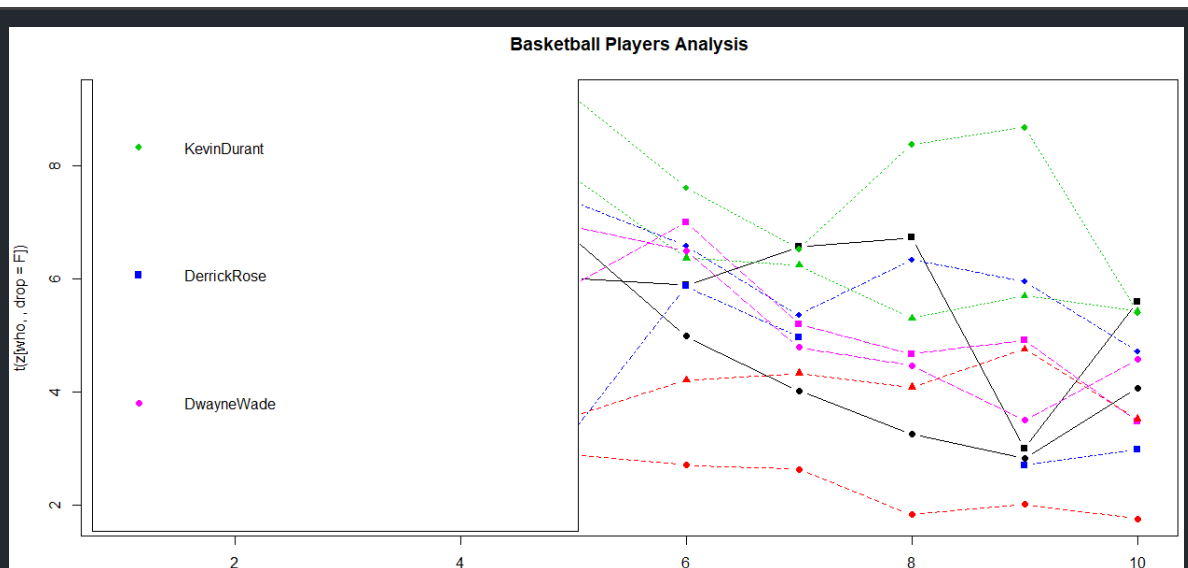
#Games matrix

```
Games <- rbind(KobeBryant_G, JoeJohnson_G, LeBronJames_G,
CarmeloAnthony_G, DwightHoward_G, ChrisBosh_G, ChrisPaul_G,
KevinDurant_G, DerrickRose_G, DwayneWade_G)
rm(KobeBryant_G, JoeJohnson_G, CarmeloAnthony_G, DwightHoward_G,
ChrisBosh_G, LeBronJames_G, ChrisPaul_G, DerrickRose_G,
DwayneWade_G, KevinDurant_G)
colnames(Games) <- Seasons
rownames(Games) <- Players
```

#Part 1 - Free Throw Attempts Per Game

#(You will need the Games matrix)

```
myplot(FreeThrows/Games)
```



#Notice how Chris Paul gets few attempts per game

#Field Goals

```
KobeBryant_FG <- c(978,813,775,800,716,740,574,738,31,266)
JoeJohnson_FG <- c(632,536,647,620,635,514,423,445,462,446)
LeBronJames_FG <- c(875,772,794,789,768,758,621,765,767,624)
CarmeloAnthony_FG <- c(756,691,728,535,688,684,441,669,743,358)
DwightHoward_FG <- c(468,526,583,560,510,619,416,470,473,251)
ChrisBosh_FG <- c(549,543,507,615,600,524,393,485,492,343)
ChrisPaul_FG <- c(407,381,630,631,314,430,425,412,406,568)
KevinDurant_FG <- c(306,306,587,661,794,711,643,731,849,238)
DerrickRose_FG <- c(208,208,208,574,672,711,302,0,58,338)
DwayneWade_FG <- c(699,472,439,854,719,692,416,569,415,509)
```

