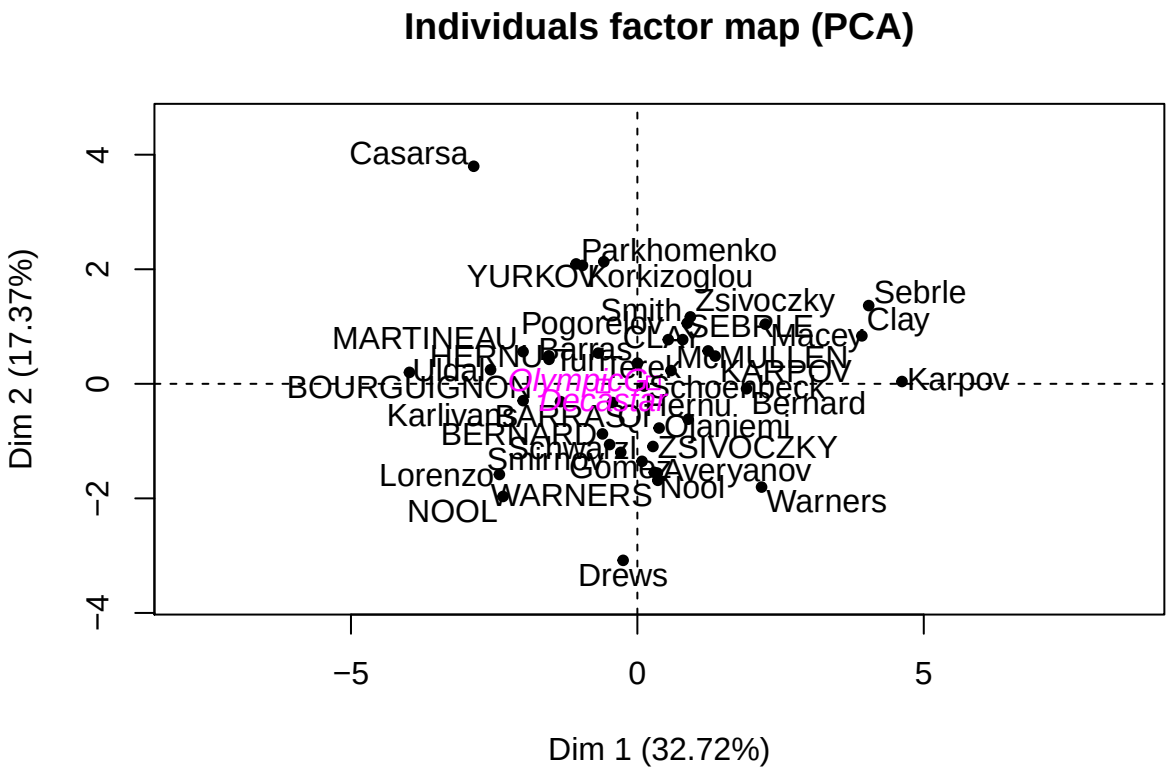
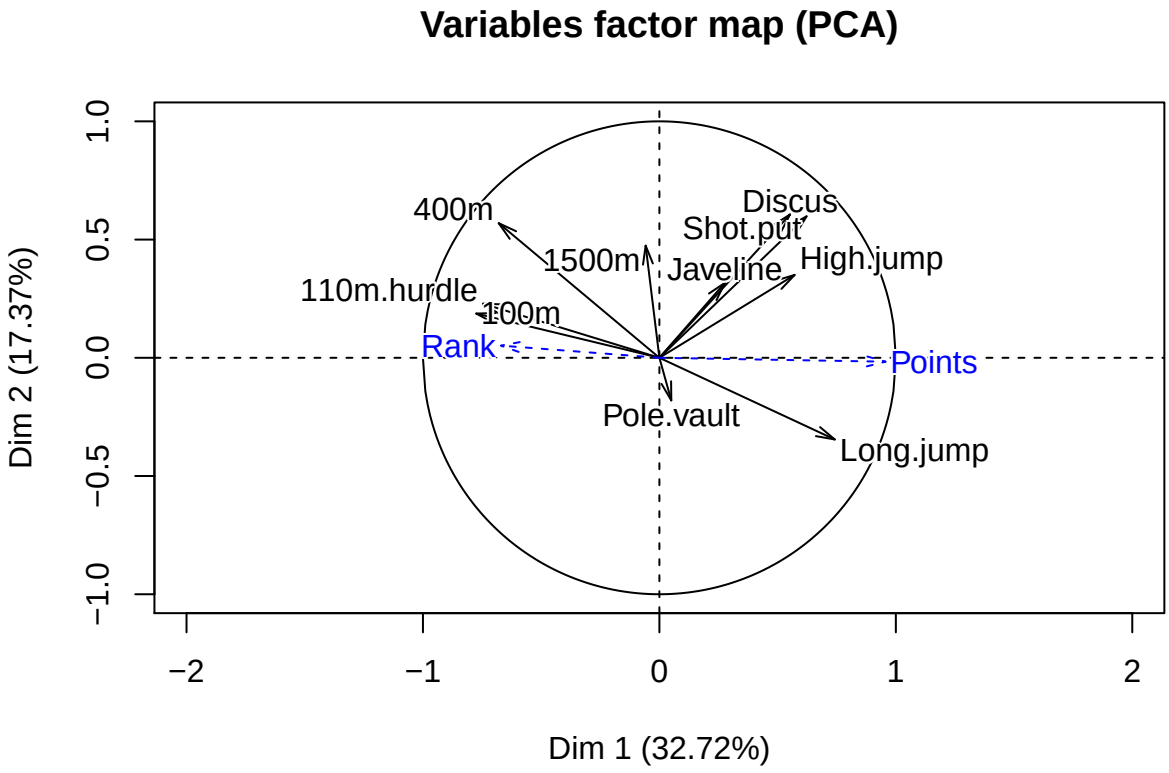
FactoMineR.R

Administrator

Thu Nov 16 21:50:14 2017

```
library(FactoMineR)
data(decathlon)
View(decathlon)
res.pca <- PCA(decathlon,quanti.sup=11:12,quali.sup=13)
```






```
res.pca
```

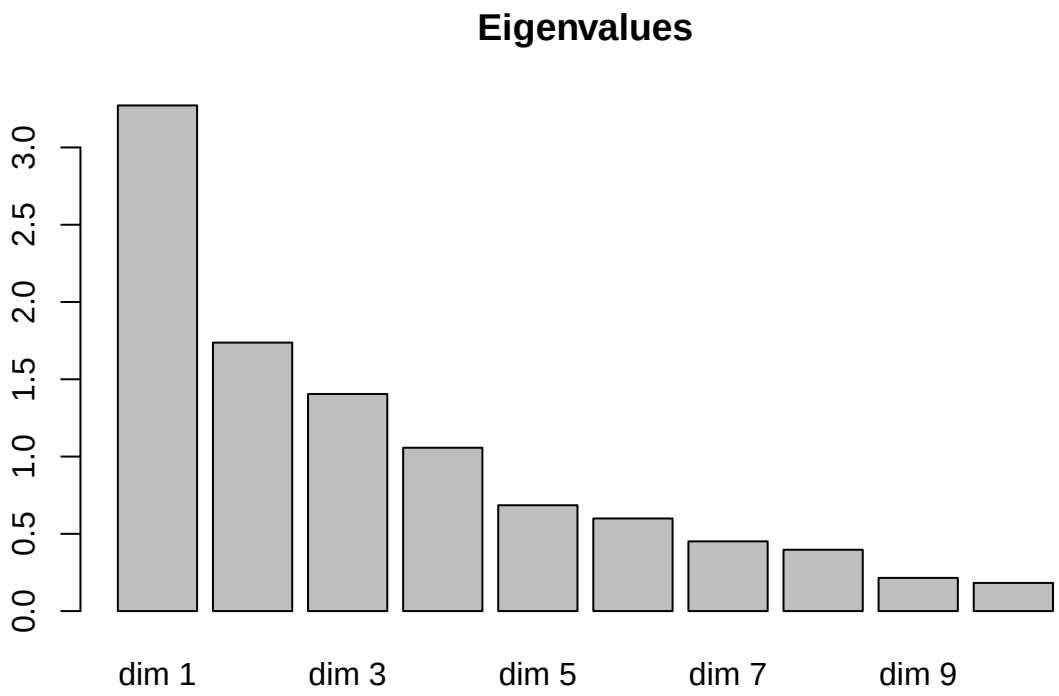
```
## **Results for the Principal Component Analysis (PCA)**
## The analysis was performed on 41 individuals, described by 13 variables
## *The results are available in the following objects:
##
##    name
## 1  "$eig"
## 2  "$var"
## 3  "$var$coord"
## 4  "$var$cor"
## 5  "$var$cos2"
## 6  "$var$contrib"
## 7  "$ind"
## 8  "$ind$coord"
## 9  "$ind$cos2"
## 10 "$ind$contrib"
## 11 "$quanti.sup"
## 12 "$quanti.sup$coord"
## 13 "$quanti.sup$cor"
## 14 "$quali.sup"
## 15 "$quali.sup$coord"
## 16 "$quali.sup$v.test"
## 17 "$call"
## 18 "$call$centre"
## 19 "$call$ecart.type"
## 20 "$call$row.w"
```

```
## 21 "$call$col.w"
##    description
## 1  "eigenvalues"
## 2  "results for the variables"
## 3  "coord. for the variables"
## 4  "correlations variables - dimensions"
## 5  "cos2 for the variables"
## 6  "contributions of the variables"
## 7  "results for the individuals"
## 8  "coord. for the individuals"
## 9  "cos2 for the individuals"
## 10 "contributions of the individuals"
## 11 "results for the supplementary quantitative variables"
## 12 "coord. for the supplementary quantitative variables"
## 13 "correlations suppl. quantitative variables - dimensions"
## 14 "results for the supplementary categorical variables"
## 15 "coord. for the supplementary categories"
## 16 "v-test of the supplementary categories"
## 17 "summary statistics"
## 18 "mean of the variables"
## 19 "standard error of the variables"
## 20 "weights for the individuals"
## 21 "weights for the variables"
```

```
round(res.pca$eig,2)
```

```
##         eigenvalue percentage of variance
## comp 1        3.27                  32.72
## comp 2        1.74                  17.37
## comp 3        1.40                  14.05
## comp 4        1.06                  10.57
## comp 5        0.68                   6.85
## comp 6        0.60                   5.99
## comp 7        0.45                   4.51
## comp 8        0.40                   3.97
## comp 9        0.21                   2.15
## comp 10       0.18                   1.82
##         cumulative percentage of variance
## comp 1                              32.72
## comp 2                              50.09
## comp 3                              64.14
## comp 4                              74.71
## comp 5                              81.56
## comp 6                              87.55
## comp 7                              92.06
## comp 8                              96.03
## comp 9                              98.18
## comp 10                            100.00
```

