

Homework 7

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Homework 7

```
library(MASS)
library(gtools)
library(smacof)
```

```
## Loading required package: plotrix
```

```
##
## Attaching package: 'smacof'
```

```
## The following object is masked from 'package:base':
##
##      transform
```

```
header <- c("biathlon", "bobsled", "down-hill", "figure", "hockey", "icedance",
"luge", "skiJump", "slalom", "snowbrd", "speed-Skt", "XctySki")
data <- read.table('sport.dat', sep = ',')
rownames(data) <- data[,1]
data <- data[,2:ncol(data)]
colnames(data) <- header
data
```

##	biathlon	bobsled	down-hill	figure	hockey	icedance	luge	skiJump	slalom
## S72	2	2	2	8	2	8	2	7	3
## JEC	5	6	8	7	5	7	6	7	7
## JA2	5	9	8	6	2	6	9	9	6
## LAF	4	4	9	2	7	2	3	7	9
## ML	2	4	8	9	9	7	4	8	7
## SLI	8	7	9	9	5	9	7	8	9
## NYV	3	3	3	9	9	9	3	8	2
## SWH	1	5	2	9	7	8	1	6	1
## XW	2	6	5	5	9	6	6	6	4
## ZH	2	3	7	8	7	8	1	2	1
## CX	1	3	2	5	1	1	3	2	2
## DL	1	2	3	4	3	5	2	6	3
## PL	3	5	9	9	9	7	4	4	8
## TC	2	2	2	9	6	8	1	3	2
## kar4	2	8	7	5	8	5	7	6	2
## HDH	1	1	1	8	3	8	1	1	1
## PCO	1	5	5	9	9	9	1	5	1
## 923	1	2	6	9	2	7	3	9	2
## 602	2	2	3	6	2	5	1	3	2
## 777	9	9	9	7	5	7	9	9	5
## yw	2	3	9	8	2	7	5	7	5
## YY	2	1	2	9	5	9	1	5	2
## XY	5	5	8	9	6	9	5	8	5
##	snowbrd	speed-Skt	XctySki						
## S72	8	4	1						
## JEC	6	6	5						
## JA2	9	7	6						
## LAF	8	5	4						
## ML	7	8	2						
## SLI	6	6	8						
## NYV	9	2	2						
## SWH	1	9	1						
## XW	7	7	2						
## ZH	2	8	2						
## CX	1	3	1						
## DL	1	2	1						
## PL	9	8	3						
## TC	3	8	2						
## kar4	8	8	2						
## HDH	1	3	2						
## PCO	5	9	1						
## 923	9	8	2						
## 602	3	9	2						
## 777	9	7	5						
## yw	8	9	2						
## YY	2	7	1						
## XY	6	9	5						

```
### interval, matrix-conditional
result1 <- smacof::smacofRect(delta = data, ndim = 2, type = "interval", conditionality = 'matrix')
### interval, row-conditional
result2 <- smacof::smacofRect(delta = data, ndim = 2, type = "interval", conditionality = 'row')
```

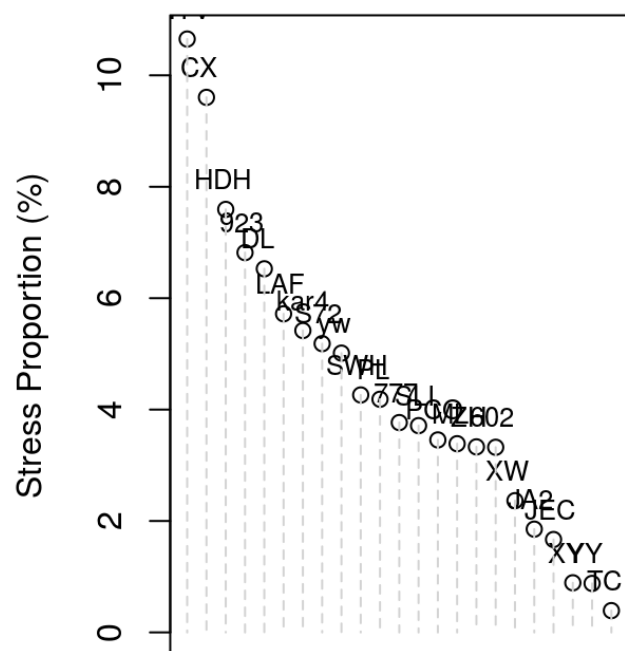
```
## Warning in smacof::smacofRect(delta = data, ndim = 2, type = "interval", :
## Iteration limit reached! Increase itmax argument!
```

```
### ordinal, matrix-conditional
result3 <- smacof::smacofRect(delta = data, ndim = 2, type = "ordinal", conditionality = 'matrix')
### ordinal, row-conditional
result4 <- smacof::smacofRect(delta = data, ndim = 2, type = "ordinal", conditionality = 'row')
```

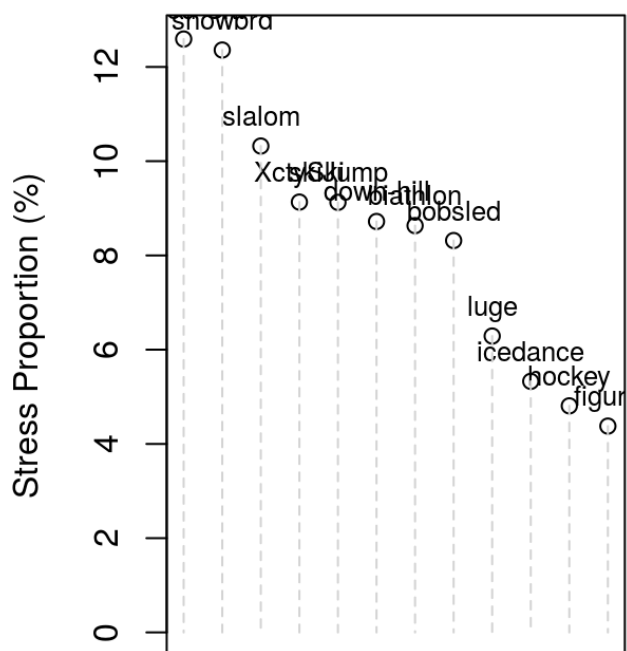
```
## Warning in smacof::smacofRect(delta = data, ndim = 2, type = "ordinal", :
## Iteration limit reached! Increase itmax argument!
```

```
plot(result1, "stressplot")
```

