> setwd("P:/R/data")

> data.soccer <- read.csv("complete.csv")

> head(data.soccer)

ID name full\_name club

1 20801 Cristiano Ronaldo C. Ronaldo dos Santos Aveiro Real Madrid CF

2 158023 L. Messi Lionel Messi FC Barcelona

3 190871 Neymar Neymar da Silva Santos Jr. Paris Saint-Germain

4 176580 L. SuÃ¡rez Luis SuÃ¡rez FC Barcelona

5 167495 M. Neuer Manuel Neuer FC Bayern Munich

6 188545 R. Lewandowski Robert Lewandowski FC Bayern Munich

club\_logo special age league birth\_date height\_cm

1 https://cdn.sofifa.org/18/teams/243.png 2228 32 Spanish Primera DivisiÃ³n 1985-02-05 185

2 https://cdn.sofifa.org/18/teams/241.png 2158 30 Spanish Primera DivisiÃ³n 1987-06-24 170

3 https://cdn.sofifa.org/18/teams/73.png 2100 25 French Ligue 1 1992-02-05 175

4 https://cdn.sofifa.org/18/teams/241.png 2291 30 Spanish Primera DivisiÃ³n 1987-01-24 182

5 https://cdn.sofifa.org/18/teams/21.png 1493 31 German Bundesliga 1986-03-27 193

6 https://cdn.sofifa.org/18/teams/21.png 2146 28 German Bundesliga 1988-08-21 185

weight\_kg body\_type real\_face flag nationality

1 80 C. Ronaldo True https://cdn.sofifa.org/flags/38@3x.png Portugal

2 72 Messi True https://cdn.sofifa.org/flags/52@3x.png Argentina

3 68 Neymar True https://cdn.sofifa.org/flags/54@3x.png Brazil

4 86 Normal True https://cdn.sofifa.org/flags/60@3x.png Uruguay

5 92 Normal True https://cdn.sofifa.org/flags/21@3x.png Germany

6 79 Normal True https://cdn.sofifa.org/flags/37@3x.png Poland

photo eur\_value eur\_wage eur\_release\_clause overall

1 https://cdn.sofifa.org/18/players/20801.png 9.55e+07 565000 195800000 94

2 https://cdn.sofifa.org/18/players/158023.png 1.05e+08 565000 215300000 93

3 https://cdn.sofifa.org/18/players/190871.png 1.23e+08 280000 236800000 92

4 https://cdn.sofifa.org/18/players/176580.png 9.70e+07 510000 198900000 92

5 https://cdn.sofifa.org/18/players/167495.png 6.10e+07 230000 100700000 92

6 https://cdn.sofifa.org/18/players/188545.png 9.20e+07 355000 151800000 91

potential pac sho pas dri def phy international\_reputation skill\_moves weak\_foot work\_rate\_att

1 94 90 93 82 90 33 80 5 5 4 High

2 93 89 90 86 96 26 61 5 4 4 Medium

3 94 92 84 79 95 30 60 5 5 5 High

4 92 82 90 79 87 42 81 5 4 4 High

5 92 91 90 95 89 60 91 5 1 4 Medium

6 91 81 88 75 86 38 82 4 3 4 High

work\_rate\_def preferred\_foot crossing finishing heading\_accuracy short\_passing volleys dribbling

1 Low Right 85 94 88 83 88 91

2 Medium Left 77 95 71 88 85 97

3 Medium Right 75 89 62 81 83 96

4 Medium Right 77 94 77 83 88 86

5 Medium Right 15 13 25 55 11 30

6 Medium Right 62 91 85 83 87 85

curve free\_kick\_accuracy long\_passing ball\_control acceleration sprint\_speed agility reactions

1 81 76 77 93 89 91 89 96

2 89 90 87 95 92 87 90 95

3 81 84 75 95 94 90 96 88

4 86 84 64 91 88 77 86 93

5 14 11 59 48 58 61 52 85

6 77 84 65 89 79 83 78 91

balance shot\_power jumping stamina strength long\_shots aggression interceptions positioning vision

1 63 94 95 92 80 92 63 29 95 85

2 95 85 68 73 59 88 48 22 93 90

3 82 80 61 78 53 77 56 36 90 80

4 60 87 69 89 80 86 78 41 92 84

5 35 25 78 44 83 16 29 30 12 70

6 80 88 84 79 84 83 80 39 91 78

penalties composure marking standing\_tackle sliding\_tackle gk\_diving gk\_handling gk\_kicking