```
barplot(res.pca$eig[,1],main="Eigenvalues",
        names.arg=paste("dim",1:nrow(res.pca$eig)))
```




```
round(cbind(res.pca$ind$coord[,1:4],res.pca$ind$cos2[,1:4],
            res.pca$ind$contrib[,1:4]),2)
```

```
##              Dim.1 Dim.2 Dim.3 Dim.4 Dim.1 Dim.2 Dim.3 Dim.4 Dim.1 Dim.2
## SEBRLE        0.79  0.77  0.83  1.17  0.11  0.11  0.12  0.25  0.47  0.84
## CLAY          1.23  0.57  2.14 -0.35  0.12  0.03  0.37  0.01  1.14  0.46
## KARPOV        1.36  0.48  1.96 -1.86  0.16  0.02  0.33  0.30  1.38  0.33
## BERNARD      -0.61 -0.87  0.89  2.22  0.05  0.10  0.10  0.65  0.28  1.07
## YURKOV       -0.59  2.13 -1.23  0.87  0.04  0.50  0.16  0.08  0.26  6.38
## WARNERS       0.36 -1.68  0.77 -0.59  0.02  0.48  0.10  0.06  0.09  3.99
## ZSIVOCZKY     0.27 -1.09 -1.28 -1.62  0.01  0.18  0.25  0.40  0.06  1.68
## McMULLEN      0.59  0.23 -0.42 -1.52  0.05  0.01  0.03  0.35  0.26  0.07
## MARTINEAU    -2.00  0.56 -0.73 -0.54  0.28  0.02  0.04  0.02  2.97  0.44
## HERNU        -1.55  0.49  0.84  0.33  0.31  0.03  0.09  0.01  1.78  0.33
## BARRAS       -1.34 -0.31  0.00 -0.65  0.47  0.03  0.00  0.11  1.34  0.14
## NOOL         -2.34 -1.97 -1.34  0.20  0.39  0.28  0.13  0.00  4.10  5.43
## BOURGUIGNON  -3.98  0.20  1.33  0.52  0.86  0.00  0.10  0.01 11.80  0.06
## Sebrle        4.04  1.37 -0.29  1.94  0.70  0.08  0.00  0.16 12.16  2.62
## Clay          3.92  0.84  0.23  1.49  0.71  0.03  0.00  0.10 11.45  0.98
## Karpov        4.62  0.04 -0.04 -1.31  0.85  0.00  0.00  0.07 15.91  0.00
## Macey         2.23  1.04 -1.86 -0.74  0.42  0.09  0.29  0.05  3.72  1.52
## Warners       2.17 -1.80  0.85 -0.28  0.53  0.37  0.08  0.01  3.51  4.57
## Zsivoczky     0.93  1.17 -1.48  0.81  0.13  0.21  0.33  0.10  0.64  1.92
## Hernu         0.89 -0.62 -0.90 -0.13  0.24  0.11  0.24  0.01  0.59  0.54
## Nool          0.30 -1.55  1.36  2.20  0.01  0.25  0.19  0.50  0.07  3.35
## Bernard       1.91 -0.09 -0.76 -1.45  0.45  0.00  0.07  0.26  2.71  0.01
```

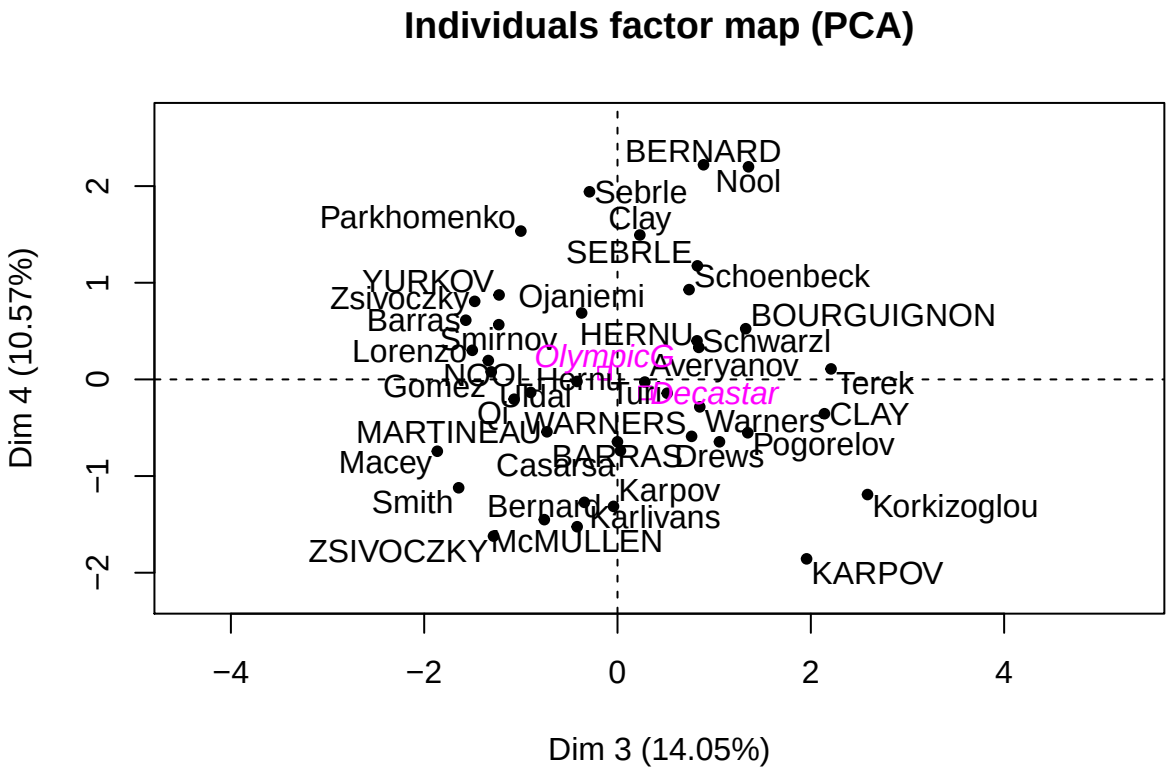
```