Stress Decomposition Chart - Row Stress Decomposition Chart - Column



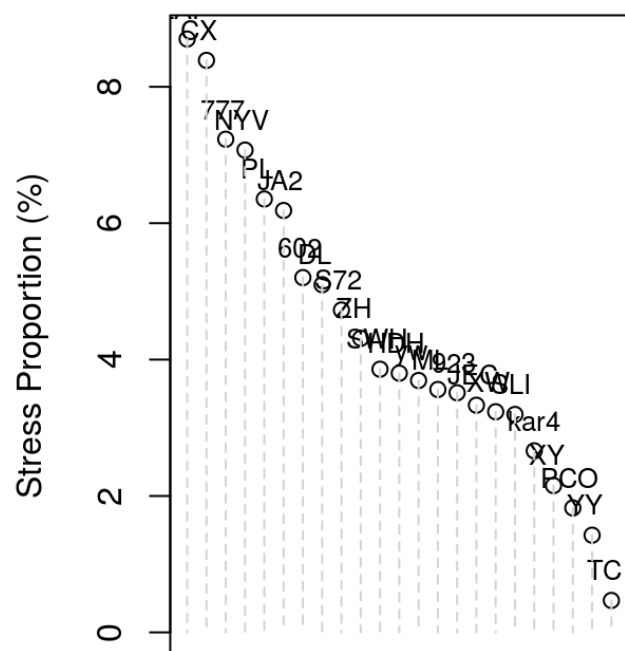
Row Objects



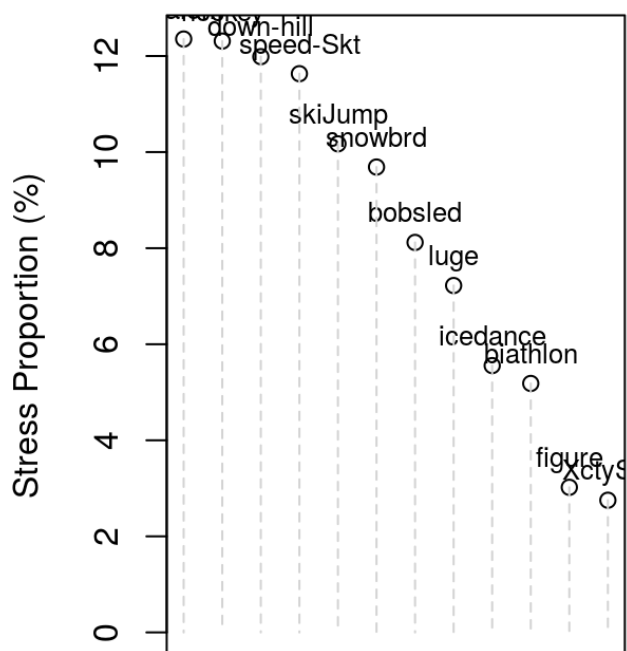
Column Objects

```
plot(result2, "stressplot")
```

