PRINCIPAL COMPONENT ANALYSIS

head(AustralianOpen_Finalists_allstats)

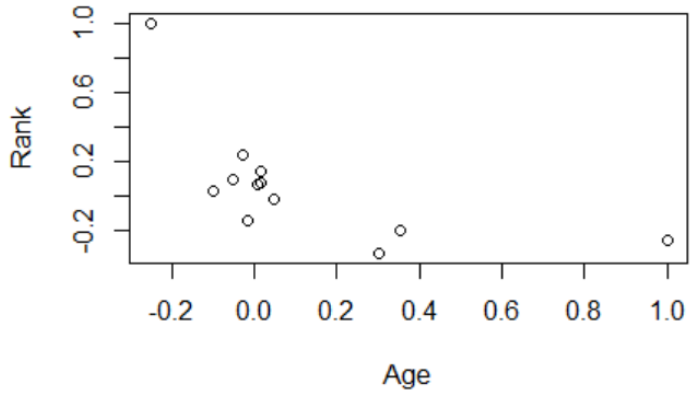
```
> head(AustralianOpen_Finalists_allstats)
     PlayerName Year total_matchs winpercentage      MatchID          Round AvgMinsPerGame
1: Andre Agassi 2000            7             1 m_2000_A_114     4th Round            3.84
2: Andre Agassi 2000            7             1 m_2000_A_122 Quarterfinals            3.32
3: Andre Agassi 2000            7             1  m_2000_A_73     2nd Round            3.44
4: Andre Agassi 2000            7             1 m_2000_A_124    Semifinals            3.50
5: Andre Agassi 2000            7             1  m_2000_A_44     1st Round            3.48
6: Andre Agassi 2000            7             1  m_2000_A_97     3rd Round            3.39
```

```
> str(AustralianOpen_Finalists_allstats)
Classes 'data.table' and 'data.frame':  277 obs. of  28 variables:
 $ PlayerName          : chr  "Andre Agassi" "Andre Agassi" "Andre Agassi" "Andre Agassi" ...
 $ Year                : num  2000 2000 2000 2000 2000 ...
 $ total_matchs        : int  7 7 7 7 7 7 7 7 7 7 ...
 $ winpercentage       : num  1 1 1 1 1 1 1 1 1 1 ...
 $ MatchID             : chr  "m_2000_A_114" "m_2000_A_122" "m_2000_A_73" "m_2000_A_124" ...
 $ Round               : chr  "4th Round" "Quarterfinals" "2nd Round" "Semifinals" ...
 $ AvgMinsPerGame      : num  3.84 3.32 3.44 3.5 3.48 3.39 3.86 3.81 4 3.75 ...
 $ AvgSecsPerPoint     : num  37.9 35.1 37.2 34.5 37.3 37 35 38.3 32.6 33.3 ...
 $ AvgMinsPerSet       : num  41.3 31 31 35 29 31.7 34.8 39.3 68 33.8 ...
 $ Tournament          : chr  "Australian Open" "Australian Open" "Australian Open" "Australi
an Open" ...
 $ TotalMatchMins      : num  165 93 93 175 87 95 139 118 68 135 ...
 $ Points              : num  0 0 0 0 0 0 0 0 0 0 ...
 $ Age                 : num  30 30 30 30 30 30 30 31 31 31 ...
 $ Rank                : num  1 1 1 1 1 1 1 6 6 6 ...
 $ Winner              : logi  TRUE TRUE TRUE TRUE TRUE TRUE ...
 $ TotalSets           : num  3 3 3 3 3 3 3 3 1 3 ...
 $ avgOdds             : num  0 0 0 0 0 0 0 0 0 0 ...
 $ maxOdds             : num  0 0 0 0 0 0 0 0 0 0 ...
 $ SP_Percent          : num  0.709 0.574 0.581 0.69 0.551 ...
 $ RP_Percent          : num  0.291 0.426 0.419 0.31 0.449 ...
 $ BP_Win_Percentage   : num  0.778 0.5 0 0.889 1 ...
 $ Aces                : num  8 6 8 13 6 8 9 6 8 5 ...
 $ firstServeReturnsWon : num  11 13 12 19 18 14 23 30 19 33 ...
 $ SecondServeReturnsWon: num  28 27 27 29 22 25 27 18 16 32 ...
 $ FirstServesIn       : num  96 45 50 101 40 35 77 55 40 77 ...
 $ DoubleFaults        : num  4 1 1 3 1 3 5 0 2 2 ...
 $ FirstServePercentage : num  0.691 0.662 0.658 0.682 0.656 ...
 $ avgset_overyears    : num  32.9 32.9 32.9 32.9 32.9 ...
```