## Schwarzl     0.08 -1.35  0.82  0.40  0.00  0.47  0.17  0.04  0.00  2.57
## Pogorelov    0.54  0.77  1.35 -0.55  0.05  0.10  0.32  0.05  0.22  0.83
## Schoenbeck   0.11 -0.04  0.74  0.93  0.00  0.00  0.17  0.27  0.01  0.00
## Barras       0.00  0.36 -1.57  0.61  0.00  0.03  0.50  0.08  0.00  0.18
## Smith        0.87  1.06 -1.64 -1.12  0.06  0.09  0.22  0.10  0.56  1.58
## Averyanov    0.35 -1.56  0.28 -0.03  0.02  0.38  0.01  0.00  0.09  3.41
## Ojaniemi     0.38 -0.77 -0.37  0.69  0.03  0.11  0.03  0.09  0.11  0.84
## Smirnov     -0.48 -1.06 -1.23  0.57  0.06  0.28  0.37  0.08  0.17  1.58
## Qi          -0.43 -0.33 -1.07 -0.20  0.06  0.03  0.37  0.01  0.14  0.15
## Drews       -0.25 -3.08  1.05 -0.65  0.01  0.81  0.09  0.04  0.05 13.33
## Parkhomenko -1.07  2.09 -1.00  1.53  0.09  0.36  0.08  0.19  0.85  6.15
## Terek       -0.68  0.54  2.21  0.11  0.04  0.03  0.45  0.00  0.35  0.40
## Gomez       -0.29 -1.20 -1.31  0.08  0.01  0.21  0.25  0.00  0.06  2.01
## Turi        -1.54  0.43  0.51 -0.14  0.25  0.02  0.03  0.00  1.77  0.26
## Lorenzo     -2.41 -1.58 -1.50  0.30  0.47  0.20  0.18  0.01  4.32  3.52
## Karlivans   -1.99 -0.29 -0.34 -1.27  0.54  0.01  0.02  0.22  2.97  0.12
## Korkizoglou -0.96  2.07  2.59 -1.19  0.06  0.27  0.42  0.09  0.68  6.00
## Uldal       -2.56  0.25 -0.42 -0.02  0.76  0.01  0.02  0.00  4.89  0.08
## Casarsa     -2.86  3.80  0.03 -0.74  0.34  0.60  0.00  0.02  6.09 20.25
##              Dim.3 Dim.4
## SEBRLE        1.19  3.18
## CLAY          7.96  0.29
## KARPOV        6.64  7.95
## BERNARD       1.37 11.38
## YURKOV        2.61  1.76
## WARNERS       1.02  0.80
## ZSIVOCZKY     2.86  6.07
## McMULLEN      0.30  5.36
## MARTINEAU     0.93  0.68
## HERNU         1.23  0.25
## BARRAS        0.00  0.96
## NOOL          3.10  0.09
## BOURGUIGNON   3.05  0.63
## Sebrle        0.15  8.70
## Clay          0.09  5.15
## Karpov        0.00  3.98
## Macey         6.03  1.27
## Warners       1.26  0.19
## Zsivoczky     3.79  1.51
## Hernu         1.40  0.04
## Nool          3.19 11.17
## Bernard       1.00  4.86
## Schwarzl      1.17  0.37
## Pogorelov     3.15  0.70
## Schoenbeck    0.95  1.99
## Barras        4.28  0.87
## Smith         4.69  2.90
## Averyanov     0.14  0.00
## Ojaniemi      0.24  1.09
## Smirnov       2.62  0.74
## Qi            1.99  0.10
## Drews         1.93  0.96
## Parkhomenko   1.74  5.43
## Terek         8.47  0.03
```

```
## Gomez         2.96  0.01
## Turi          0.46  0.05
## Lorenzo       3.92  0.21
## Karlivans     0.20  3.73
## Korkizoglou  11.61  3.28
## Uldal         0.30  0.00
## Casarsa       0.00  1.26
```

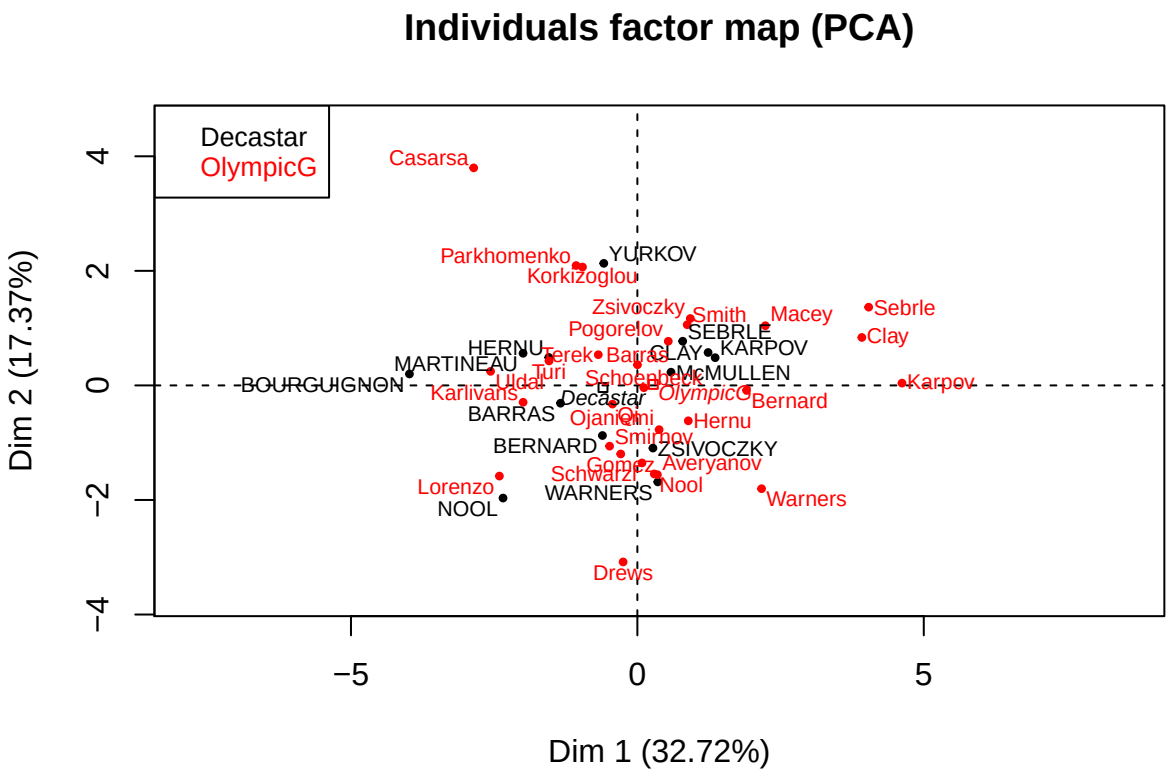
```
round(cbind(res.pca$quali.sup$coord[,1:4],res.pca$quali.sup$cos2[,1:4],res.pca$quali.sup$vtest[,1:4]),2)
```

```