Stress Decomposition Chart - Row Stress Decomposition Chart - Column



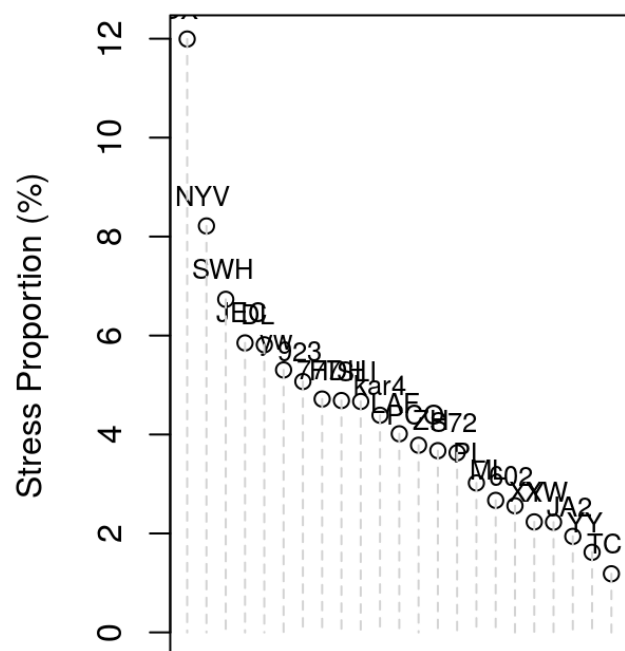
Row Objects



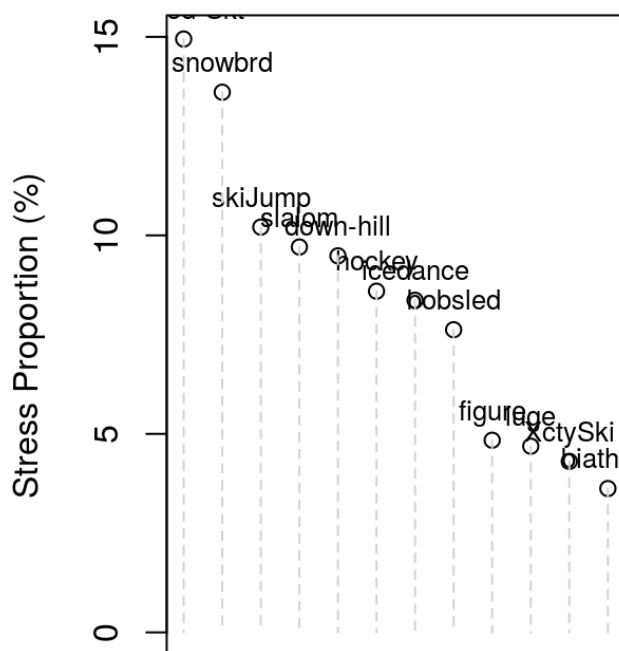
Column Objects

```
plot(result3, "stressplot")
```

Stress Decomposition Chart - Row Stress Decomposition Chart - Column



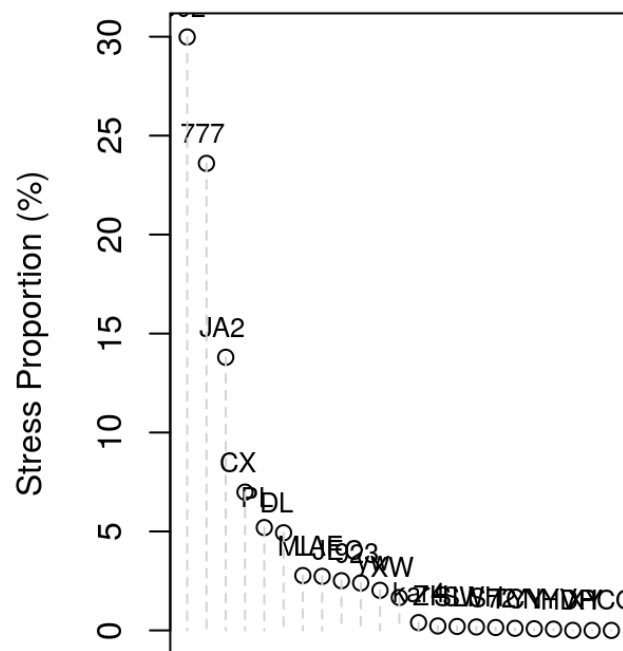
Row Objects



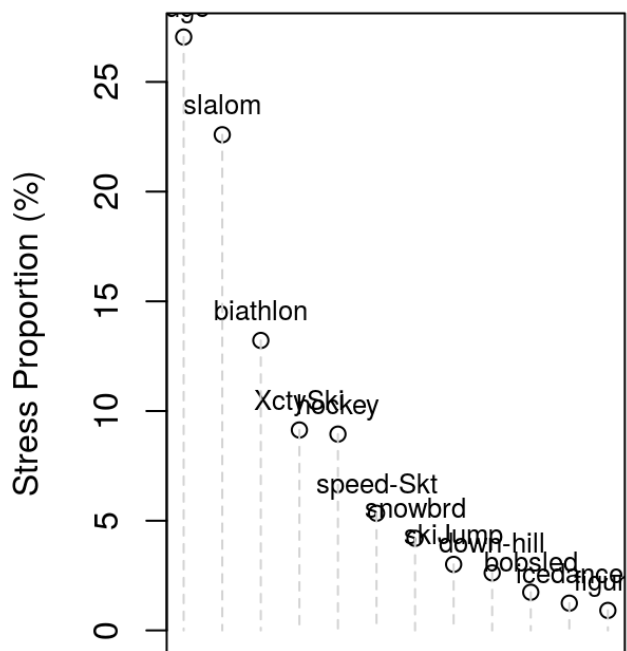
Column Objects

```
plot(result4, "stressplot")
```