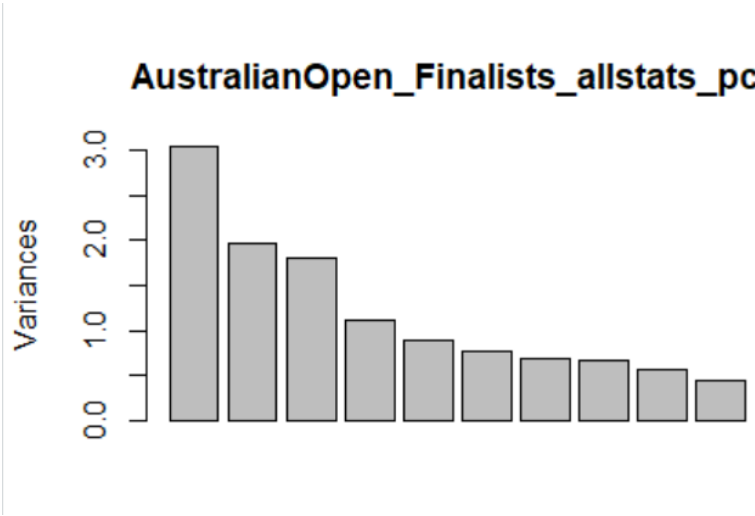
```
> summary(AustralianOpen_Finalists_allstats)
  PlayerName             Year       total_matchs   winpercentage      MatchID
 Length:277         Min.   :2000   Min.   :6.000   Min.   :0.8333   Length:277
 Class :character   1st Qu.:2005   1st Qu.:7.000   1st Qu.:0.8571   Class :character
 Mode  :character   Median :2009   Median :7.000   Median :0.8571   Mode  :character
                    Mean   :2009   Mean   :6.935   Mean   :0.9278
                    3rd Qu.:2014   3rd Qu.:7.000   3rd Qu.:1.0000
                    Max.   :2019   Max.   :7.000   Max.   :1.0000
    Round           AvgMinsPerGame  AvgSecsPerPoint AvgMinsPerSet    Tournament
 Length:277         Min.   :2.930   Min.   :30.20   Min.   : 0.00   Length:277
 Class :character   1st Qu.:3.860   1st Qu.:37.60   1st Qu.:34.70   Class :character
 Mode  :character   Median :4.280   Median :40.70   Median :40.60   Mode  :character
                    Mean   :4.361   Mean   :41.25   Mean   :41.29
                    3rd Qu.:4.700   3rd Qu.:44.30   3rd Qu.:47.30
                    Max.   :9.030   Max.   :75.00   Max.   :93.30
 TotalMatchMins      Points           Age             Rank          Winner
 Min.   : 28.0   Min.   :    0   Min.   :21.0   Min.   : 1.000   Mode :logical
 1st Qu.:104.0   1st Qu.:    0   1st Qu.:24.0   1st Qu.: 1.000   FALSE:20
 Median :135.0   Median : 4675   Median :26.0   Median : 3.000   TRUE :257
 Mean   :144.3   Mean   : 5361   Mean   :26.8   Mean   : 9.289
 3rd Qu.:174.0   3rd Qu.: 9595   3rd Qu.:29.0   3rd Qu.: 8.000
 Max.   :353.0   Max.   :16790   Max.   :36.0   Max.   :86.000
   TotalSets        avgOdds          maxOdds         SP_Percent       RP_Percent
 Min.   :0.000   Min.   :0.0000   Min.   :0.0000   Min.   :0.4000   Min.   :0.1828
 1st Qu.:3.000   1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.:0.5556   1st Qu.:0.3644
 Median :3.000   Median :0.0000   Median :0.0000   Median :0.5984   Median :0.4016
 Mean   :2.765   Mean   :0.6334   Mean   :0.6652   Mean   :0.5954   Mean   :0.4046
 3rd Qu.:3.000   3rd Qu.:1.0700   3rd Qu.:1.1100   3rd Qu.:0.6356   3rd Qu.:0.4444
 Max.   :3.000   Max.   :7.5400   Max.   :9.9500   Max.   :0.8172   Max.   :0.6000
```

```
> cor(AustralianOpen_Finalists_allstats_Numeric)
                              Age        Rank     avgOdds  SP_Percent  RP_Percent
Age                   1.000000000 -0.25095148  0.35273241  0.01634941 -0.01634941
Rank                 -0.250951480  1.00000000 -0.20051576  0.13959147 -0.13959147
avgOdds               0.352732406 -0.20051576  1.00000000  0.12317660 -0.12317660
SP_Percent            0.016349411  0.13959147  0.12317660  1.00000000 -1.00000000
RP_Percent           -0.016349411 -0.13959147 -0.12317660 -1.00000000  1.00000000
BP_Win_Percentage     0.046445661 -0.01874517  0.06214194  0.33361774 -0.33361774
Aces                 -0.028322047  0.24189751  0.07063104  0.33096101 -0.33096101
firstServeReturnsWon  0.007560355  0.06350431  0.14914315 -0.19223673  0.19223673
SecondServeReturnsWon -0.099838420  0.02929340 -0.09410121 -0.12071837  0.12071837
FirstServesIn         0.017875384  0.08019394  0.20328529  0.53140762 -0.53140762
DoubleFaults         -0.050686282  0.09506826  0.08046195  0.21856225 -0.21856225
FirstServePercentage  0.302870829 -0.33129744  0.18773514 -0.05401739  0.05401739
```

```
plot(cor(AustralianOpen_Finalists_allstats_Numeric))
```




```
AustralianOpen_Finalists_allstats_pca<-prcomp(AustralianOpen_Finalists_allstats_Numeric,scale=TRUE)
plot(AustralianOpen_Finalists_allstats_pca)
```



```
> summary(AustralianOpen_Finalists_allstats_pca)
Importance of components:
                          PC1    PC2    PC3     PC4     PC5     PC6     PC7     PC8     PC9
Standard deviation     1.7420 1.4031 1.3450 1.06024 0.94928 0.87265 0.82817 0.81273 0.75323
Proportion of Variance 0.2529 0.1641 0.1507 0.09368 0.07509 0.06346 0.05715 0.05504 0.04728
Cumulative Proportion  0.2529 0.4169 0.5677 0.66136 0.73645 0.79991 0.85707 0.91211 0.95939
                          PC10    PC11      PC12
Standard deviation     0.66214 0.22105 8.502e-16
Proportion of Variance 0.03654 0.00407 0.000e+00
Cumulative Proportion  0.99593 1.00000 1.000e+00
```

```
View(AustralianOpen_Finalists_allstats_pca)
```

Name	Type	Value
AustralianOpen_Finalists_...	list [5] (S3: prcomp)	List of length 5
sdev	double [12]	1.742 1.403 1.345 1.060 0.949 0.873 ...
rotation	double [12 x 12]	-4.15e-03 1.36e-01 1.18e-01 4.84e-01 -4.84e-01 2.61e-01 4.28e-01 -3.82e-01 ...
center	double [12]	26.801 9.289 0.633 0.595 0.405 0.578 ...
scale	double [12]	3.7184 16.6810 0.9290 0.0615 0.0615 0.3189 ...
x	double [277 x 12]	2.51e+00 -1.42e+00 -1.52e+00 2.70e+00 -1.50e+00 -1.53e+00 1.59e+00 8.23...

```
eigen_AO_Finalists <-AustralianOpen_Finalists_allstats_pca$sdev^2
> eigen_AO_Finalists
 [1] 3.034501e+00 1.968804e+00 1.808901e+00 1.124111e+00 9.011337e-01 7.61513
4e-01
 [7] 6.858578e-01 6.605265e-01 5.673569e-01 4.384332e-01 4.886229e-02 7.22779
6e-31
>
> names(eigen_AO_Finalists) <- paste("PC",1:12,sep="")
> eigen_AO_Finalists
          PC1           PC2           PC3           PC4           PC5           PC6
PC7
3.034501e+00 1.968804e+00 1.808901e+00 1.124111e+00 9.011337e-01 7.615134e-01
6.858578e-01
          PC8           PC9          PC10          PC11          PC12
6.605265e-01 5.673569e-01 4.384332e-01 4.886229e-02 7.227796e-31
```

```
> sumlambdas<-sum(eigen_AO_Finalists)
> sumlambdas
[1] 12
```

```
> propvar<-eigen_AO_Finalists/sumlambdas
> propvar
          PC1           PC2           PC3           PC4           PC5           PC6
PC7
2.528751e-01 1.640670e-01 1.507418e-01 9.367588e-02 7.509447e-02 6.345945e-02
5.715482e-02
          PC8           PC9          PC10          PC11          PC12
5.504387e-02 4.727975e-02 3.653610e-02 4.071857e-03 6.023163e-32
```

```
> cumvar_AO_Finalists<-cumsum(propvar)
> cumvar_AO_Finalists
      PC1       PC2       PC3       PC4       PC5       PC6       PC7       P
C8       PC9
0.2528751 0.4169420 0.5676838 0.6613597 0.7364542 0.7999136 0.8570684 0.91211
23 0.9593920
     PC10      PC11      PC12
0.9959281 1.0000000 1.0000000


> matlambdas<-rbind(eigen_AO_Finalists,propvar,cumvar_AO_Finalists)
> rownames(matlambdas)
[1] "eigen_AO_Finalists"  "propvar"             "cumvar_AO_Finalists"
> round(matlambdas,5)
                         PC1     PC2     PC3     PC4     PC5     PC6     PC7
PC8     PC9
eigen_AO_Finalists   3.03450 1.96880 1.80890 1.12411 0.90113 0.76151 0.68586 0
.66053 0.56736
propvar              0.25288 0.16407 0.15074 0.09368 0.07509 0.06346 0.05715 0
.05504 0.04728
cumvar_AO_Finalists  0.25288 0.41694 0.56768 0.66136 0.73645 0.79991 0.85707 0
.91211 0.95939
                        PC10    PC11 PC12
eigen_AO_Finalists   0.43843 0.04886    0
propvar              0.03654 0.00407    0
cumvar_AO_Finalists  0.99593 1.00000    1


> summary(AustralianOpen_Finalists_allstats_pca)
Importance of components:
                          PC1    PC2    PC3     PC4     PC5     PC6     PC7
PC8     PC9
Standard deviation     1.7420 1.4031 1.3450 1.06024 0.94928 0.87265 0.82817 0
.81273 0.75323
Proportion of Variance 0.2529 0.1641 0.1507 0.09368 0.07509 0.06346 0.05715 0
.05504 0.04728
Cumulative Proportion  0.2529 0.4169 0.5677 0.66136 0.73645 0.79991 0.85707 0
.91211 0.95939
                          PC10    PC11      PC12
Standard deviation     0.66214 0.22105 8.502e-16
Proportion of Variance 0.03654 0.00407 0.000e+00
Cumulative Proportion  0.99593 1.00000 1.000e+00


> print(AustralianOpen_Finalists_allstats_pca)
Standard deviations (1, .., p=12):
 [1] 1.741982e+00 1.403141e+00 1.344954e+00 1.060241e+00 9.492806e-01 8.72647
3e-01
 [7] 8.281653e-01 8.127278e-01 7.532310e-01 6.621429e-01 2.210482e-01 8.50164
4e-16
```