#Matrix

```
FieldGoals <- rbind(KobeBryant_FG, JoeJohnson_FG, LeBronJames_FG,
CarmeloAnthony_FG, DwightHoward_FG, ChrisBosh_FG, ChrisPaul_FG,
KevinDurant_FG, DerrickRose_FG, DwayneWade_FG)
rm(KobeBryant_FG, JoeJohnson_FG, LeBronJames_FG,
CarmeloAnthony_FG, DwightHoward_FG, ChrisBosh_FG, ChrisPaul_FG,
KevinDurant_FG, DerrickRose_FG, DwayneWade_FG)
colnames(FieldGoals) <- Seasons
rownames(FieldGoals) <- Players
```

#Field Goal Attempts

```
KobeBryant_FGA <-
c(2173,1757,1690,1712,1569,1639,1336,1595,73,713)
JoeJohnson_FGA <-
c(1395,1139,1497,1420,1386,1161,931,1052,1018,1025)
LeBronJames_FGA <-
c(1823,1621,1642,1613,1528,1485,1169,1354,1353,1279)
CarmeloAnthony_FGA <-
c(1572,1453,1481,1207,1502,1503,1025,1489,1643,806)
DwightHoward_FGA <- c(881,873,974,979,834,1044,726,813,800,423)
```

```

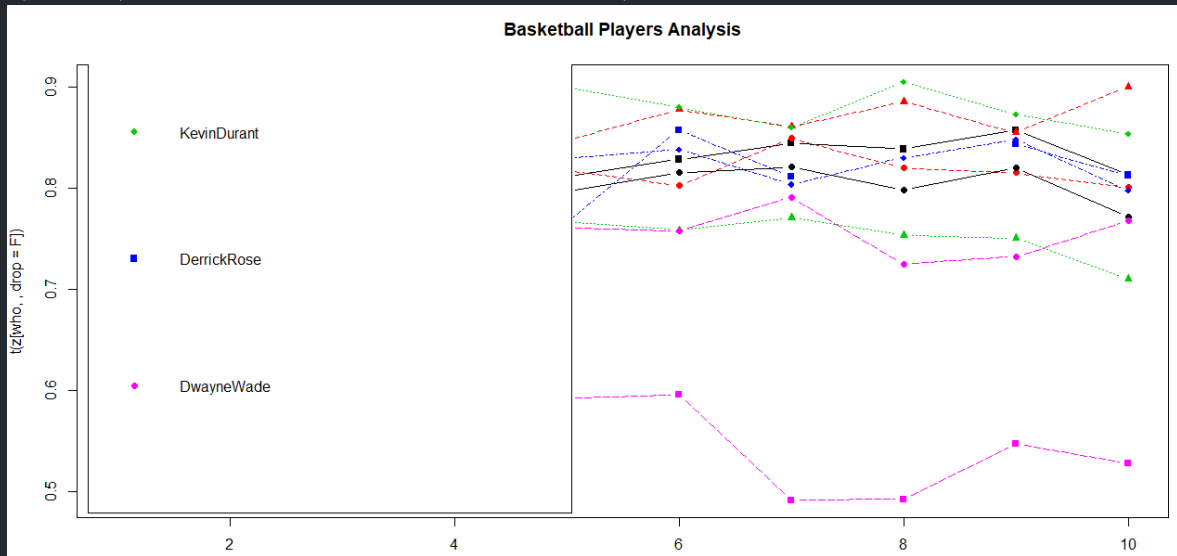
ChrisBosh_FGA <- c(1087,1094,1027,1263,1158,1056,807,907,953,745)
ChrisPaul_FGA <- c(947,871,1291,1255,637,928,890,856,870,1170)
KevinDurant_FGA <-
c(647,647,1366,1390,1668,1538,1297,1433,1688,467)
DerrickRose_FGA <- c(436,436,436,1208,1373,1597,695,0,164,835)
DwayneWade_FGA <- c(1413,962,937,1739,1511,1384,837,1093,761,1084)
#Matrix
FieldGoalAttempts <- rbind(KobeBryant_FGA, JoeJohnson_FGA,
LeBronJames_FGA, CarmeloAnthony_FGA, DwightHoward_FGA,
ChrisBosh_FGA, ChrisPaul_FGA, KevinDurant_FGA, DerrickRose_FGA,
DwayneWade_FGA)
rm(KobeBryant_FGA, JoeJohnson_FGA, LeBronJames_FGA,
CarmeloAnthony_FGA, DwightHoward_FGA, ChrisBosh_FGA,
ChrisPaul_FGA, KevinDurant_FGA, DerrickRose_FGA, DwayneWade_FGA)
colnames(FieldGoalAttempts) <- Seasons
rownames(FieldGoalAttempts) <- Players

#Points
KobeBryant_PTS <-
c(2832,2430,2323,2201,1970,2078,1616,2133,83,782)
JoeJohnson_PTS <-
c(1653,1426,1779,1688,1619,1312,1129,1170,1245,1154)
LeBronJames_PTS <-
c(2478,2132,2250,2304,2258,2111,1683,2036,2089,1743)
CarmeloAnthony_PTS <-
c(2122,1881,1978,1504,1943,1970,1245,1920,2112,966)
DwightHoward_PTS <-
c(1292,1443,1695,1624,1503,1784,1113,1296,1297,646)
ChrisBosh_PTS <-
c(1572,1561,1496,1746,1678,1438,1025,1232,1281,928)
ChrisPaul_PTS <-
c(1258,1104,1684,1781,841,1268,1189,1186,1185,1564)
KevinDurant_PTS <-
c(903,903,1624,1871,2472,2161,1850,2280,2593,686)
DerrickRose_PTS <- c(597,597,597,1361,1619,2026,852,0,159,904)
DwayneWade_PTS <-
c(2040,1397,1254,2386,2045,1941,1082,1463,1028,1331)
#Matrix
Points <- rbind(KobeBryant_PTS, JoeJohnson_PTS, LeBronJames_PTS,
CarmeloAnthony_PTS, DwightHoward_PTS, ChrisBosh_PTS,
ChrisPaul_PTS, KevinDurant_PTS, DerrickRose_PTS, DwayneWade_PTS)
rm(KobeBryant_PTS, JoeJohnson_PTS, LeBronJames_PTS,
CarmeloAnthony_PTS, DwightHoward_PTS, ChrisBosh_PTS,
ChrisPaul_PTS, KevinDurant_PTS, DerrickRose_PTS, DwayneWade_PTS)
colnames(Points) <- Seasons
rownames(Points) <- Players