Stress Decomposition Chart - Row Stress Decomposition Chart - Column



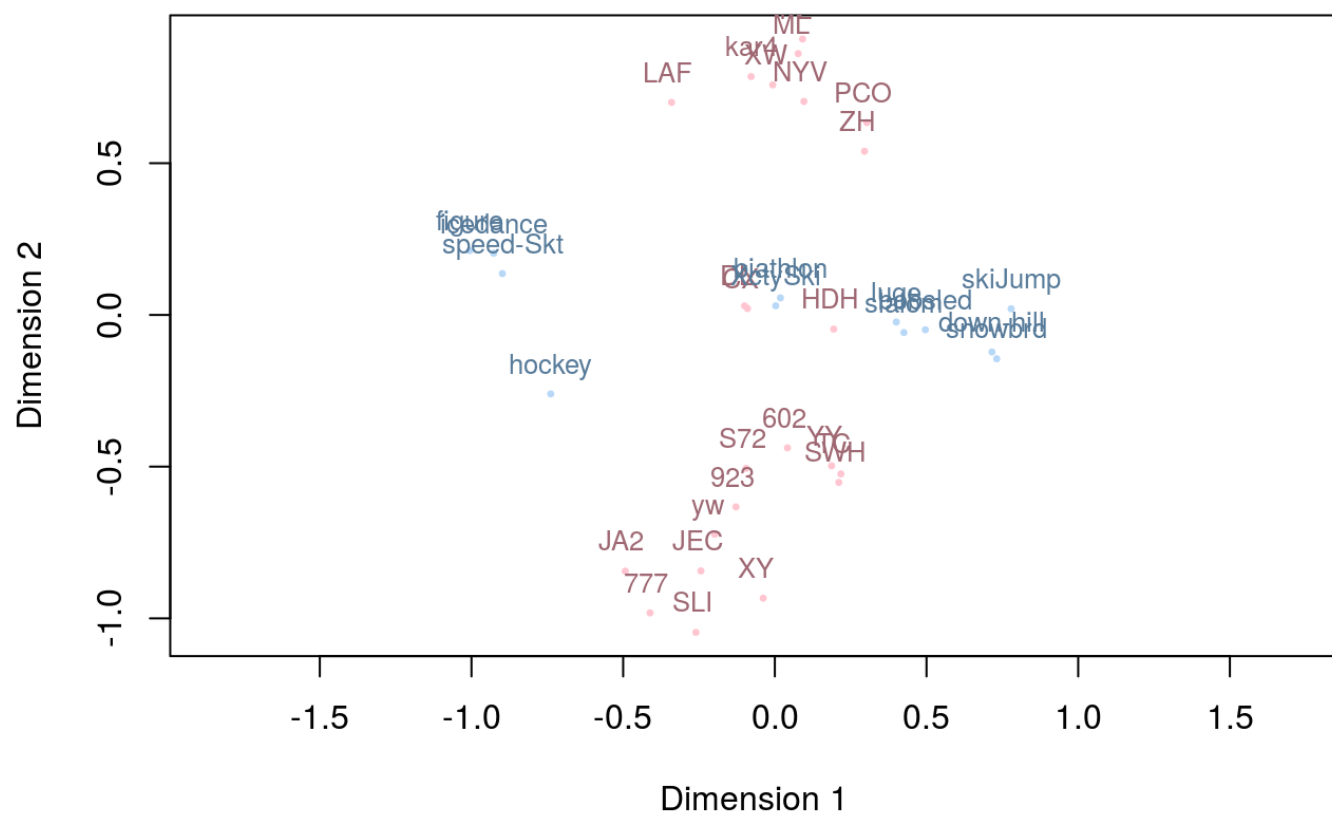
Row Objects



Column Objects

```
plot(result1)
```

Joint Configuration Plot



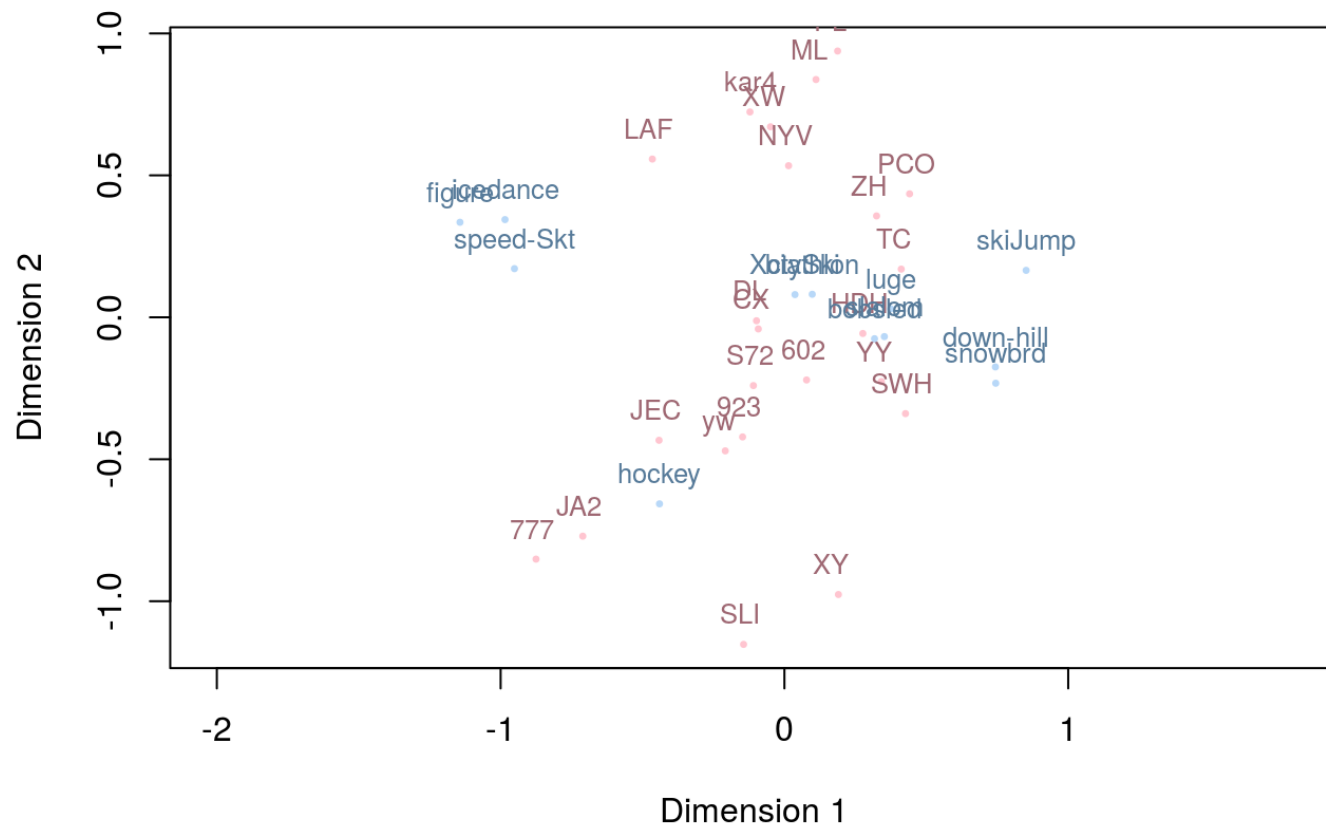
```
plot(result2)
```


Joint Configuration Plot



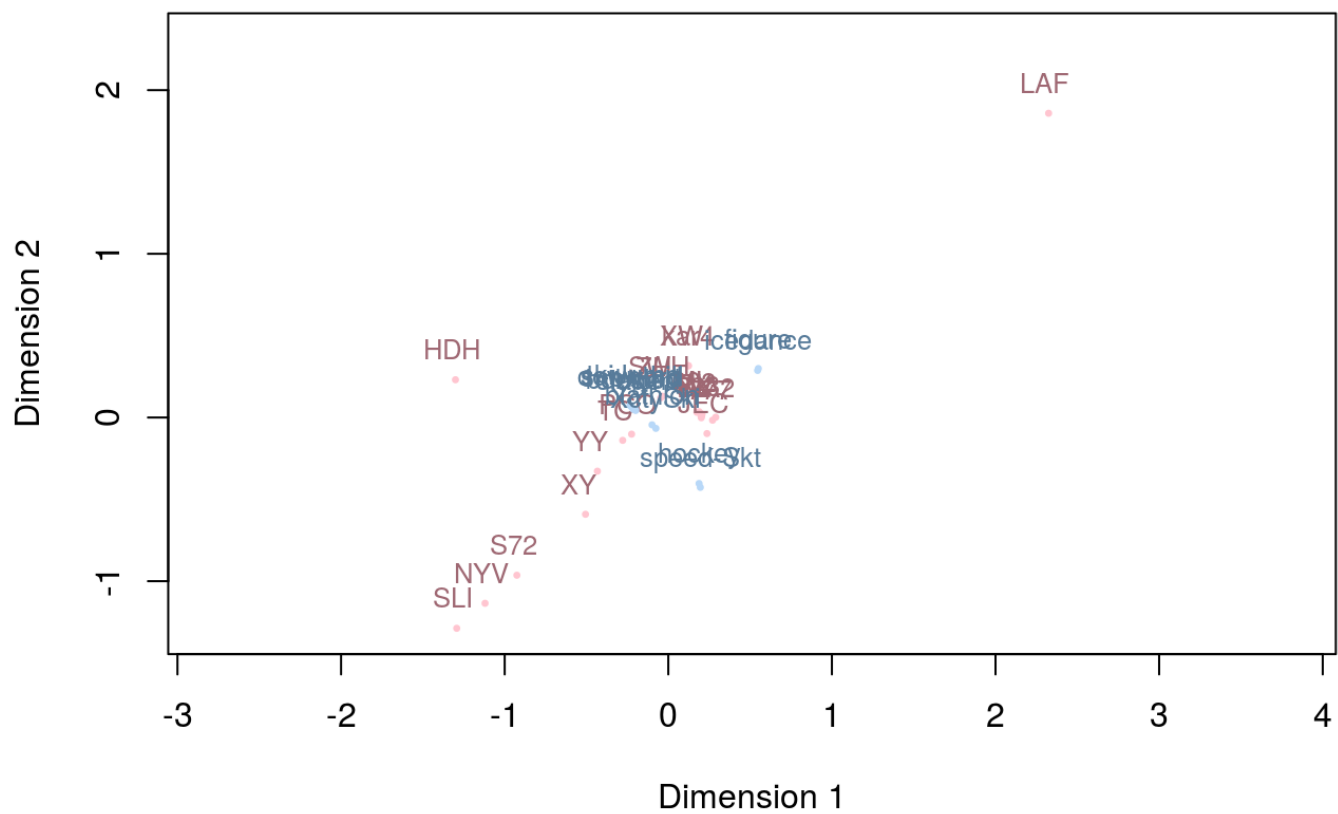
```
plot(result3)