Rotation (n x k) = (12 x 12):

	PC1	PC2	PC3	PC4	PC5
Age	-0.00415178	0.42830942	-0.232554474	0.314609668	-0.04632629
Rank	0.13630501	-0.38197446	0.243595669	0.155808021	0.34813788
avgOdds	0.11807701	0.34188696	-0.274509489	0.476805302	-0.14611186
SP_Percent	0.48391843	0.19453812	0.308779847	-0.007946174	-0.03292276
RP_Percent	-0.48391843	-0.19453812	-0.308779847	0.007946174	0.03292276
BP_Win_Percentage	0.26061584	0.18226722	-0.006836468	-0.395263686	0.11221296
Aces	0.31732681	-0.19283950	-0.016447010	0.370417984	0.37960882
firstServeReturnsWon	0.11056995	-0.24004315	-0.506991061	0.241247978	0.26234179
SecondServeReturnsWon	0.13556848	-0.30358565	-0.404359859	-0.397499499	-0.08812446
FirstServesIn	0.46875952	-0.01812074	-0.326892184	-0.188532278	0.10380643
DoubleFaults	0.27786436	-0.21598416	-0.157093786	0.054974387	-0.70441043
FirstServePercentage	-0.05423925	0.45923720	-0.261023158	-0.317897990	0.33598190

	PC6	PC7	PC8	PC9	PC10
Age	0.07970268	-0.63457440	-0.335950103	0.29919590	0.22054563
Rank	-0.15206363	-0.05060044	-0.744818085	-0.19909378	-0.09768241
avgOdds	-0.10789635	0.22739381	-0.013033622	-0.69122593	-0.04389392
SP_Percent	0.14662673	0.10424547	0.006397133	0.07541969	0.15795541
RP_Percent	-0.14662673	-0.10424547	-0.006397133	-0.07541969	-0.15795541
BP_Win_Percentage	-0.76231012	-0.32625171	0.141283958	-0.14915111	-0.01480656
Aces	0.16206350	-0.34295605	0.451779918	0.02147937	-0.47944497
firstServeReturnsWon	-0.29723940	0.30625163	0.069620240	0.36171974	0.30759324
SecondServeReturnsWon	0.37873653	-0.33614764	-0.030957822	-0.37581689	0.13408444
FirstServesIn	0.16173311	0.19139591	-0.109800818	0.03343799	0.15240337
DoubleFaults	-0.16974263	0.01768431	-0.179256050	0.25843657	-0.47111092
FirstServePercentage	0.14744370	0.23135101	-0.240979790	0.13776595	-0.54967266