##           Dim.1 Dim.2 Dim.3 Dim.4 Dim.1 Dim.2 Dim.3 Dim.4
## Decastar -0.60 -0.04  0.29 -0.14   0.4     0  0.09  0.02
## OlympicG  0.28  0.02 -0.13  0.06   0.4     0  0.09  0.02
```

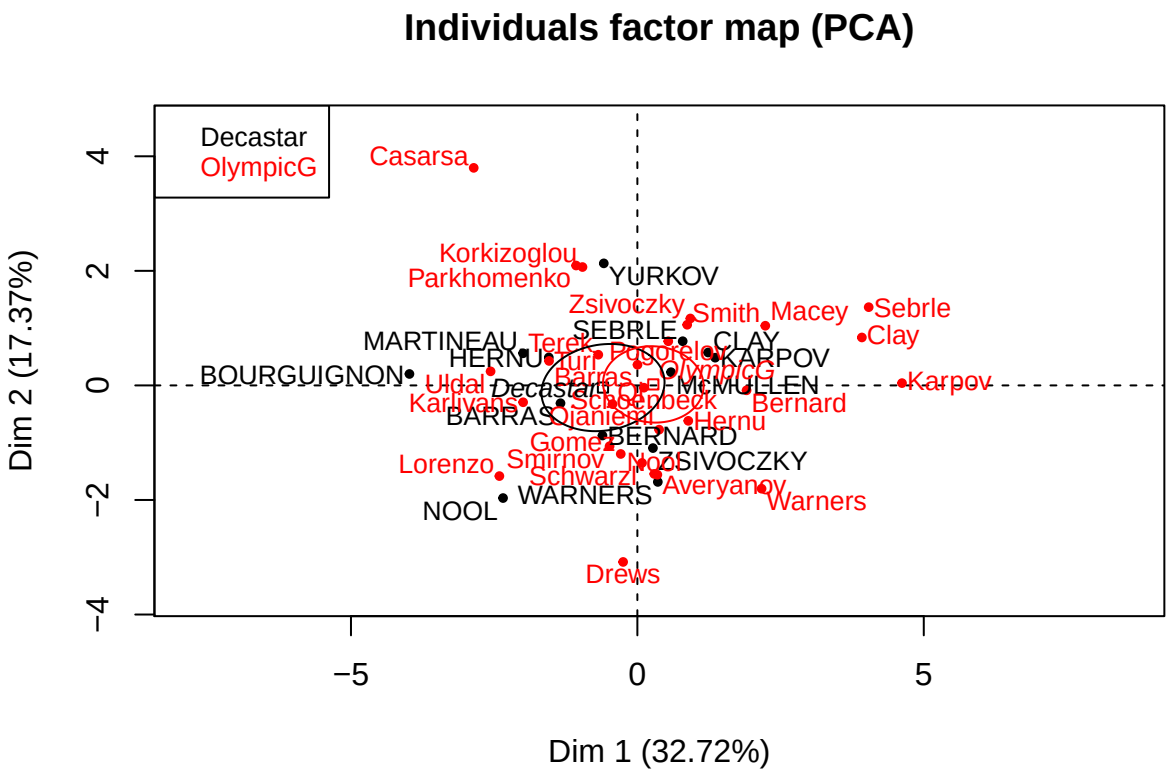
```
plot(res.pca,choix="ind",axes=3:4)
```




```
plot(res.pca,choix="ind",habillage=13,cex=0.7)
```




```
concat.data <- cbind.data.frame(decathlon[,13],res.pca$ind$coord)
ellipse.coord <- coord.ellipse(concat.data,bary=TRUE)
plot.PCA(res.pca,habillage=13,ellipse=ellipse.coord,cex=0.8)
```



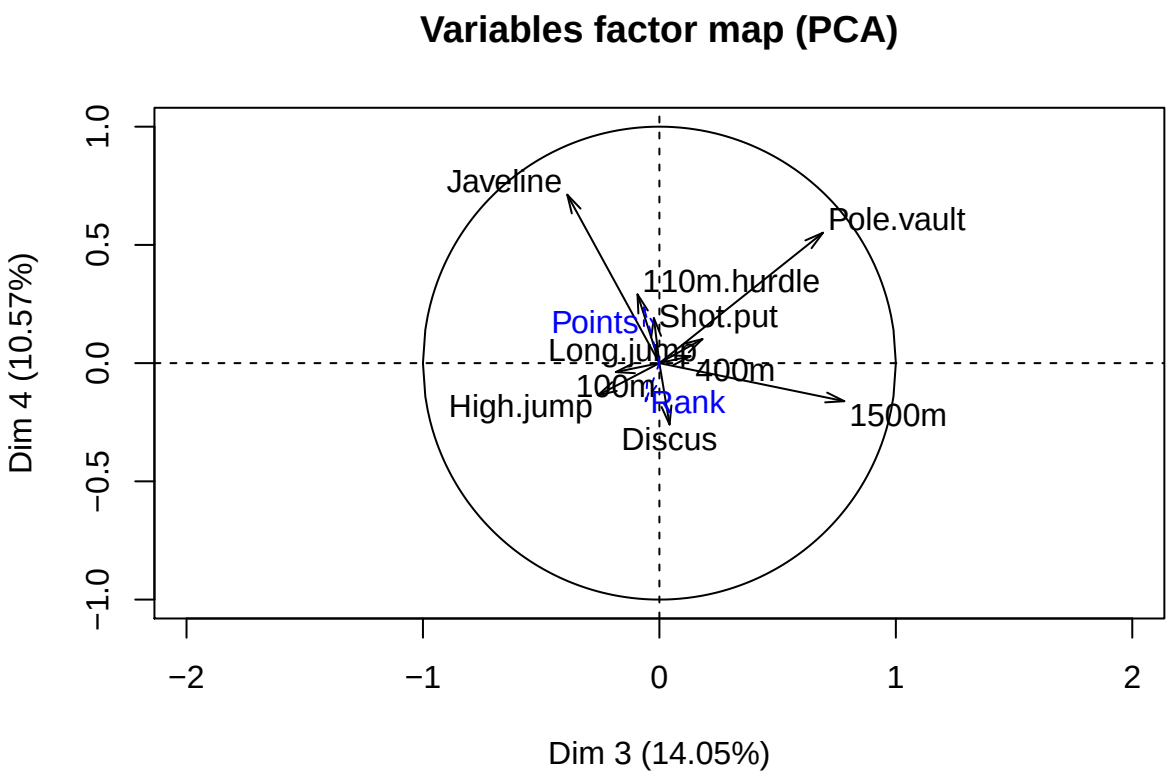

```
round(cbind(res.pca$var$coord[,1:4],res.pca$var$cos2[,1:4],
            res.pca$var$contrib[,1:4]),2)
```

```
##              Dim.1 Dim.2 Dim.3 Dim.4 Dim.1 Dim.2 Dim.3 Dim.4 Dim.1 Dim.2
## 100m         -0.77  0.19 -0.18 -0.04  0.60  0.04  0.03  0.00 18.34  2.02
## Long.jump     0.74 -0.35  0.18  0.10  0.55  0.12  0.03  0.01 16.82  6.87
## Shot.put      0.62  0.60 -0.02  0.19  0.39  0.36  0.00  0.04 11.84 20.61
## High.jump     0.57  0.35 -0.26 -0.14  0.33  0.12  0.07  0.02 10.00  7.06
## 400m         -0.68  0.57  0.13  0.03  0.46  0.32  0.02  0.00 14.12 18.67
## 110m.hurdle -0.75  0.23 -0.09  0.29  0.56  0.05  0.01  0.08 17.02  3.01
## Discus        0.55  0.61  0.04 -0.26  0.31  0.37  0.00  0.07  9.33 21.16
## Pole.vault    0.05 -0.18  0.69  0.55  0.00  0.03  0.48  0.30  0.08  1.87
## Javeline      0.28  0.32 -0.39  0.71  0.08  0.10  0.15  0.51  2.35  5.78
## 1500m        -0.06  0.47  0.78 -0.16  0.00  0.22  0.61  0.03  0.10 12.95
##              Dim.3 Dim.4
## 100m          2.42  0.14
## Long.jump     2.36  0.98
## Shot.put      0.04  3.44
## High.jump     4.79  1.74
## 400m          1.23  0.08
## 110m.hurdle   0.61  8.00
## Discus        0.13  6.38
## Pole.vault   34.06 28.78
## Javeline     10.81 48.00
## 1500m        43.54  2.46
```

```
round(cbind(res.pca$quanti.sup$coord[,1:4],res.pca$quanti.sup$cos2[,1:4]),2)
```

```
##        Dim.1 Dim.2 Dim.3 Dim.4 Dim.1 Dim.2 Dim.3 Dim.4
## Rank   -0.67  0.05 -0.06 -0.16  0.45     0     0  0.03
## Points  0.96 -0.02 -0.07  0.24  0.91     0     0  0.06
```

```
plot(res.pca,choix="var",axes=3:4)
```




```
dimdesc(res.pca)
```

```
## $Dim.1
## $Dim.1$quanti
##             correlation      p.value
## Points        0.9561543 2.099191e-22
## Long.jump     0.7418997 2.849886e-08
## Shot.put      0.6225026 1.388321e-05
## High.jump     0.5719453 9.362285e-05
## Discus        0.5524665 1.802220e-04
## Rank         -0.6705104 1.616348e-06
## 400m         -0.6796099 1.028175e-06
## 110m.hurdle  -0.7462453 2.136962e-08
## 100m         -0.7747198 2.778467e-09
##
##
## $Dim.2
## $Dim.2$quanti
##           correlation      p.value
```