```

Joint Configuration Plot



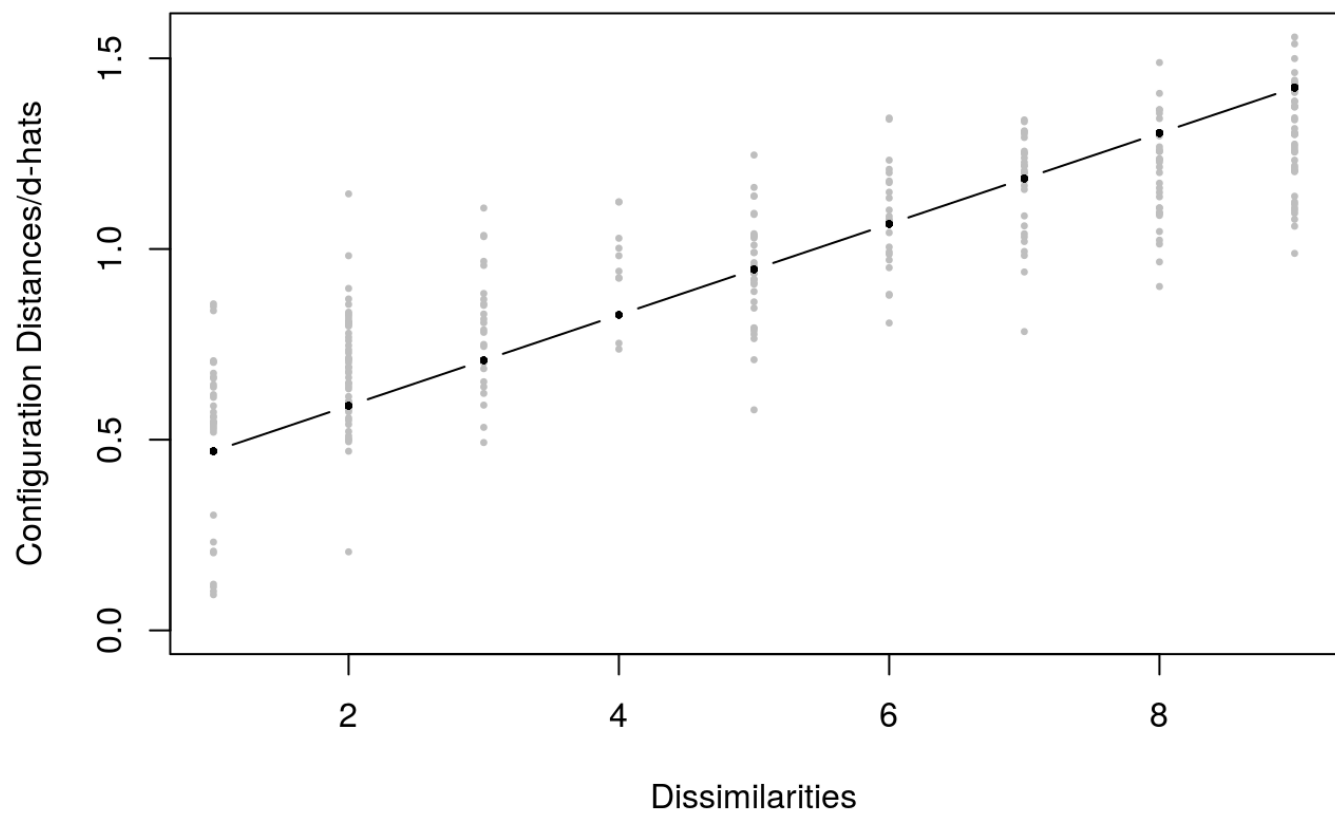
```
plot(result4)
```

Joint Configuration Plot



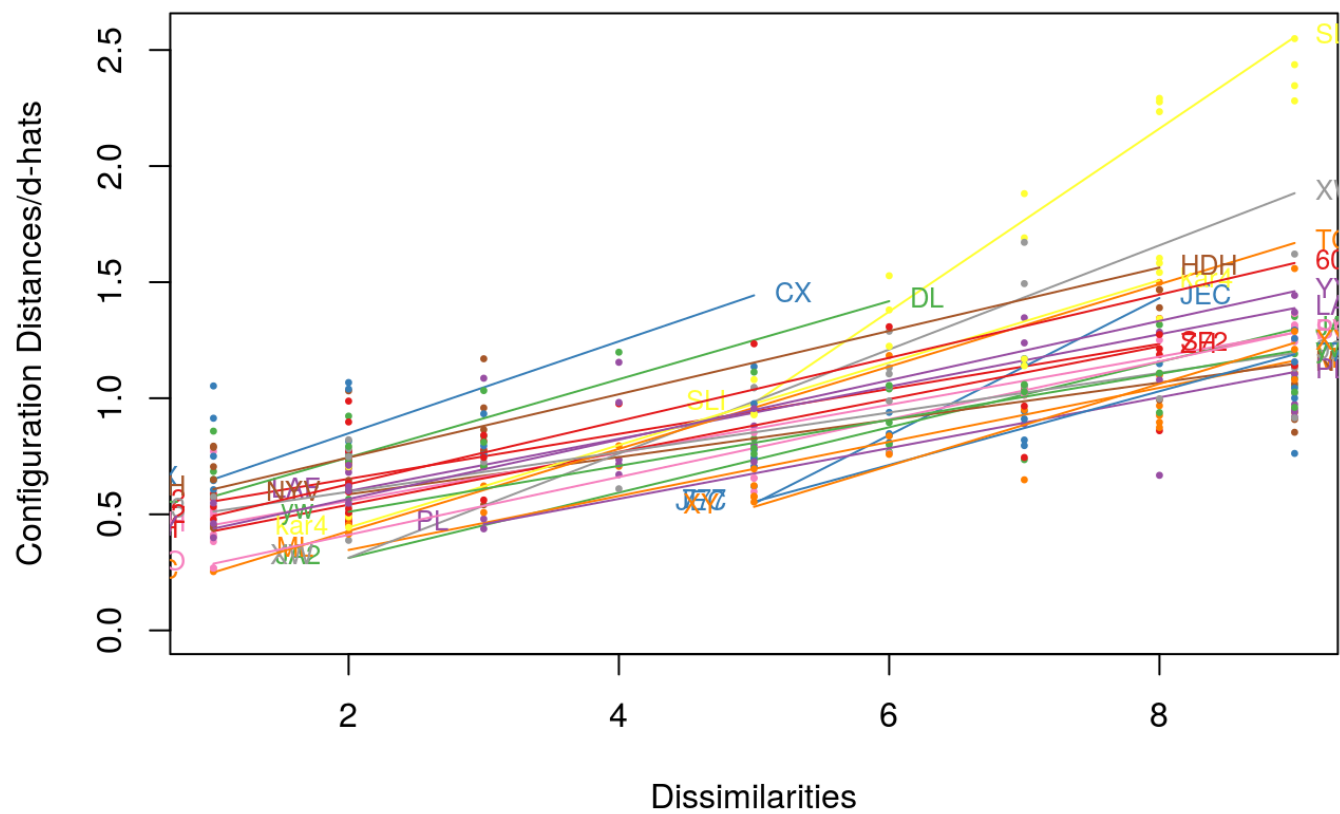
```
plot(result1,"Shepard")
```

Shepard Diagram



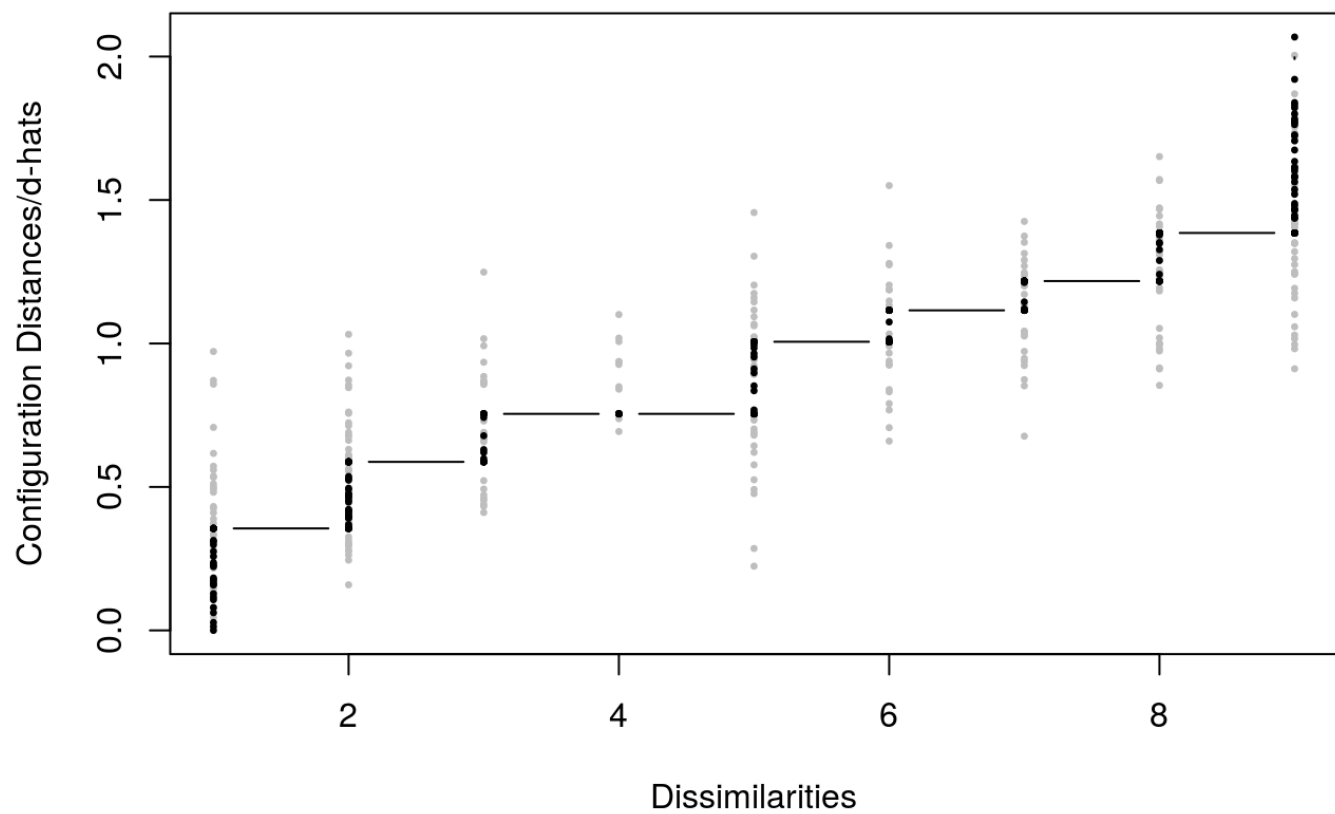
```
plot(result2,"Shepard")
```

Shepard Diagram



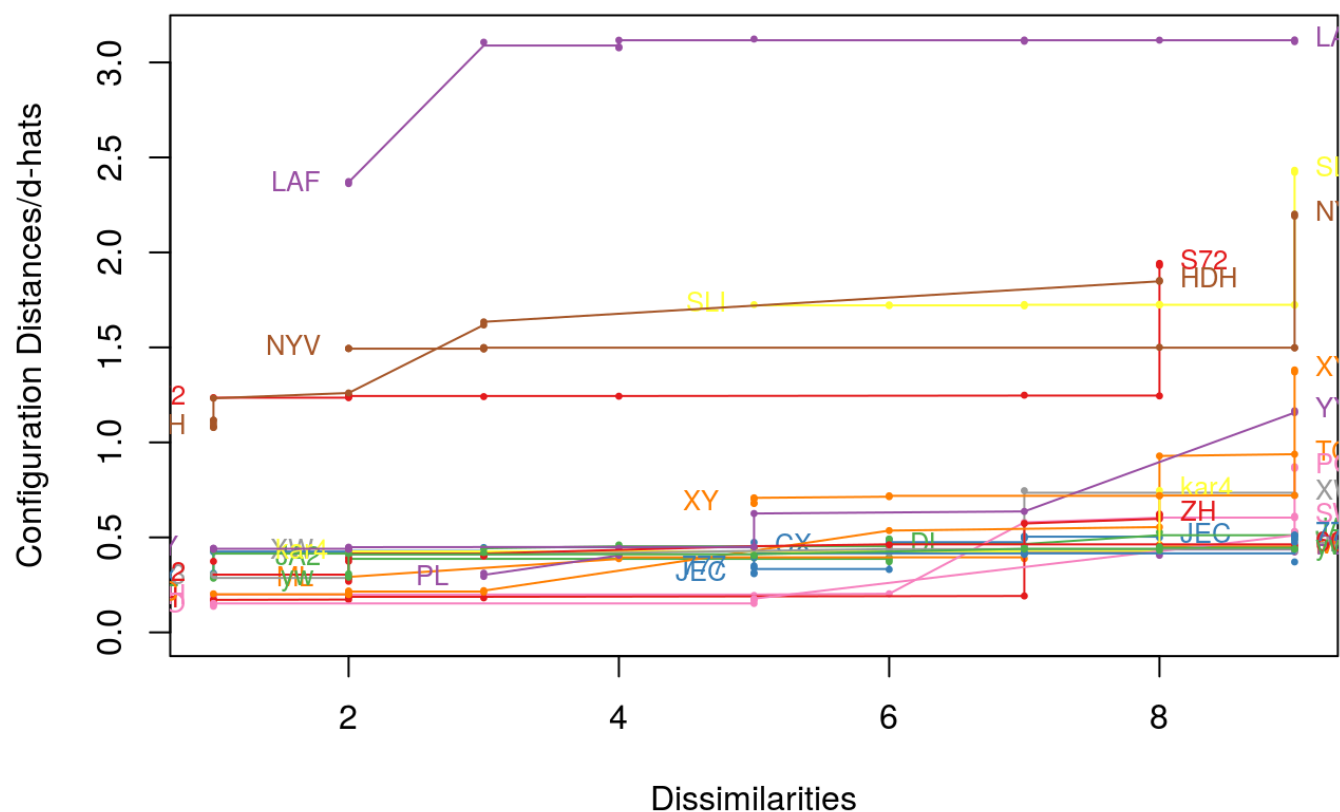
