Inclusion

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Table of contents

1 Lire les données

```
library(tidyverse)
library(psych)
library(lavaan)
library(lavaanExtra)

library(haven)
df <- read_sav("Data inclusion.sav")
```

2 Analyse factorielle

```
library(psych)

df_fac <- df %>% select(6:11)
model = fa(df_fac, 2, rotate="oblimin")
model
```

```
Factor Analysis using method =  minres
Call: fa(r = df_fac, nfactors = 2, rotate = "oblimin")
Standardized loadings (pattern matrix) based upon correlation matrix
           MR1   MR2   h2   u2 com
SatisfW1  0.82  0.07 0.76 0.24 1.0
SatisfW2  0.69  0.03 0.50 0.50 1.0
SatisfW3  0.81 -0.07 0.58 0.42 1.0
MotivW1   0.36  0.47 0.60 0.40 1.9
MotivW2   0.27  0.53 0.56 0.44 1.5
MotivW3  -0.04  0.95 0.84 0.16 1.0

                       MR1  MR2
SS loadings           2.21 1.63
Proportion Var        0.37 0.27
Cumulative Var        0.37 0.64
Proportion Explained  0.58 0.42
Cumulative Proportion 0.58 1.00

 With factor correlations of
     MR1  MR2
MR1 1.00 0.73
MR2 0.73 1.00

Mean item complexity =  1.2
Test of the hypothesis that 2 factors are sufficient.

df null model =  15  with the objective function =  3.08 with Chi Square =  2299.25
df of  the model are 4  and the objective function was  0.01

The root mean square of the residuals (RMSR) is  0.01
The df corrected root mean square of the residuals is  0.02

The harmonic n.obs is  750 with the empirical chi square  2.99  with prob <  0.56
The total n.obs was  751  with Likelihood Chi Square =  11.12  with prob <  0.025

Tucker Lewis Index of factoring reliability =  0.988
RMSEA index =  0.049  and the 90 % confidence intervals are  0.016 0.084
BIC =  -15.36
Fit based upon off diagonal values = 1
Measures of factor score adequacy
                                                MR1  MR2
Correlation of (regression) scores with factors   0.93 0.94
Multiple R square of scores with factors          0.87 0.89
```

```
Minimum correlation of possible factor scores     0.74 0.77
```

```
scores<-model$scores
```

3 test genre

```
foo<-cbind(df[,1:5], scores) %>%
  mutate(Sexe=ifelse(Sexe==1,"Male", "Female"),
         ManSex=ifelse(ManSex==1,"Male Manager", "Female Manager"))%>%
  rename(Satisfaction=MR1,
         Motivation=MR2)


table(foo$Sexe)
```

```
Female   Male
   541    210
```

```
table(foo$ManSex)
```

```
Female Manager   Male Manager
           220            531
```