```
## Discus      0.6063134 2.650745e-05
## Shot.put    0.5983033 3.603567e-05
## 400m        0.5694378 1.020941e-04
## 1500m       0.4742238 1.734405e-03
## High.jump   0.3502936 2.475025e-02
## Javeline    0.3169891 4.344974e-02
## Long.jump  -0.3454213 2.696969e-02
##
##
## $Dim.3
## $Dim.3$quanti
##            correlation      p.value
## 1500m        0.7821428 1.554450e-09
## Pole.vault   0.6917567 5.480172e-07
## Javeline    -0.3896554 1.179331e-02
```

```
dimdesc(res.pca,proba=0.2)
```

```
## $Dim.1
## $Dim.1$quanti
##             correlation      p.value
## Points        0.9561543 2.099191e-22
## Long.jump     0.7418997 2.849886e-08
## Shot.put      0.6225026 1.388321e-05
## High.jump     0.5719453 9.362285e-05
## Discus        0.5524665 1.802220e-04
## Javeline      0.2771108 7.942460e-02
## Rank         -0.6705104 1.616348e-06
## 400m         -0.6796099 1.028175e-06
## 110m.hurdle  -0.7462453 2.136962e-08
## 100m         -0.7747198 2.778467e-09
##
## $Dim.1$quali
##                      R2   p.value
## Competition 0.05110487 0.1552515
##
## $Dim.1$category
##            Estimate   p.value
## OlympicG  0.4393744 0.1552515
## Decastar -0.4393744 0.1552515
##
##
## $Dim.2
## $Dim.2$quanti
##             correlation      p.value
## Discus        0.6063134 2.650745e-05
## Shot.put      0.5983033 3.603567e-05
## 400m          0.5694378 1.020941e-04
## 1500m         0.4742238 1.734405e-03
## High.jump     0.3502936 2.475025e-02
## Javeline      0.3169891 4.344974e-02
## 110m.hurdle   0.2287933 1.501925e-01
## Long.jump    -0.3454213 2.696969e-02
##
##
```

```
## $Dim.3
## $Dim.3$quanti
##            correlation      p.value
## 1500m        0.7821428 1.554450e-09
## Pole.vault   0.6917567 5.480172e-07
## High.jump   -0.2595119 1.013160e-01
## Javeline    -0.3896554 1.179331e-02
```

```
res.pca$call$centre
```

```
##  [1]  10.998049   7.260000  14.477073   1.976829  49.616341  14.605854
##  [7]  44.325610   4.762439  58.316585 279.024878
```

```
res.pca$call$ecart.type
```

```
##  [1]  0.25979560  0.31251927  0.81431175  0.08785906  1.13929751
##  [6]  0.46599998  3.33639725  0.27458865  4.76759315 11.53001177
```

```
round(scale(decathlon[,1:12]),2)
```

```