	PC11	PC12
Age	-0.035617950	-1.370222e-16
Rank	0.032917599	7.204847e-18
avgOdds	0.043408318	8.019690e-17
SP_Percent	0.261611057	7.071068e-01
RP_Percent	-0.261611057	7.071068e-01
BP_Win_Percentage	-0.001685847	8.964077e-17
Aces	-0.047078812	1.996870e-16
firstServeReturnsWon	0.365577301	-2.776579e-17
SecondServeReturnsWon	0.378901466	3.509267e-16
FirstServesIn	-0.726337635	-4.471402e-16

```
DoubleFaults           0.047482294 -9.629723e-17
FirstServePercentage   0.222776913  1.520023e-16
```

```
AustralianOpen_Finalists_allstats_pca$rotation
                              PC1          PC2          PC3          PC4
PC5
Age                   -0.00415178  0.42830942 -0.232554474  0.314609668 -0.04
632629
Rank                   0.13630501 -0.38197446  0.243595669  0.155808021  0.34
813788
avgOdds                0.11807701  0.34188696 -0.274509489  0.476805302 -0.14
611186
SP_Percent             0.48391843  0.19453812  0.308779847 -0.007946174 -0.03
292276
RP_Percent            -0.48391843 -0.19453812 -0.308779847  0.007946174  0.03
292276
BP_Win_Percentage      0.26061584  0.18226722 -0.006836468 -0.395263686  0.11
221296
Aces                   0.31732681 -0.19283950 -0.016447010  0.370417984  0.37
960882
firstServeReturnsWon   0.11056995 -0.24004315 -0.506991061  0.241247978  0.26
234179
SecondServeReturnsWon  0.13556848 -0.30358565 -0.404359859 -0.397499499 -0.08
812446
FirstServesIn          0.46875952 -0.01812074 -0.326892184 -0.188532278  0.10
380643
DoubleFaults           0.27786436 -0.21598416 -0.157093786  0.054974387 -0.70
441043
FirstServePercentage  -0.05423925  0.45923720 -0.261023158 -0.317897990  0.33
598190
                              PC6          PC7          PC8          PC9
PC10
Age                    0.07970268 -0.63457440 -0.335950103  0.29919590  0.220
54563
Rank                  -0.15206363 -0.05060044 -0.744818085 -0.19909378 -0.097
68241
avgOdds               -0.10789635  0.22739381 -0.013033622 -0.69122593 -0.043
89392
SP_Percent             0.14662673  0.10424547  0.006397133  0.07541969  0.157
95541
RP_Percent            -0.14662673 -0.10424547 -0.006397133 -0.07541969 -0.157
95541
BP_Win_Percentage     -0.76231012 -0.32625171  0.141283958 -0.14915111 -0.014
80656
Aces                   0.16206350 -0.34295605  0.451779918  0.02147937 -0.479
44497
firstServeReturnsWon  -0.29723940  0.30625163  0.069620240  0.36171974  0.307
59324
SecondServeReturnsWon  0.37873653 -0.33614764 -0.030957822 -0.37581689  0.134
08444
FirstServesIn          0.16173311  0.19139591 -0.109800818  0.03343799  0.152
40337
DoubleFaults          -0.16974263  0.01768431 -0.179256050  0.25843657 -0.471
11092
FirstServePercentage   0.14744370  0.23135101 -0.240979790  0.13776595 -0.549
67266
                             PC11          PC12
Age                   -0.035617950 -1.370222e-16
Rank                   0.032917599  7.204847e-18
avgOdds                0.043408318  8.019690e-17
SP_Percent             0.261611057  7.071068e-01
RP_Percent            -0.261611057  7.071068e-01
BP_Win_Percentage     -0.001685847  8.964077e-17
```

```
Aces                   -0.047078812  1.996870e-16
firstServeReturnsWon    0.365577301 -2.776579e-17
SecondServeReturnsWon   0.378901466  3.509267e-16
FirstServesIn          -0.726337635 -4.471402e-16
DoubleFaults            0.047482294 -9.629723e-17
FirstServePercentage    0.222776913  1.520023e-16


#Sample scores stores in AustralianOpen_Finalists_allstats_pca$x

> head(AustralianOpen_Finalists_allstats_pca$x)
           PC1        PC2         PC3        PC4        PC5        PC6
PC7
[1,]  2.514665  1.5872062  0.67009186 -1.6517068 -0.8693204  1.1465220 -0.549
4237
[2,] -1.421527  0.8228852  0.34733753 -0.8177448 -0.1415148  0.8181356 -1.028
0831
[3,] -1.524914  0.5108870  0.42306493 -0.1243265 -0.2168012  2.1702613 -0.630
2430
[4,]  2.702994  1.1160577 -0.09989699 -1.2755796  0.1607227  0.7739094 -0.739
1820
[5,] -1.503460  0.9591323  0.11138776 -0.9395291  0.2447338 -0.9883880 -1.255
2731
[6,] -1.533669 -0.5137968  0.85399134  0.7820955 -1.5077049  1.4263890 -0.986
5489
               PC8        PC9        PC10        PC11         PC12
[1,] -0.5895241723 0.61394048 -0.02831829 -0.29491498 1.173952e-15
[2,] -0.2525658813 0.01698936  0.13897452  0.13608186 7.844005e-16
[3,] -0.3310518040 0.22489122  0.04211636 -0.05066367 2.824750e-17
[4,]  0.0315090168 0.73644588  0.13172698 -0.26313280 1.111926e-15
[5,]  0.0758887799 0.19662481  0.12504675  0.07637995 1.181607e-15
[6,] -0.0008126966 0.41926563  0.42383211  0.06513463 4.774504e-16


#Identifying scores by their conversion status

> AO_type_finalists_pca<-cbind(data.frame(AustralianOpen_Finalists_allstats$W
inner),AustralianOpen_Finalists_allstats_pca$x)
>
> head(AO_type_finalists_pca)
  AustralianOpen_Finalists_allstats.Winner       PC1        PC2         PC3
PC4
1                                     TRUE  2.514665  1.5872062  0.67009186 -
1.6517068
2                                     TRUE -1.421527  0.8228852  0.34733753 -
0.8177448
3                                     TRUE -1.524914  0.5108870  0.42306493 -
0.1243265
4                                     TRUE  2.702994  1.1160577 -0.09989699 -
1.2755796
5                                     TRUE -1.503460  0.9591323  0.11138776 -
0.9395291
6                                     TRUE -1.533669 -0.5137968  0.85399134
0.7820955
         PC5        PC6        PC7           PC8        PC9        PC10
PC11
1 -0.8693204  1.1465220 -0.5494237 -0.5895241723 0.61394048 -0.02831829 -0.29
491498
2 -0.1415148  0.8181356 -1.0280831 -0.2525658813 0.01698936  0.13897452  0.13
608186
3 -0.2168012  2.1702613 -0.6302430 -0.3310518040 0.22489122  0.04211636 -0.05
066367
4  0.1607227  0.7739094 -0.7391820  0.0315090168 0.73644588  0.13172698 -0.26
313280
```

```
5  0.2447338 -0.9883880 -1.2552731  0.0758887799 0.19662481  0.12504675  0.07
637995
6 -1.5077049  1.4263890 -0.9865489 -0.0008126966 0.41926563  0.42383211  0.06
513463
          PC12
1 1.173952e-15
2 7.844005e-16
3 2.824750e-17
4 1.111926e-15
5 1.181607e-15
6 4.774504e-16


#Means of scores for all PC's classified by Winners of Finals

> tabmeansPC
  Winner        PC1         PC2         PC3         PC4        PC5           P
C6         PC7
1  FALSE  1.4964560  0.44209629  0.96920003  0.33131294 -0.8892816 -0.0853491
51  0.63719083
2   TRUE -0.1164557 -0.03440438 -0.07542413 -0.02578311  0.0692048  0.0066419
57 -0.04958683
          PC8         PC9         PC10        PC11         PC12
1 -0.42899660 -0.1914264  0.050570026 -0.22116832 8.466044e-16
2  0.03338495  0.0148970 -0.003935411  0.01721154 5.773858e-16


> tabmeansPC<-tabmeansPC[rev(order(tabmeansPC$Winner)),]
> tabmeansPC
  Winner        PC1         PC2         PC3         PC4        PC5           P
C6         PC7
2   TRUE -0.1164557 -0.03440438 -0.07542413 -0.02578311  0.0692048  0.0066419
57 -0.04958683
1  FALSE  1.4964560  0.44209629  0.96920003  0.33131294 -0.8892816 -0.0853491
51  0.63719083
          PC8         PC9         PC10        PC11         PC12
2  0.03338495  0.0148970 -0.003935411  0.01721154 5.773858e-16
1 -0.42899660 -0.1914264  0.050570026 -0.22116832 8.466044e-16




> tabfmeans<-t(tabmeansPC[,-1])
> tabfmeans
                2             1
PC1  -1.164557e-01  1.496456e+00
PC2  -3.440438e-02  4.420963e-01
PC3  -7.542413e-02  9.692000e-01
PC4  -2.578311e-02  3.313129e-01
PC5   6.920480e-02 -8.892816e-01
PC6   6.641957e-03 -8.534915e-02
PC7  -4.958683e-02  6.371908e-01
PC8   3.338495e-02 -4.289966e-01
PC9   1.489700e-02 -1.914264e-01
PC10 -3.935411e-03  5.057003e-02
PC11  1.721154e-02 -2.211683e-01
PC12  5.773858e-16  8.466044e-16
```

```
> colnames(tabfmeans)<-t(as.vector(tabmeansPC[1]))
> tabfmeans
              TRUE          FALSE
PC1  -1.164557e-01  1.496456e+00
PC2  -3.440438e-02  4.420963e-01
PC3  -7.542413e-02  9.692000e-01
PC4  -2.578311e-02  3.313129e-01
PC5   6.920480e-02 -8.892816e-01
PC6   6.641957e-03 -8.534915e-02
PC7  -4.958683e-02  6.371908e-01
PC8   3.338495e-02 -4.289966e-01
PC9   1.489700e-02 -1.914264e-01
PC10 -3.935411e-03  5.057003e-02
PC11  1.721154e-02 -2.211683e-01
PC12  5.773858e-16  8.466044e-16


#Standard Deviations of scores for all the PC's Classified by Winner Yes/NO


> tabsdsPC<-aggregate(AO_type_finalists_pca[,2:13],by=list(Winner=AustralianO
pen_Finalists_allstats$Winner),sd)
> tabsds<-t(tabsdsPC[,-1])
> colnames(tabsds)<-t(as.vector(tabsdsPC[1]))
> tabsds
             FALSE         TRUE
PC1  1.255267e+00 1.722225e+00
PC2  1.880504e+00 1.357829e+00
PC3  1.924780e+00 1.263392e+00
PC4  1.149186e+00 1.051034e+00
PC5  9.378078e-01 9.163349e-01
PC6  6.748801e-01 8.868987e-01
PC7  4.988461e-01 8.287238e-01
PC8  1.015771e+00 7.874357e-01
PC9  1.078374e+00 7.226948e-01
PC10 6.740626e-01 6.623809e-01
PC11 2.538462e-01 2.092325e-01
PC12 6.048802e-16 7.344560e-16


#t test on all the principal components

> t.test(PC1~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalists_
pca)

        Welch Two Sample t-test


data:  PC1 by AustralianOpen_Finalists_allstats$Winner
t = 5.3667, df = 24.935, p-value = 1.46e-05
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.9938503 2.2319731
sample estimates:
mean in group FALSE  mean in group TRUE
          1.4964560          -0.1164557

Significant
```

```
> t.test(PC2~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalists_
pca)

        Welch Two Sample t-test

data:  PC2 by AustralianOpen_Finalists_allstats$Winner
t = 1.1109, df = 20.571, p-value = 0.2794
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.416662  1.369663
sample estimates:
mean in group FALSE  mean in group TRUE
         0.44209629         -0.03440438
```