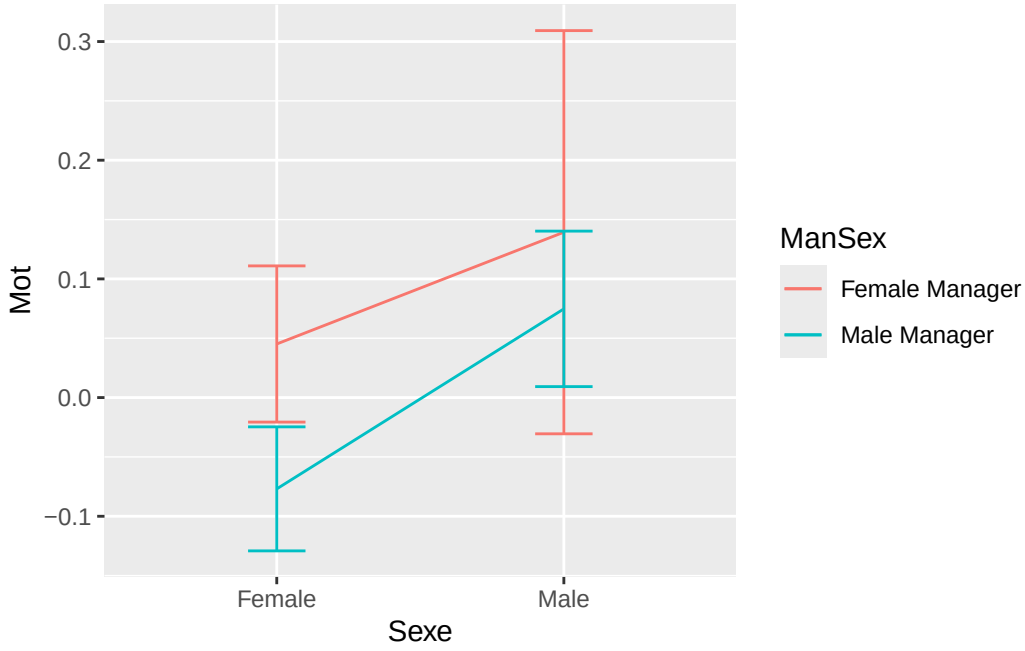
```
table(foo$Sexe, df$ManSex)
```

```
          1   2
  Female 359 182
  Male   172  38
```

```
fit<-lm(Motivation~Sexe+Sexe:ManSex, foo)
summary(fit)
```

```
Call:
lm(formula = Motivation ~ Sexe + Sexe:ManSex, data = foo)

Residuals:
    Min      1Q  Median      3Q     Max
-3.0868 -0.5137  0.1981  0.4604  1.4313

Coefficients:
                               Estimate Std. Error t value Pr(>|t|)
(Intercept)                     0.04516    0.06970   0.648    0.517
SexeMale                        0.09417    0.16771   0.561    0.575
SexeFemale:ManSexMale Manager -0.12208    0.08557  -1.427    0.154
SexeMale:ManSexMale Manager   -0.06458    0.16864  -0.383    0.702

Residual standard error: 0.9403 on 746 degrees of freedom
  (1 observation effacée parce que manquante)
Multiple R-squared:  0.006306,  Adjusted R-squared:  0.00231
F-statistic: 1.578 on 3 and 746 DF,  p-value: 0.1933
```

```r
foo1<-foo |>
  group_by(Sexe,ManSex )%>%
  summarise(n=n(),
            Sat=mean(Satisfaction, na.rm=TRUE),
            se_sat=sd(Satisfaction, na.rm=TRUE)/sqrt(n),
            Mot=mean(Motivation, na.rm=TRUE),
            se_mot=sd(Motivation, na.rm=TRUE)/sqrt(n)
            )

ggplot(foo1, aes(x=Sexe, y=Mot, group=ManSex))+
  geom_line(aes(color=ManSex))+
  geom_errorbar(aes(ymin=Mot-se_mot,ymax=Mot+se_mot, color=ManSex), width=.2)
```



4 Lavaan

modèle factoriel

https://stats.oarc.ucla.edu/r/seminars/rcfa/

```
foo <- na.omit(df_fac)

HS.model <- ' Satisfaction  =~ SatisfW1 + SatisfW2 + SatisfW3
              Motivation =~ MotivW1 + MotivW2 + MotivW3
              Satisfaction ~~ Motivation'

fit <- cfa(HS.model, data = foo, std.lv=TRUE)
summary(fit)
```