##              100m Long.jump Shot.put High.jump  400m 110m.hurdle Discus
## SEBRLE       0.16      1.01     0.43      1.05  0.17        0.18  -0.17
## CLAY        -0.91      0.44    -0.26     -1.31 -0.21       -1.18   1.89
## KARPOV       0.08      0.13     0.36      0.71 -1.08       -1.09   1.37
## BERNARD      0.08     -0.09    -0.28     -0.64 -0.60        0.81  -1.02
## YURKOV       1.30     -0.54     0.86      1.38  0.70        1.49   0.57
## WARNERS      0.43      1.07    -0.20      0.04 -0.81       -0.80  -0.95
## ZSIVOCZKY    0.50      0.13    -1.21      0.37 -0.86       -0.92   0.40
## McMULLEN    -0.64      0.16    -0.87      1.72  0.25       -0.48   0.02
## MARTINEAU    2.44     -1.42     0.11     -0.30  0.45        0.69   0.97
## HERNU        1.41      0.95    -0.08     -1.31  1.29        0.96   0.20
## BARRAS       1.26     -0.92    -0.47     -0.30 -0.12       -0.27  -0.66
## NOOL         1.26      0.03    -2.18      0.04 -0.36        1.45  -1.90
## BOURGUIGNON  1.38     -1.45    -1.23     -1.31  1.34        2.26  -1.14
## Sebrle      -0.56      1.83     2.28      1.61 -1.09       -1.18   1.30
## Clay        -2.12      2.21     0.91      0.94 -0.37       -1.01   1.71
## Karpov      -1.89      1.74     1.76      1.27 -2.43       -1.35   2.17
## Macey       -0.41      0.66     1.52      1.95 -0.56       -0.10   1.19
## Warners     -1.44      1.52     0.00     -0.08 -1.43       -1.26  -0.18
## Zsivoczky   -0.33     -0.38     1.01      1.61 -0.19        0.73   0.38
## Hernu       -0.11     -0.22     0.21      0.60 -0.77       -0.75   0.12
## Nool        -0.75      0.85    -0.26     -1.09 -0.70        0.41  -0.67
## Bernard     -1.17      0.70     0.39      1.61 -0.42       -0.92   0.13
## Schwarzl    -0.07      0.73    -0.57     -0.41  0.12       -0.75  -0.56
## Pogorelov   -0.18      0.16     0.76      0.94  1.02       -0.84   0.08
## Schoenbeck  -0.37      0.13     0.36     -1.09  0.59       -0.56   0.02
## Barras       0.54     -0.85     0.53     -0.41 -0.18       -0.50   0.15
## Smith       -0.56     -1.42     0.93     -0.75 -0.30       -1.26   1.39
## Averyanov   -1.70      0.25    -0.04     -0.41  0.09       -0.46  -1.32
## Ojaniemi    -1.21      0.76     0.60     -0.41 -0.43        0.86  -1.18
## Smirnov     -0.41     -0.60    -0.72     -0.41 -0.44        0.35  -0.55
## Qi           0.24      0.25    -1.12     -0.08  0.03        0.37   0.24
## Drews       -0.49      0.38    -1.71     -1.09 -0.96       -1.26  -1.25
## Parkhomenko  0.54     -2.05     1.47      0.60  1.23        0.58  -0.72
## Terek       -0.30     -1.01     0.82     -0.41 -0.05        1.09   0.38
## Gomez        0.31      0.00     0.11     -1.43 -0.87       -0.42  -1.00
```

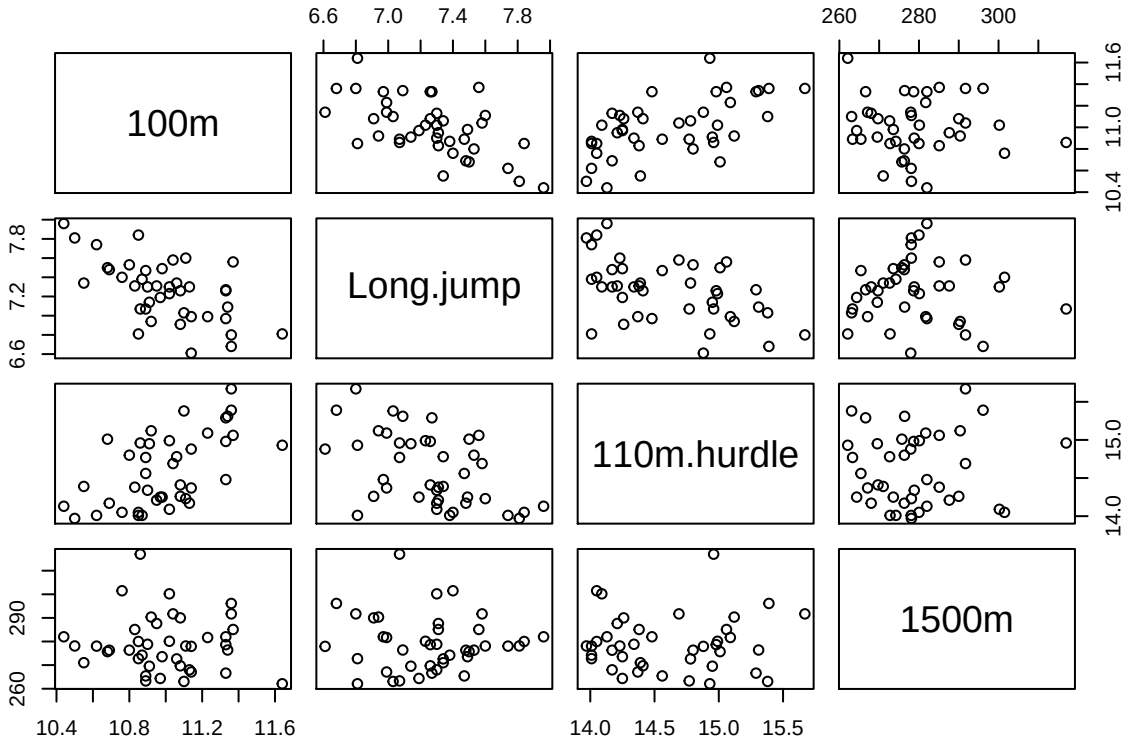
```