Not significant

```
> t.test(PC3~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalists_
pca)

        Welch Two Sample t-test

data:  PC3 by AustralianOpen_Finalists_allstats$Winner
t = 2.3874, df = 20.294, p-value = 0.0268
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.132758 1.956490
sample estimates:
mean in group FALSE  mean in group TRUE
         0.96920003         -0.07542413
```

Significant

```
> t.test(PC4~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalists_
pca)

        Welch Two Sample t-test

data:  PC4 by AustralianOpen_Finalists_allstats$Winner
t = 1.3465, df = 21.547, p-value = 0.1921
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.1935606  0.9077527
sample estimates:
mean in group FALSE  mean in group TRUE
         0.33131294         -0.02578311
```

Not significant

```
> t.test(PC5~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalists_
pca)

        Welch Two Sample t-test

data:  PC5 by AustralianOpen_Finalists_allstats$Winner
t = -4.4099, df = 21.919, p-value = 0.0002233
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.4093407 -0.5076321
sample estimates:
mean in group FALSE  mean in group TRUE
         -0.8892816           0.0692048
```

Significant

```
> t.test(PC6~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalists_
pca)

        Welch Two Sample t-test

data:  PC6 by AustralianOpen_Finalists_allstats$Winner
t = -0.57234, df = 24.418, p-value = 0.5723
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.4234195  0.2394373
sample estimates:
mean in group FALSE  mean in group TRUE
       -0.085349151         0.006641957
```

Not Significant

```
> t.test(PC7~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalists_
pca)

        Welch Two Sample t-test

data:  PC7 by AustralianOpen_Finalists_allstats$Winner
t = 5.5862, df = 27.942, p-value = 5.643e-06
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.4349194 0.9386359
sample estimates:
mean in group FALSE  mean in group TRUE
         0.63719083         -0.04958683
```

Significant

```
> t.test(PC8~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalists_
pca)

        Welch Two Sample t-test

data:  PC8 by AustralianOpen_Finalists_allstats$Winner
t = -1.9897, df = 20.815, p-value = 0.05992
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.94591102  0.02114792
sample estimates:
mean in group FALSE  mean in group TRUE
        -0.42899660          0.03338495
```

Not Significant

```
> t.test(PC9~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalists_
pca)

        Welch Two Sample t-test

data:  PC9 by AustralianOpen_Finalists_allstats$Winner
t = -0.84107, df = 20.35, p-value = 0.4101
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.7174673  0.3048205
sample estimates:
mean in group FALSE  mean in group TRUE
         -0.1914264           0.014897
```

Not Significant

```
> t.test(PC10~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalists
_pca)

        Welch Two Sample t-test

data:  PC10 by AustralianOpen_Finalists_allstats$Winner
t = 0.34876, df = 21.954, p-value = 0.7306
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.2696509  0.3786617
sample estimates:
mean in group FALSE  mean in group TRUE
        0.050570026        -0.003935411
```

Not Significant

```
> t.test(PC11~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalists
_pca)

        Welch Two Sample t-test

data:  PC11 by AustralianOpen_Finalists_allstats$Winner
t = -4.0929, df = 21.058, p-value = 0.000518
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.3594824 -0.1172773
sample estimates:
mean in group FALSE  mean in group TRUE
        -0.22116832          0.01721154
```

Significant

```
> t.test(PC12~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalists
_pca)

        Welch Two Sample t-test

data:  PC12 by AustralianOpen_Finalists_allstats$Winner
t = 1.8852, df = 23.587, p-value = 0.07178
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -2.578742e-17  5.642246e-16
sample estimates:
mean in group FALSE  mean in group TRUE
       8.466044e-16        5.773858e-16
```

Not Significant

```
> var.test(PC1~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalist
s_pca)

        F test to compare two variances

data:  PC1 by AustralianOpen_Finalists_allstats$Winner
F = 0.53124, num df = 19, denom df = 256, p-value = 0.1057
alternative hypothesis: true ratio of variances is not equal to 1
```

```
95 percent confidence interval:
 0.297964 1.150953
sample estimates:
ratio of variances
         0.5312421

Not Significant


> var.test(PC2~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalist
s_pca)

        F test to compare two variances

data:  PC2 by AustralianOpen_Finalists_allstats$Winner
F = 1.918, num df = 19, denom df = 256, p-value = 0.02655
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 1.075795 4.155501
sample estimates:
ratio of variances
          1.918043

Significant


> var.test(PC3~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalist
s_pca)

        F test to compare two variances

data:  PC3 by AustralianOpen_Finalists_allstats$Winner
F = 2.3211, num df = 19, denom df = 256, p-value = 0.003531
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 1.301838 5.028643
sample estimates:
ratio of variances
          2.321056

Significant


> var.test(PC4~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalist
s_pca)

        F test to compare two variances

data:  PC4 by AustralianOpen_Finalists_allstats$Winner
F = 1.1955, num df = 19, denom df = 256, p-value = 0.5225
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.6705294 2.5900714
sample estimates:
ratio of variances
          1.195492

Not Significant


> var.test(PC5~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalist
s_pca)

        F test to compare two variances
```