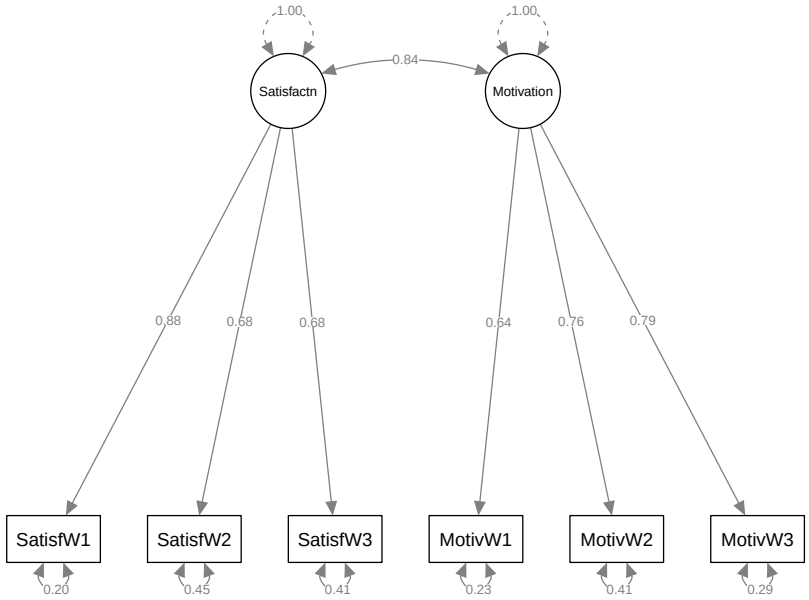
```
lavaan 0.6-18 ended normally after 20 iterations

  Estimator                                         ML
  Optimization method                           NLMINB
  Number of model parameters                        13
```

```
  Number of observations                           750

Model Test User Model:

  Test statistic                                33.238
  Degrees of freedom                                 8
  P-value (Chi-square)                           0.000

Parameter Estimates:

  Standard errors                             Standard
  Information                                 Expected
  Information saturated (h1) model          Structured

Latent Variables:
                   Estimate  Std.Err  z-value  P(>|z|)
  Satisfaction =~
    SatisfW1          0.876    0.030   29.079    0.000
    SatisfW2          0.685    0.032   21.341    0.000
    SatisfW3          0.683    0.031   22.084    0.000
  Motivation =~
    MotivW1           0.642    0.026   25.055    0.000
    MotivW2           0.764    0.032   23.548    0.000
    MotivW3           0.790    0.030   26.083    0.000

Covariances:
                   Estimate  Std.Err  z-value  P(>|z|)
  Satisfaction ~~
    Motivation        0.841    0.019   44.672    0.000

Variances:
                   Estimate  Std.Err  z-value  P(>|z|)
   .SatisfW1          0.199    0.022    8.835    0.000
   .SatisfW2          0.454    0.028   16.465    0.000
   .SatisfW3          0.406    0.025   16.102    0.000
   .MotivW1           0.229    0.016   14.054    0.000
   .MotivW2           0.408    0.027   15.179    0.000
   .MotivW3           0.294    0.022   13.087    0.000
    Satisfaction      1.000
    Motivation        1.000
```

```r
standardizedSolution(fit)
```

```
            lhs op          rhs est.std    se      z pvalue ci.lower ci.upper
1  Satisfaction =~     SatisfW1   0.891 0.014 64.349      0    0.864    0.918
2  Satisfaction =~     SatisfW2   0.713 0.021 33.839      0    0.672    0.754
3  Satisfaction =~     SatisfW3   0.731 0.020 36.185      0    0.692    0.771
4    Motivation =~      MotivW1   0.802 0.017 47.144      0    0.768    0.835
5    Motivation =~      MotivW2   0.767 0.019 41.236      0    0.731    0.804
6    Motivation =~      MotivW3   0.825 0.016 51.535      0    0.793    0.856
7  Satisfaction ~~   Motivation   0.841 0.019 44.672      0    0.804    0.878
8      SatisfW1 ~~     SatisfW1   0.206 0.025  8.339      0    0.157    0.254
9      SatisfW2 ~~     SatisfW2   0.492 0.030 16.367      0    0.433    0.551
10     SatisfW3 ~~     SatisfW3   0.465 0.030 15.726      0    0.407    0.523
11      MotivW1 ~~      MotivW1   0.357 0.027 13.103      0    0.304    0.411
12      MotivW2 ~~      MotivW2   0.411 0.029 14.416      0    0.356    0.467
13      MotivW3 ~~      MotivW3   0.320 0.026 12.128      0    0.268    0.372
14 Satisfaction ~~ Satisfaction   1.000 0.000     NA     NA    1.000    1.000
15   Motivation ~~   Motivation   1.000 0.000     NA     NA    1.000    1.000
```

```r
library(lavaanPlot)

#lavaanPlot(model = fit, edge_options = list(color = "grey"),
#           coefs = TRUE, covs = TRUE,
#           graph_options = list(rankdir = "LR"),
#           node_options = list(shape = "box", fontname = "Helvetica",
#                                              width = 2,
#                                              height = .5))
#nice_lavaanPlot(fit)
library(semPlot)

semPaths(fit, "par", weighted = FALSE, nCharNodes = 10, shapeMan = "rectangle",
         sizeMan = 10, sizeMan2 = 5)
```



https://methodenlehre.github.io/SGSCLM-R-course/cfa-and-sem-with-lavaan.html