1 85 95 22 31 23 7 11 15

2 78 96 13 28 26 6 11 15

3 81 92 21 24 33 9 9 15

4 85 83 30 45 38 27 25 31

5 47 70 10 10 11 91 90 95

6 84 87 25 42 19 15 6 12

gk\_positioning gk\_reflexes rs rw rf ram rcm rm rdm rcb rb rwb st lw cf cam cm lm cdm cb lb lwb ls

1 14 11 92 91 91 89 82 89 62 53 61 66 92 91 91 89 82 89 62 53 61 66 92

2 14 8 88 91 92 92 84 90 59 45 57 62 88 91 92 92 84 90 59 45 57 62 88

3 15 11 84 89 88 88 79 87 59 46 59 64 84 89 88 88 79 87 59 46 59 64 84

4 33 37 88 87 88 87 80 85 65 58 64 68 88 87 88 87 80 85 65 58 64 68 88

5 91 89 NA NA NA NA NA NA NA NA NA NA NA NA NA NA NA NA NA NA NA NA NA

6 8 10 88 84 87 84 78 82 62 57 58 61 88 84 87 84 78 82 62 57 58 61 88

lf lam lcm ldm lcb gk X1\_on\_1\_rush\_trait acrobatic\_clearance\_trait argues\_with\_officials\_trait

1 91 89 82 62 53 NA False False False

2 92 92 84 59 45 NA False False False

3 88 88 79 59 46 NA False False False

4 88 87 80 65 58 NA False False False

5 NA NA NA NA NA 92 True False False

6 87 84 78 62 57 NA False False False

avoids\_using\_weaker\_foot\_trait backs\_into\_player\_trait bicycle\_kicks\_trait

1 False False False

2 False False False

3 False False False

4 False False False

5 False False False

6 False False False

cautious\_with\_crosses\_trait chip\_shot\_trait chipped\_penalty\_trait comes\_for\_crosses\_trait

1 False False False False

2 False True False False

3 False False False False

4 False False False False

5 False False False True

6 False True False False

corner\_specialist\_trait diver\_trait dives\_into\_tackles\_trait diving\_header\_trait driven\_pass\_trait

1 False False False False False

2 False False False False False

3 False True False False False

4 False True False False False

5 False False False False False

6 False False False False False

early\_crosser\_trait fan.s\_favourite\_trait fancy\_flicks\_trait finesse\_shot\_trait flair\_trait

1 False False False False True

2 False False False True False

3 False False False False True

4 False False False False False

5 False False False False False

6 False False False True False

flair\_passes\_trait gk\_flat\_kick\_trait gk\_long\_throw\_trait gk\_up\_for\_corners\_trait

1 False False False False

2 False False False False

3 False False False False

4 False False False False

5 False False True False

6 False False False False

giant\_throw\_in\_trait inflexible\_trait injury\_free\_trait injury\_prone\_trait leadership\_trait

1 False False False False False

2 False False False False False

3 False False False False False

4 False False False False False

5 False False False False False

6 False False True False False

long\_passer\_trait long\_shot\_taker\_trait long\_throw\_in\_trait one\_club\_player\_trait

1 False True False False

2 False True False True

3 False False False False

4 False False False False

5 False False False False

6 False False False False

outside\_foot\_shot\_trait playmaker\_trait power\_free\_kick\_trait power\_header\_trait puncher\_trait

1 False False True False False

2 False True False False False

3 False False False False False

4 False False False False False

5 False False False False False

6 False False False False False

rushes\_out\_of\_goal\_trait saves\_with\_feet\_trait second\_wind\_trait selfish\_trait

1 False False False False

2 False False False False

3 False False False False

4 False False False False

5 True False False False

6 False False False False

skilled\_dribbling\_trait stutter\_penalty\_trait swerve\_pass\_trait takes\_finesse\_free\_kicks\_trait

1 True False False False

2 True False False False

3 True False False True

4 False False False False

5 False False False False

6 False False False False

target\_forward\_trait team\_player\_trait technical\_dribbler\_trait tries\_to\_beat\_defensive\_line\_trait

1 False False False False

2 False False False False

3 False False True False

4 False False True True

5 False False False False

6 False False False False

poacher\_speciality speedster\_speciality aerial\_threat\_speciality dribbler\_speciality

1 False True False True

2 False False False True

3 False True False True

4 False False False False

5 False False False False

6 False False False False

playmaker\_speciality engine\_speciality distance\_shooter\_speciality crosser\_speciality

1 False False True False

2 False False False False

3 False False False False

4 False False False False

5 False False False False

6 False False False False

free\_kick\_specialist\_speciality tackling\_speciality tactician\_speciality acrobat\_speciality