```

#Part 2 - Free Throw Accuracy

```
myplot(FreeThrows/FreeThrowAttempts)
```



#And yet Chris Paul's accuracy is one of the highest

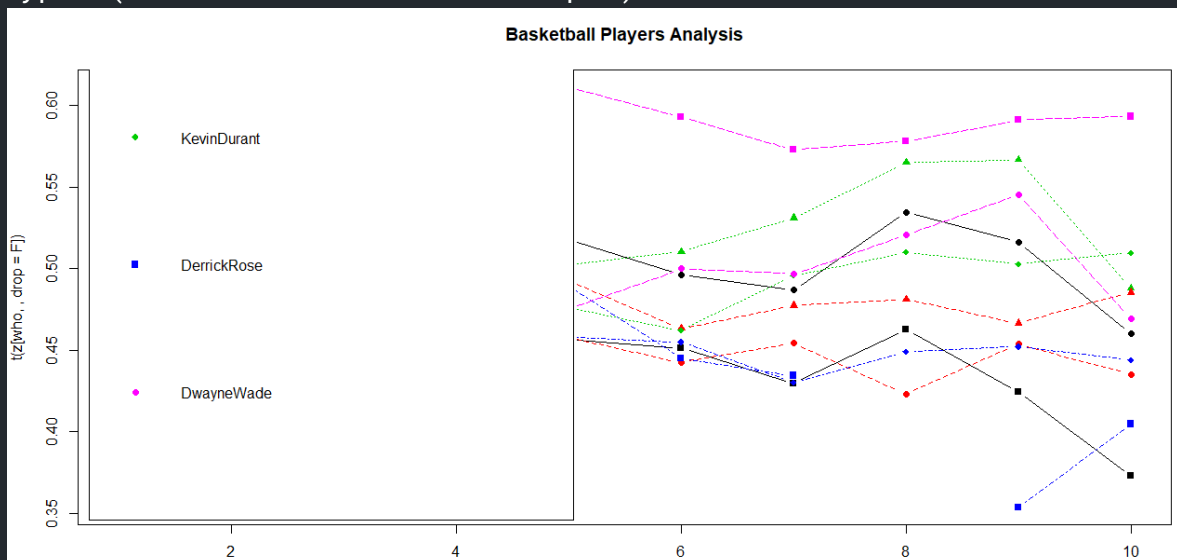
#Chances are his team would get more points if he had more FTA's