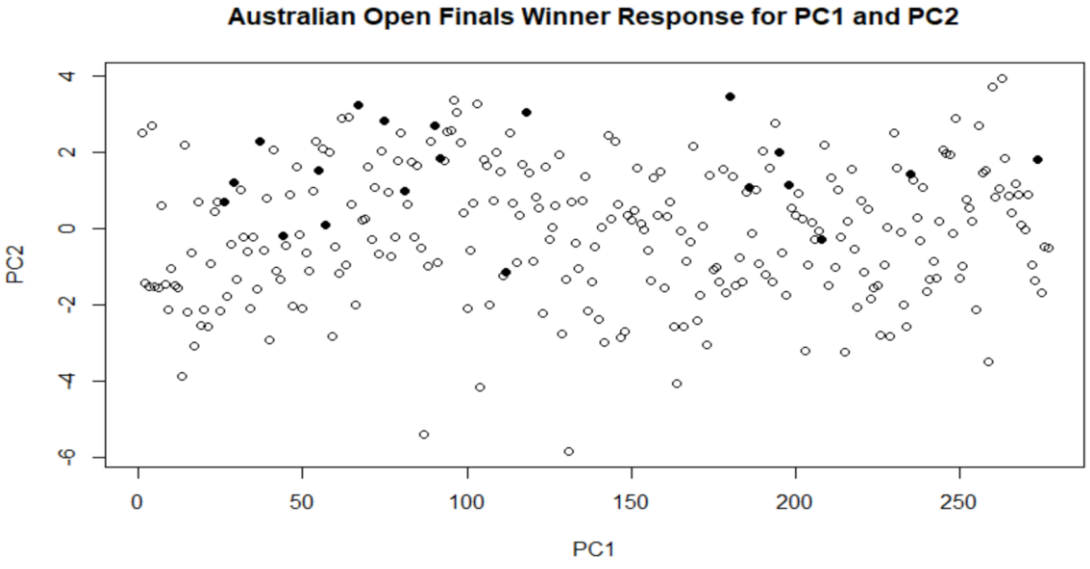
```
data:  PC5 by AustralianOpen_Finalists_allstats$Winner
F = 1.0474, num df = 19, denom df = 256, p-value = 0.8142
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.5874765 2.2692607
sample estimates:
ratio of variances
          1.047416

Not Significant


> var.test(PC6~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalist
s_pca)

        F test to compare two variances

data:  PC6 by AustralianOpen_Finalists_allstats$Winner
F = 0.57904, num df = 19, denom df = 256, p-value = 0.1609
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.3247704 1.2544991
sample estimates:
ratio of variances
         0.5790356

Not Significant


> var.test(PC7~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalist
s_pca)

        F test to compare two variances

data:  PC7 by AustralianOpen_Finalists_allstats$Winner
F = 0.36234, num df = 19, denom df = 256, p-value = 0.01176
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.2032285 0.7850161
sample estimates:
ratio of variances
         0.3623376

Significant


> var.test(PC8~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalist
s_pca)

        F test to compare two variances

data:  PC8 by AustralianOpen_Finalists_allstats$Winner
F = 1.664, num df = 19, denom df = 256, p-value = 0.08524
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.9333235 3.6051731
sample estimates:
ratio of variances
          1.664029
Not Significant
```

```
> var.test(PC9~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalist
s_pca)

        F test to compare two variances

data:  PC9 by AustralianOpen_Finalists_allstats$Winner
F = 2.2265, num df = 19, denom df = 256, p-value = 0.005751
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 1.248821 4.823853
sample estimates:
ratio of variances
          2.226532
Significant


> var.test(PC10~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalis
ts_pca)

        F test to compare two variances

data:  PC10 by AustralianOpen_Finalists_allstats$Winner
F = 1.0356, num df = 19, denom df = 256, p-value = 0.8407
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.5808394 2.2436236
sample estimates:
ratio of variances
          1.035583

Not Significant


> var.test(PC11~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalis
ts_pca)

        F test to compare two variances

data:  PC11 by AustralianOpen_Finalists_allstats$Winner
F = 1.4719, num df = 19, denom df = 256, p-value = 0.1909
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.8255709 3.1889541
sample estimates:
ratio of variances
          1.471916
Not Significant


> var.test(PC12~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalis
ts_pca)

        F test to compare two variances

data:  PC12 by AustralianOpen_Finalists_allstats$Winner
F = 0.67828, num df = 19, denom df = 256, p-value = 0.3215
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.3804332 1.4695092
sample estimates:
ratio of variances
         0.6782772

Not Significant
```