1 False False False True

2 True False False True

3 False False False True

4 False False False True

5 False False False False

6 False False False False

strength\_speciality clinical\_finisher\_speciality prefers\_rs prefers\_rw prefers\_rf prefers\_ram

1 False True False False False False

2 False True False True False False

3 False False False False False False

4 False True False False False False

5 False False False False False False

6 False True False False False False

prefers\_rcm prefers\_rm prefers\_rdm prefers\_rcb prefers\_rb prefers\_rwb prefers\_st prefers\_lw

1 False False False False False False True True

2 False False False False False False True False

3 False False False False False False False True

4 False False False False False False True False

5 False False False False False False False False

6 False False False False False False True False

prefers\_cf prefers\_cam prefers\_cm prefers\_lm prefers\_cdm prefers\_cb prefers\_lb prefers\_lwb

1 False False False False False False False False

2 True False False False False False False False

3 False False False False False False False False

4 False False False False False False False False

5 False False False False False False False False

6 False False False False False False False False

prefers\_ls prefers\_lf prefers\_lam prefers\_lcm prefers\_ldm prefers\_lcb prefers\_gk

1 False False False False False False False

2 False False False False False False False

3 False False False False False False False

4 False False False False False False False

5 False False False False False False True

6 False False False False False False False

> data.psa <- data.soccer[,c(6, 7, 10, 11, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30)]

> pairs(data.psa)

> rownames(data.psa) <- data.soccer[,1]

> data.psa <- na.omit(data.psa)

> head(data.psa)

special age height\_cm weight\_kg eur\_value eur\_wage eur\_release\_clause overall potential pac

20801 2228 32 185 80 9.55e+07 565000 195800000 94 94 90

158023 2158 30 170 72 1.05e+08 565000 215300000 93 93 89

190871 2100 25 175 68 1.23e+08 280000 236800000 92 94 92

176580 2291 30 182 86 9.70e+07 510000 198900000 92 92 82

167495 1493 31 193 92 6.10e+07 230000 100700000 92 92 91

188545 2146 28 185 79 9.20e+07 355000 151800000 91 91 81

sho pas dri def phy international\_reputation skill\_moves weak\_foot

20801 93 82 90 33 80 5 5 4

158023 90 86 96 26 61 5 4 4

190871 84 79 95 30 60 5 5 5

176580 90 79 87 42 81 5 4 4

167495 90 95 89 60 91 5 1 4

188545 88 75 86 38 82 4 3 4

> pc.soccer <- prcomp(data.psa, scale.=TRUE)

> pc.soccer$rotation

PC1 PC2 PC3 PC4 PC5 PC6

special -0.27123561 -0.10054683 0.30423512 -0.336248364 0.03669257 -0.105081806

age -0.11411664 0.17958245 0.49162396 0.130567635 -0.45562571 0.212255356

height\_cm 0.06448089 0.42758490 -0.08155150 0.273013971 0.12025990 -0.291211551

weight\_kg 0.02751444 0.42926651 0.01667321 0.301133794 0.05998390 -0.282552085

eur\_value -0.32920795 0.11080656 -0.32687463 -0.061019730 -0.13586672 0.044994407

eur\_wage -0.31091754 0.13370671 -0.27176200 -0.063574518 -0.19506397 0.083274851

eur\_release\_clause -0.32524376 0.10846680 -0.33802029 -0.064442522 -0.12877593 0.046920037

overall -0.34428799 0.14455892 0.18850531 0.007199215 0.14875152 -0.005289372

potential -0.27883285 0.03545322 -0.19677350 -0.074889458 0.49108547 -0.149505195

pac -0.16785889 -0.29331173 -0.01773201 0.064536841 0.38337675 0.024116958

sho -0.23660655 -0.14383177 0.10484546 0.504852223 -0.04094543 -0.050459662

pas -0.29488628 -0.07794977 0.24824554 0.199671921 0.07310633 0.193719910

dri -0.29547504 -0.21251626 0.12703549 0.292189024 0.15468057 0.117571079

def -0.05905273 0.29846124 0.23427163 -0.492110169 0.17343190 0.180748110

phy -0.13801217 0.38399152 0.28370279 -0.093238779 0.18951541 -0.126881122

international\_reputation -0.27669598 0.14397921 -0.21916689 -0.021873969 -0.30983488 0.121557353

skill\_moves -0.16613223 -0.30191964 0.04948498 -0.207957623 -0.17726816 -0.319170617

weak\_foot -0.12752602 -0.14175438 0.12116362 -0.090652698 -0.25548427 -0.725142898