## Turi         0.31     -1.11    -1.04      0.60  1.78       -0.73  -1.33
## Lorenzo      0.39     -0.73    -1.52     -1.43 -0.24        1.64  -1.22
## Karlivans    1.26      0.00    -1.43     -0.08  0.80        0.79  -0.29
## Korkizoglou -0.52     -0.60     0.40     -0.41  1.34        0.75   0.52
## Uldal        0.88     -0.85    -1.15     -1.43  1.16        1.03  -0.39
## Casarsa      1.38     -1.83     0.54     -0.41  3.11        1.66   1.28
##             Pole.vault Javeline 1500m  Rank Points
## SEBRLE            0.93     1.01  1.09 -1.40   0.62
## CLAY              0.57     0.38  1.93 -1.28   0.34
## KARPOV            0.57    -1.66  1.81 -1.15   0.27
## BERNARD           2.01     0.92  0.09 -1.03   0.18
## YURKOV           -0.15     1.06 -0.22 -0.90   0.09
## WARNERS           0.57    -1.36 -0.08 -0.77   0.07
## ZSIVOCZKY        -1.23    -0.61 -0.94 -0.65   0.00
## McMULLEN         -1.23    -0.40  0.52 -0.52  -0.03
## MARTINEAU         0.57    -1.24 -1.45 -0.39  -0.59
## HERNU             0.21    -0.23  0.52 -0.27  -0.80
## BARRAS           -0.15    -0.60  0.25 -0.14  -0.87
## NOOL             -0.51    -0.18 -1.06 -0.02  -1.03
## BOURGUIGNON       0.93    -0.75  1.09  0.11  -2.02
## Sebrle            0.85     2.53  0.08 -1.40   2.59
## Clay              0.49     2.36  0.25 -1.28   2.38
## Karpov           -0.58    -0.58 -0.08 -1.15   2.10
## Macey            -1.30     0.03 -1.17 -1.03   1.19
## Warners           0.49    -0.61 -0.08 -0.90   0.99
## Zsivoczky        -0.22     1.06 -0.81 -0.77   0.82
## Hernu             0.14    -0.12 -1.26 -0.65   0.68
## Nool              2.29     0.62 -0.23 -0.52   0.67
## Bernard          -1.30    -0.63 -0.23 -0.39   0.64
## Schwarzl          1.21    -0.41 -0.47 -0.27   0.28
## Pogorelov         0.85    -1.01  0.74 -0.14   0.23
## Schoenbeck        0.85     0.53 -0.02 -0.02   0.21
## Barras           -0.58     1.29 -1.02  0.11   0.18
## Smith            -2.02     0.66 -0.54  0.24   0.05
## Averyanov         0.14    -0.79 -0.69  0.36   0.05
## Ojaniemi         -0.58     0.20 -0.28  0.49   0.00
## Smirnov          -0.22     0.53 -1.35  0.62  -0.04
## Qi               -0.94     0.51 -0.55  0.74  -0.21
## Drews             0.85    -1.41 -0.41  0.87  -0.23
## Parkhomenko       0.14     1.55 -0.09  0.99  -0.26
## Terek             1.93    -1.59  0.97  1.12  -0.33
## Gomez            -1.30     0.50 -0.80  1.25  -0.41
## Turi              0.14     0.21  0.94  1.37  -0.87
## Lorenzo          -0.94     0.01 -1.37  1.50  -1.21
## Karlivans        -0.94    -1.12 -0.03  1.63  -1.23
## Korkizoglou      -0.22    -1.09  3.25  1.75  -1.26
## Uldal            -0.94     0.35  0.23  1.88  -1.49
## Casarsa          -1.30     0.06  1.46  2.01  -1.76
## attr(,"scaled:center")
##        100m   Long.jump    Shot.put   High.jump        400m 110m.hurdle
##   10.998049    7.260000   14.477073    1.976829   49.616341   14.605854
##      Discus  Pole.vault    Javeline       1500m        Rank      Points
##   44.325610    4.762439   58.316585  279.024878   12.121951 8005.365854
## attr(,"scaled:scale")
```