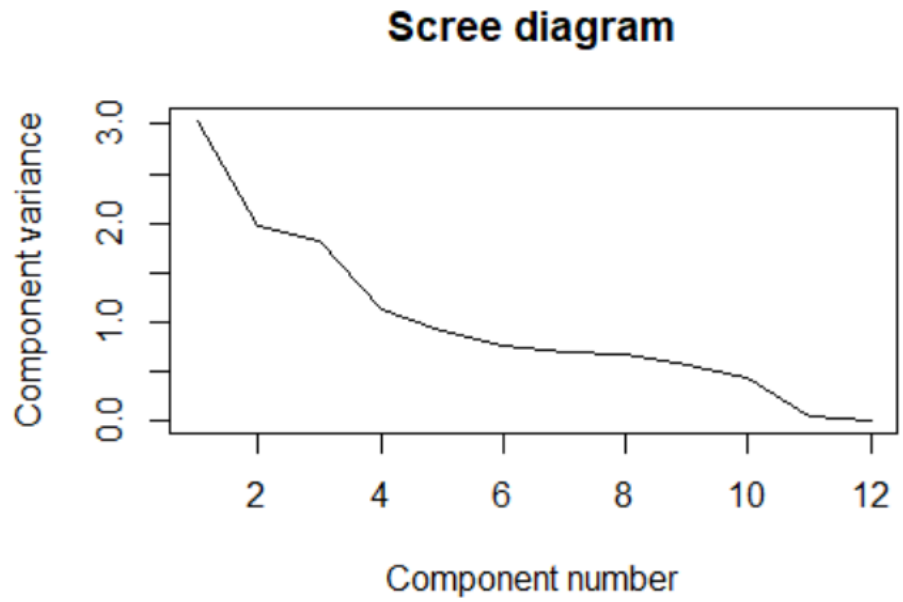
```
> (LTPC_1<-leveneTest(PC1~AustralianOpen_Finalists_allstats$Winner,data=AO_ty
pe_finalists_pca))
Levene's Test for Homogeneity of Variance (center = median)
       Df F value  Pr(>F)
group   1  3.5103 0.06205 .
      275
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
Warning message:
In leveneTest.default(y = y, group = group, ...) : group coerced to factor.
> (p_PC1_1sided<-LTPC_1[[3]][1]/2)
[1] 0.03102489


> (LTPC_1<-leveneTest(PC2~AustralianOpen_Finalists_allstats$Winner,data=AO_ty
pe_finalists_pca))
Levene's Test for Homogeneity of Variance (center = median)
       Df F value  Pr(>F)
group   1  4.1808 0.04184 *
      275
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
Warning message:
In leveneTest.default(y = y, group = group, ...) : group coerced to factor.
> (p_PC2_1sided<-LTPC_1[[3]][1]/2)
[1] 0.02091785

> (LTPC_1<-leveneTest(PC3~AustralianOpen_Finalists_allstats$Winner,data=AO_ty
pe_finalists_pca))
Levene's Test for Homogeneity of Variance (center = median)
       Df F value   Pr(>F)
group   1   10.58 0.001286 **
      275
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
Warning message:
In leveneTest.default(y = y, group = group, ...) : group coerced to factor.
> (p_PC3_1sided<-LTPC_1[[3]][1]/2)
[1] 0.0006430479

> (LTPC_1<-leveneTest(PC4~AustralianOpen_Finalists_allstats$Winner,data=AO_ty
pe_finalists_pca))
Levene's Test for Homogeneity of Variance (center = median)
       Df F value Pr(>F)
group   1  0.2254 0.6354
      275
Warning message:
In leveneTest.default(y = y, group = group, ...) : group coerced to factor.
> (p_PC4_1sided<-LTPC_1[[3]][1]/2)
[1] 0.317683


> (LTPC_1<-leveneTest(PC5~AustralianOpen_Finalists_allstats$Winner,data=AO_ty
pe_finalists_pca))
Levene's Test for Homogeneity of Variance (center = median)
       Df F value Pr(>F)
group   1   3e-04 0.9864
      275
Warning message:
```

```
In leveneTest.default(y = y, group = group, ...) : group coerced to factor.
> (p_PC5_1sided<-LTPC_1[[3]][1]/2)
[1] 0.493195


> (LTPC_1<-leveneTest(PC6~AustralianOpen_Finalists_allstats$Winner,data=AO_ty
pe_finalists_pca))
Levene's Test for Homogeneity of Variance (center = median)
       Df F value Pr(>F)
group   1  1.3002 0.2552
      275
Warning message:
In leveneTest.default(y = y, group = group, ...) : group coerced to factor.
> (p_PC6_1sided<-LTPC_1[[3]][1]/2)
[1] 0.1275801



> (LTPC_1<-leveneTest(PC7~AustralianOpen_Finalists_allstats$Winner,data=AO_ty
pe_finalists_pca))
Levene's Test for Homogeneity of Variance (center = median)
       Df F value  Pr(>F)
group   1  4.8222 0.02893 *
      275
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
Warning message:
In leveneTest.default(y = y, group = group, ...) : group coerced to factor.
> (p_PC7_1sided<-LTPC_1[[3]][1]/2)
[1] 0.01446502



> (LTPC_1<-leveneTest(PC8~AustralianOpen_Finalists_allstats$Winner,data=AO_ty
pe_finalists_pca))
Levene's Test for Homogeneity of Variance (center = median)
       Df F value Pr(>F)
group   1  1.1873 0.2768
      275
Warning message:
In leveneTest.default(y = y, group = group, ...) : group coerced to factor.
> (p_PC8_1sided<-LTPC_1[[3]][1]/2)
[1] 0.1384192


 > (LTPC_1<-leveneTest(PC9~AustralianOpen_Finalists_allstats$Winner,data=AO_type_finalists
 Levene's Test for Homogeneity of Variance (center = median)
        Df F value Pr(>F)
 group   1  6.4889 0.0114 *
       275
 ---
 Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
 Warning message:
 In leveneTest.default(y = y, group = group, ...) : group coerced to factor.
 > (p_PC9_1sided<-LTPC_1[[3]][1]/2)
 [1] 0.005699886


> (LTPC_1<-leveneTest(PC10~AustralianOpen_Finalists_allstats$Winner,data=AO_t
ype_finalists_pca))
Levene's Test for Homogeneity of Variance (center = median)
       Df F value Pr(>F)
group   1  0.1651 0.6848
      275
Warning message:
```

```
In leveneTest.default(y = y, group = group, ...) : group coerced to factor.
> (p_PC10_1sided<-LTPC_1[[3]][1]/2)
[1] 0.3424184


> (LTPC_1<-leveneTest(PC11~AustralianOpen_Finalists_allstats$Winner,data=AO_t
ype_finalists_pca))
Levene's Test for Homogeneity of Variance (center = median)
       Df F value Pr(>F)
group   1  0.5815 0.4464
      275
Warning message:
In leveneTest.default(y = y, group = group, ...) : group coerced to factor.
> (p_PC11_1sided<-LTPC_1[[3]][1]/2)
[1] 0.2231903


> (LTPC_1<-leveneTest(PC12~AustralianOpen_Finalists_allstats$Winner,data=AO_t
ype_finalists_pca))
Levene's Test for Homogeneity of Variance (center = median)
       Df F value Pr(>F)
group   1  1.4859 0.2239
      275
Warning message:
In leveneTest.default(y = y, group = group, ...) : group coerced to factor.
> (p_PC12_1sided<-LTPC_1[[3]][1]/2)
[1] 0.1119506



> #Plotting scores for first and second component
> plot(AO_type_finalists_pca$PC1,pch=ifelse(AO_type_finalists_pca$AustralianO
pen_Finalists_allstats.Winner=="TRUE",1,16),xlab = "PC1",ylab = "PC2",main="A
ustralian Open Finals Winner Response for PC1 and PC2")
```

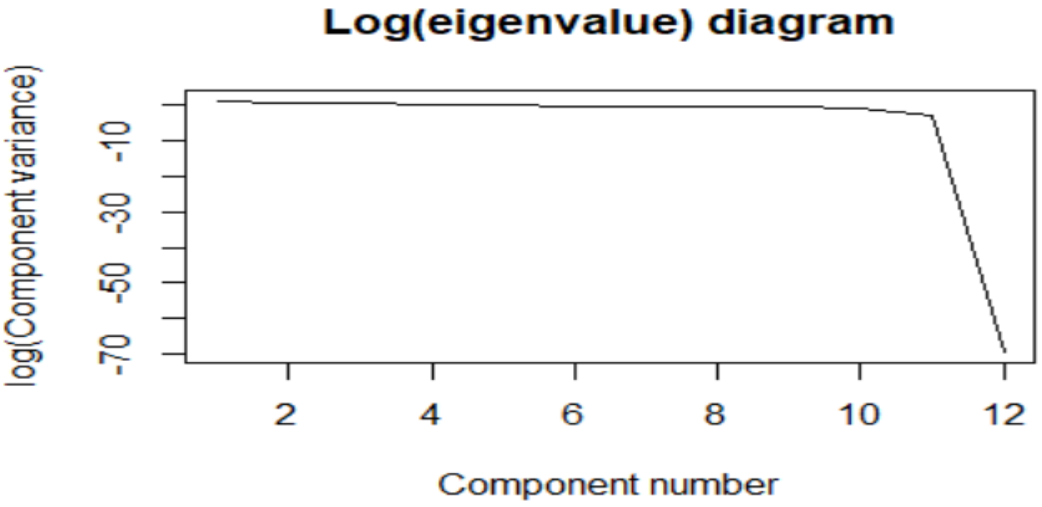


```
> plot(eigen_AO_Finalists, xlab = "Component number", ylab = "Component varia
nce", type = "l", main = "Scree diagram")
```



Component number after 10 are discarded

```
plot(log(eigen_AO_Finalists), xlab = "Component number",ylab = "log(Component
variance)", type="l",main = "Log(eigenvalue) diagram")
```