#Also notice that Dwight Howard's FT Accuracy is extremely poor

#compared to other players. If you recall, Dwight Howard's

#Field Goal Accuracy was exceptional:

```
myplot(FieldGoals/FieldGoalAttempts)
```

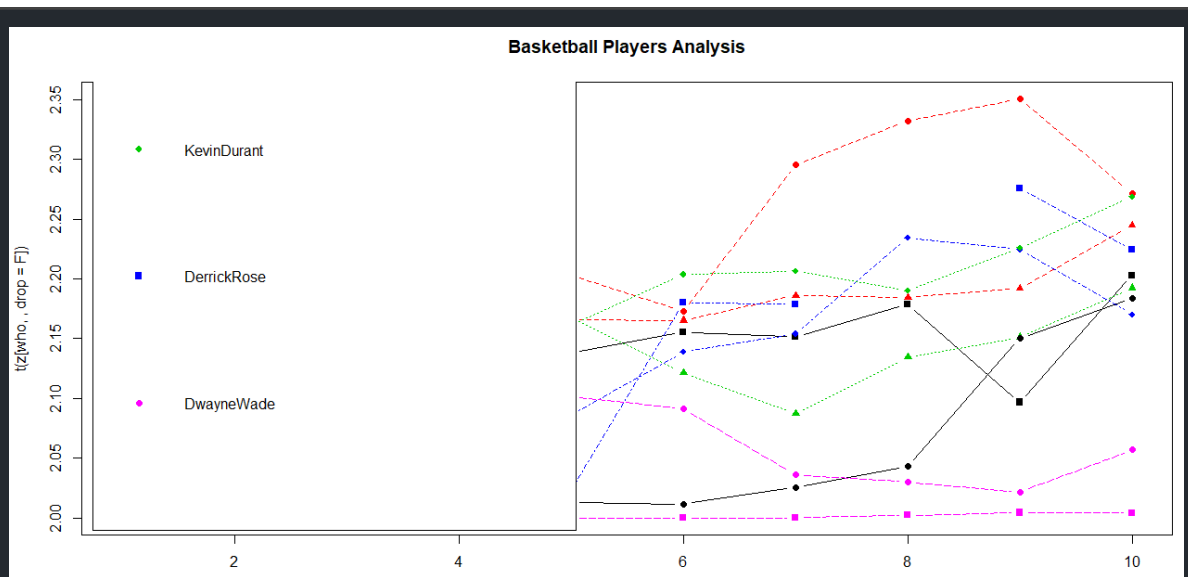


#How could this be? Why is there such a drastic difference?

#We will see just now...

#Part 3 - Player Style Patterns Excluding Free Throws

```
myplot((Points-FreeThrows)/FieldGoals)
```

#Because we have excluded free throws, this plot now shows us
 #the true representation of player style change. We can verify
 #that this is the case because all the marks without exception
 #on this plot are between 2 and 3. That is because Field Goals
 #can only be for either 2 points or 3 points.

#Insights:

#1. You can see how players' preference for 2 or 3 point shots
 # changes throughout their career. We can see that almost all
 # players in this dataset experiment with their style throughout
 # their careers. Perhaps, the most drastic change in style has
 # been experienced by Joe Johnson.

#2. There is one exception. You can see that one player has not
 # changed his style at all - almost always scoring only
 2-pointers.

Who is this mystert player? It's Dwight Howard!

Now that explains a lot. The reason that Dwight Howard's
 # Field Goal accuracy is so good is because he almost always
 # scores 2-pointers only. That means he can be close to the
 basket

or even in contact with it. Free throws, on the other hand
 require

the player to stand 15ft (4.57m) away from the hoop. That's
 # probably why Dwight Howard's Free Throw Accuracy is poor.