```
##         100m    Long.jump     Shot.put    High.jump         400m
##   0.26302300   0.31640164   0.82442781   0.08895052   1.15345081
##  110m.hurdle       Discus   Pole.vault     Javeline        1500m
##   0.47178902   3.37784476   0.27799982   4.82682018  11.67324722
##         Rank       Points
##   7.91894918 342.38514542
```

```
round(cor(decathlon[,1:12]),2)
```

```
##              100m Long.jump Shot.put High.jump  400m 110m.hurdle Discus
## 100m         1.00     -0.60    -0.36     -0.25  0.52        0.58  -0.22
## Long.jump   -0.60      1.00     0.18      0.29 -0.60       -0.51   0.19
## Shot.put    -0.36      0.18     1.00      0.49 -0.14       -0.25   0.62
## High.jump   -0.25      0.29     0.49      1.00 -0.19       -0.28   0.37
## 400m         0.52     -0.60    -0.14     -0.19  1.00        0.55  -0.12
## 110m.hurdle  0.58     -0.51    -0.25     -0.28  0.55        1.00  -0.33
## Discus      -0.22      0.19     0.62      0.37 -0.12       -0.33   1.00
## Pole.vault  -0.08      0.20     0.06     -0.16 -0.08        0.00  -0.15
## Javeline    -0.16      0.12     0.37      0.17  0.00        0.01   0.16
## 1500m       -0.06     -0.03     0.12     -0.04  0.41        0.04   0.26
## Rank         0.30     -0.60    -0.37     -0.49  0.56        0.44  -0.39
## Points      -0.68      0.73     0.63      0.58 -0.67       -0.64   0.48
##             Pole.vault Javeline 1500m  Rank Points
## 100m             -0.08    -0.16 -0.06  0.30  -0.68
## Long.jump         0.20     0.12 -0.03 -0.60   0.73
## Shot.put          0.06     0.37  0.12 -0.37   0.63
## High.jump        -0.16     0.17 -0.04 -0.49   0.58
## 400m             -0.08     0.00  0.41  0.56  -0.67
## 110m.hurdle       0.00     0.01  0.04  0.44  -0.64
## Discus           -0.15     0.16  0.26 -0.39   0.48
## Pole.vault        1.00    -0.03  0.25 -0.32   0.20
## Javeline         -0.03     1.00 -0.18 -0.21   0.42
## 1500m             0.25    -0.18  1.00  0.09  -0.19
## Rank             -0.32    -0.21  0.09  1.00  -0.74
## Points            0.20     0.42 -0.19 -0.74   1.00
```

```
pairs(decathlon[,c(1,2,6,10)])
```


100m
Long.jump
110m.hurdle
1500m
6.6
7.0
7.4
7.8
260
280
300
10.4
11.0
11.6
6.6
7.2
7.8
14.0
15.0
260
290
10.4
10.8
11.2
11.6
14.0
14.5
15.0
15.5