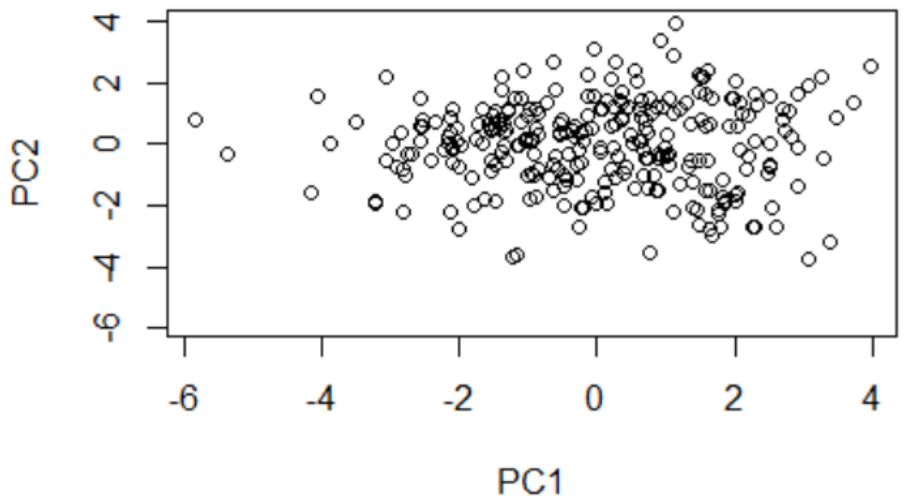


Component 12 is discarded

```
> print(summary(AustralianOpen_Finalists_allstats_pca))
Importance of components:
```

```
                          PC1    PC2    PC3     PC4     PC5     PC6     PC7
PC8     PC9
Standard deviation     1.7420 1.4031 1.3450 1.06024 0.94928 0.87265 0.82817 0
.81273 0.75323
Proportion of Variance 0.2529 0.1641 0.1507 0.09368 0.07509 0.06346 0.05715 0
.05504 0.04728
Cumulative Proportion  0.2529 0.4169 0.5677 0.66136 0.73645 0.79991 0.85707 0
.91211 0.95939
                          PC10    PC11      PC12
Standard deviation     0.66214 0.22105 8.502e-16
Proportion of Variance 0.03654 0.00407 0.000e+00
Cumulative Proportion  0.99593 1.00000 1.000e+00
```

```
> diag(cov(AustralianOpen_Finalists_allstats_pca$x))
          PC1           PC2           PC3           PC4           PC5           PC6
PC7
3.034501e+00 1.968804e+00 1.808901e+00 1.124111e+00 9.011337e-01 7.615134e-01
6.858578e-01
          PC8           PC9          PC10          PC11          PC12
6.605265e-01 5.673569e-01 4.384332e-01 4.886229e-02 5.303971e-31

> xlim <- range(AustralianOpen_Finalists_allstats_pca$x[,1])
> head(AustralianOpen_Finalists_allstats_pca$x[,1])
[1]  2.514665 -1.421527 -1.524914  2.702994 -1.503460 -1.533669
> plot(AustralianOpen_Finalists_allstats_pca$x,xlim=xlim,ylim=xlim)
```




```
> AustralianOpen_Finalists_allstats_pca$rotation[,1]
                 Age                 Rank               avgOdds
SP_Percent
         -0.00415178           0.13630501           0.11807701
0.48391843
          RP_Percent     BP_Win_Percentage                 Aces  firstServe
ReturnsWon
         -0.48391843           0.26061584           0.31732681
0.11056995
```

```
SecondServeReturnsWon         FirstServesIn          DoubleFaults  FirstServe
Percentage
          0.13556848            0.46875952            0.27786436           -
0.05423925



AustralianOpen_Finalists_allstats_pca$rotation[,2]
                  Age                  Rank               avgOdds
SP_Percent
          0.42830942           -0.38197446            0.34188696
0.19453812
           RP_Percent     BP_Win_Percentage                  Aces  firstServe
ReturnsWon
         -0.19453812            0.18226722           -0.19283950           -
0.24004315
SecondServeReturnsWon         FirstServesIn          DoubleFaults  FirstServe
Percentage
         -0.30358565           -0.01812074           -0.21598416
0.45923720
> AustralianOpen_Finalists_allstats_pca$rotation[,3]
                  Age                  Rank               avgOdds
SP_Percent
         -0.232554474           0.243595669          -0.274509489            0
.308779847
           RP_Percent     BP_Win_Percentage                  Aces  firstServe
ReturnsWon
         -0.308779847          -0.006836468          -0.016447010          -0
.506991061
SecondServeReturnsWon         FirstServesIn          DoubleFaults  FirstServe
Percentage
         -0.404359859          -0.326892184          -0.157093786          -0
.261023158
> AustralianOpen_Finalists_allstats_pca$rotation
                              PC1         PC2           PC3          PC4
PC5
Age                   -0.00415178  0.42830942 -0.232554474  0.314609668 -0.04
632629
Rank                   0.13630501 -0.38197446  0.243595669  0.155808021  0.34
813788
avgOdds                0.11807701  0.34188696 -0.274509489  0.476805302 -0.14
611186
SP_Percent             0.48391843  0.19453812  0.308779847 -0.007946174 -0.03
292276
RP_Percent            -0.48391843 -0.19453812 -0.308779847  0.007946174  0.03
292276
BP_Win_Percentage      0.26061584  0.18226722 -0.006836468 -0.395263686  0.11
221296
Aces                   0.31732681 -0.19283950 -0.016447010  0.370417984  0.37
960882
firstServeReturnsWon   0.11056995 -0.24004315 -0.506991061  0.241247978  0.26
234179
SecondServeReturnsWon  0.13556848 -0.30358565 -0.404359859 -0.397499499 -0.08
812446
FirstServesIn          0.46875952 -0.01812074 -0.326892184 -0.188532278  0.10
380643
DoubleFaults           0.27786436 -0.21598416 -0.157093786  0.054974387 -0.70
441043
FirstServePercentage  -0.05423925  0.45923720 -0.261023158 -0.317897990  0.33
598190
                              PC6         PC7           PC8          PC9
PC10
```

```
Age                    0.07970268 -0.63457440 -0.335950103  0.29919590  0.220
54563
Rank                  -0.15206363 -0.05060044 -0.744818085 -0.19909378 -0.097
68241
avgOdds               -0.10789635  0.22739381 -0.013033622 -0.69122593 -0.043
89392
SP_Percent             0.14662673  0.10424547  0.006397133  0.07541969  0.157
95541
RP_Percent            -0.14662673 -0.10424547 -0.006397133 -0.07541969 -0.157
95541
BP_Win_Percentage     -0.76231012 -0.32625171  0.141283958 -0.14915111 -0.014
80656
Aces                   0.16206350 -0.34295605  0.451779918  0.02147937 -0.479
44497
firstServeReturnsWon  -0.29723940  0.30625163  0.069620240  0.36171974  0.307
59324
SecondServeReturnsWon  0.37873653 -0.33614764 -0.030957822 -0.37581689  0.134
08444
FirstServesIn          0.16173311  0.19139591 -0.109800818  0.03343799  0.152
40337
DoubleFaults          -0.16974263  0.01768431 -0.179256050  0.25843657 -0.471
11092
FirstServePercentage   0.14744370  0.23135101 -0.240979790  0.13776595 -0.549
67266
                              PC11          PC12
Age                   -0.035617950 -1.370222e-16
Rank                   0.032917599  7.204847e-18
avgOdds                0.043408318  8.019690e-17
SP_Percent             0.261611057  7.071068e-01
RP_Percent            -0.261611057  7.071068e-01
BP_Win_Percentage     -0.001685847  8.964077e-17
Aces                  -0.047078812  1.996870e-16
firstServeReturnsWon   0.365577301 -2.776579e-17
SecondServeReturnsWon  0.378901466  3.509267e-16
FirstServesIn         -0.726337635 -4.471402e-16
DoubleFaults           0.047482294 -9.629723e-17
FirstServePercentage   0.222776913  1.520023e-16
```