```
plot(result3, "Shepard")
```

Shepard Diagram



```
plot(result4,"Shepard")
```

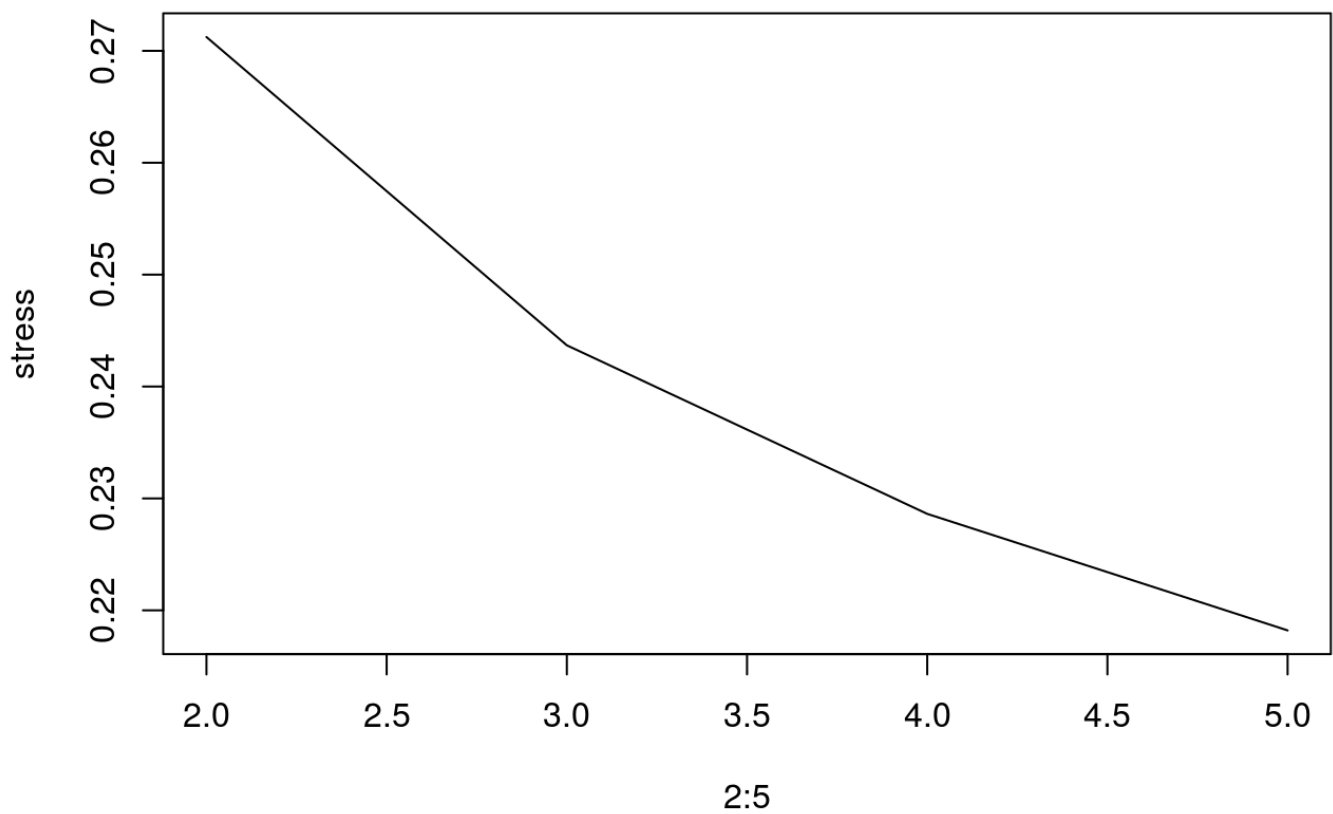
Shepard Diagram



Personally, I prefer the result 3 which is the ordinal-matrix condition. The reasons are:

1. the configuration on 2 dimension of both subjects and sports are more distinguishable. Consequently, we can easily find the difference of sports and subjects.
2. Based on the configurations, the sport involves jumping and speed are more close to each other. Hockey is far away from other sport which do not use balls. Meanwhile, ice dance and figure are close.

```
stress <- c()
for (d in 2:5){
  result <- smacof::smacofRect(delta = data, ndim = d, type = "ordinal", condition
ality = 'matrix', lambda = 0.1, itmax = 50000)
  stress <- c(stress, result$stress)
}
plot(2:5, stress, type = 'l')
```



Note, when the alpha is 0.5 as default, it seems to have too much penalty. I choose to make it smaller, which tends to give more complex model and lower stress.

Dimension 3 seems to be the best choice.