PC7 PC8 PC9 PC10 PC11 PC12

special 0.20288570 -0.158265591 0.09295015 -0.164436099 0.29133670 -0.005608118

age 0.11178271 0.172744606 -0.09805862 0.218956202 -0.39196662 -0.064976321

height\_cm 0.08430381 -0.102315093 -0.01681232 -0.273637415 -0.12151901 -0.708565450

weight\_kg 0.18841211 -0.013740180 0.02179613 -0.320280531 -0.13230455 0.687783589

eur\_value 0.02019592 0.068896809 0.29939224 0.032222616 -0.04470766 0.017493806

eur\_wage 0.03477719 0.101528888 0.21536003 -0.033192493 -0.04113944 -0.054968349

eur\_release\_clause 0.01441754 0.062482563 0.31759219 0.035887776 -0.04586748 0.015482364

overall 0.01964648 -0.037393704 -0.13412882 0.325156221 -0.33522435 -0.011906107

potential -0.15783445 -0.268462169 -0.29358873 0.350117378 -0.19547010 0.078166746

pac 0.29715019 0.704033086 -0.10460679 -0.239680603 -0.13420161 -0.069646556

sho 0.02721048 -0.151935174 0.09604077 0.162571417 0.38009716 -0.045175493

pas -0.33322399 -0.227594162 0.13933859 -0.400890714 -0.01450667 -0.010387083

dri -0.12191383 -0.010629693 0.01085867 -0.144512127 -0.03053238 0.017952008

def -0.24833538 -0.003490119 0.03512029 -0.320170641 -0.07506817 -0.019953675

phy 0.22129120 0.208488362 0.10072360 0.277172512 0.50887054 -0.030342337

international\_reputation -0.01833463 0.043407548 -0.76577475 -0.214109295 0.31059514 0.012858188

skill\_moves 0.54097863 -0.369233208 -0.04902577 -0.158606826 -0.21815533 -0.044820767

weak\_foot -0.50797512 0.299447859 -0.00538387 0.004364363 -0.02371927 0.001280162

PC13 PC14 PC15 PC16 PC17

special -0.099750105 0.42015469 0.0340353147 -0.565453980 -0.064252956

age 0.016762532 0.08194586 -0.0443180751 -0.045988186 -0.417675130

height\_cm 0.022760136 0.08229794 0.0552816807 -0.106649583 -0.035615292

weight\_kg -0.046113082 0.08714647 0.0137661287 -0.034973683 -0.011754470

eur\_value 0.355385904 0.08339946 0.0142751977 -0.013778077 -0.031743740

eur\_wage -0.817773566 -0.16893916 -0.0280617432 0.011656195 0.023863747

eur\_release\_clause 0.372433027 0.08384048 0.0251026187 -0.006811353 -0.086749284

overall 0.027331546 0.07002376 0.0006674383 -0.061667879 0.744559342

potential -0.092904683 0.03011222 -0.1264886850 -0.020952255 -0.486555165

pac 0.005404916 0.10905310 -0.1982409381 0.072142695 -0.045868059

sho -0.102567820 0.45602520 -0.0861195504 0.470467923 0.003186191

pas 0.103694754 -0.34236118 -0.5318805940 -0.090994619 0.012802555

dri 0.009020711 -0.23965230 0.7874194544 -0.072605826 -0.090296437

def -0.023317098 0.23985628 0.1612728956 0.539492926 -0.031696333

phy 0.096073289 -0.47943491 -0.0167314521 0.094917346 -0.068198597

international\_reputation 0.090823628 -0.02098259 0.0013360508 -0.001084383 0.058841144

skill\_moves 0.067670610 -0.26706049 -0.0011670645 0.346352632 -0.015551646

weak\_foot -0.001319827 -0.02014528 0.0087334224 0.028566875 0.003752326

PC18

special 0.0028091743

age -0.0075910800

height\_cm -0.0015479733

weight\_kg 0.0038464360

eur\_value -0.7179832773

eur\_wage 0.0084714442

eur\_release\_clause 0.6947736410

overall 0.0314101637

potential -0.0189531255

pac 0.0034950022

sho 0.0003198239

pas 0.0032108335

dri -0.0082872225

def -0.0054683071

phy -0.0015378734

international\_reputation 0.0126349157

skill\_moves -0.0005238157

weak\_foot 0.0024127940

> plot(pc.soccer, type="l")

> biplot(pc.soccer)