University of Colorado
Boulder

Human-Robot Interaction

Scale Construction

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Scale Construction

Terminology

Item

Responses by participants to a question on a survey

Scale

A group of related measures of a variable

Example

"A 5-item scale measuring perceptions of the robot as a teammate"

Types of Data for Scales

Nominal

Categorizations (e.g., male, female)

Ordinal

Ranked ordering (e.g., large, medium, small)

Interval

Absolute quantitative measurement with arbitrary zero point (e.g., rating scales)

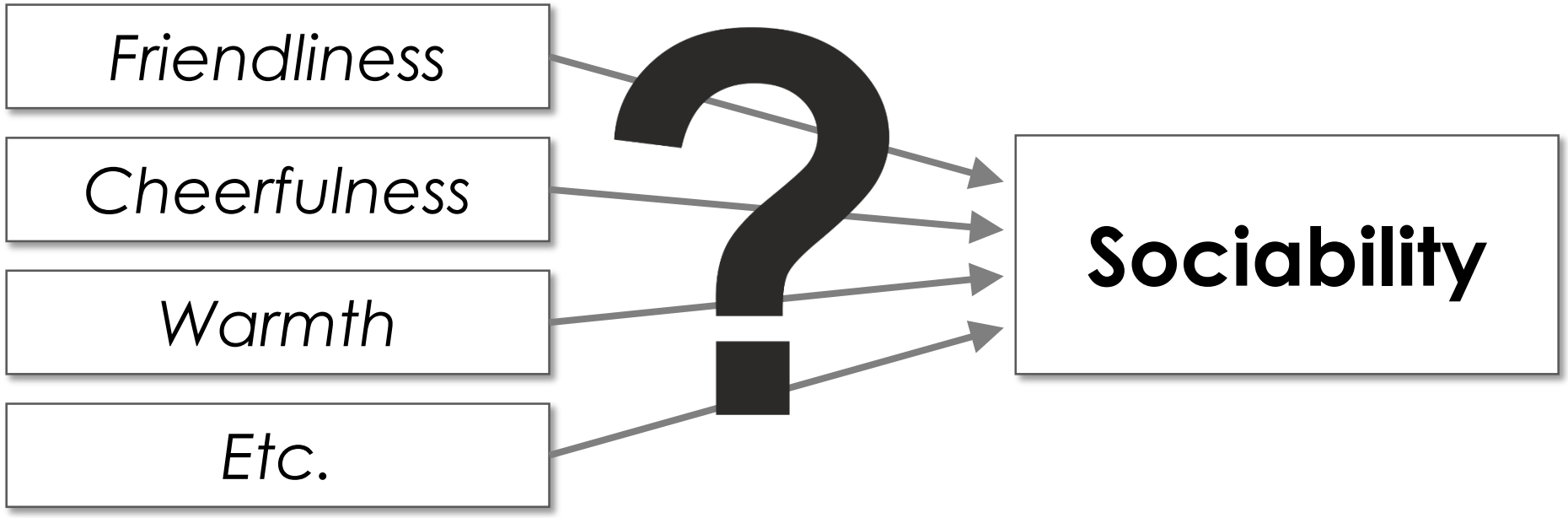
Ratio

Absolute measurements with a true zero (e.g., objective measurements)

Why is this important?

How can we measure **sociability**?

- Can't directly measure it
- Might think that it combines things like "friendliness," "talkativeness," "cheerfulness," "warmth," and/or others



Factor Analysis

A statistical test to explore relationships among items

- Used for scale construction and data reduction
- Removes redundancy or duplication from a set of correlated variables
- Represents correlated variables with a smaller set of “derived” variables
- Factors are formed that are relatively independent of one another

More Definitions

Two types of variables

- Latent variables (factors)
- Observed variables

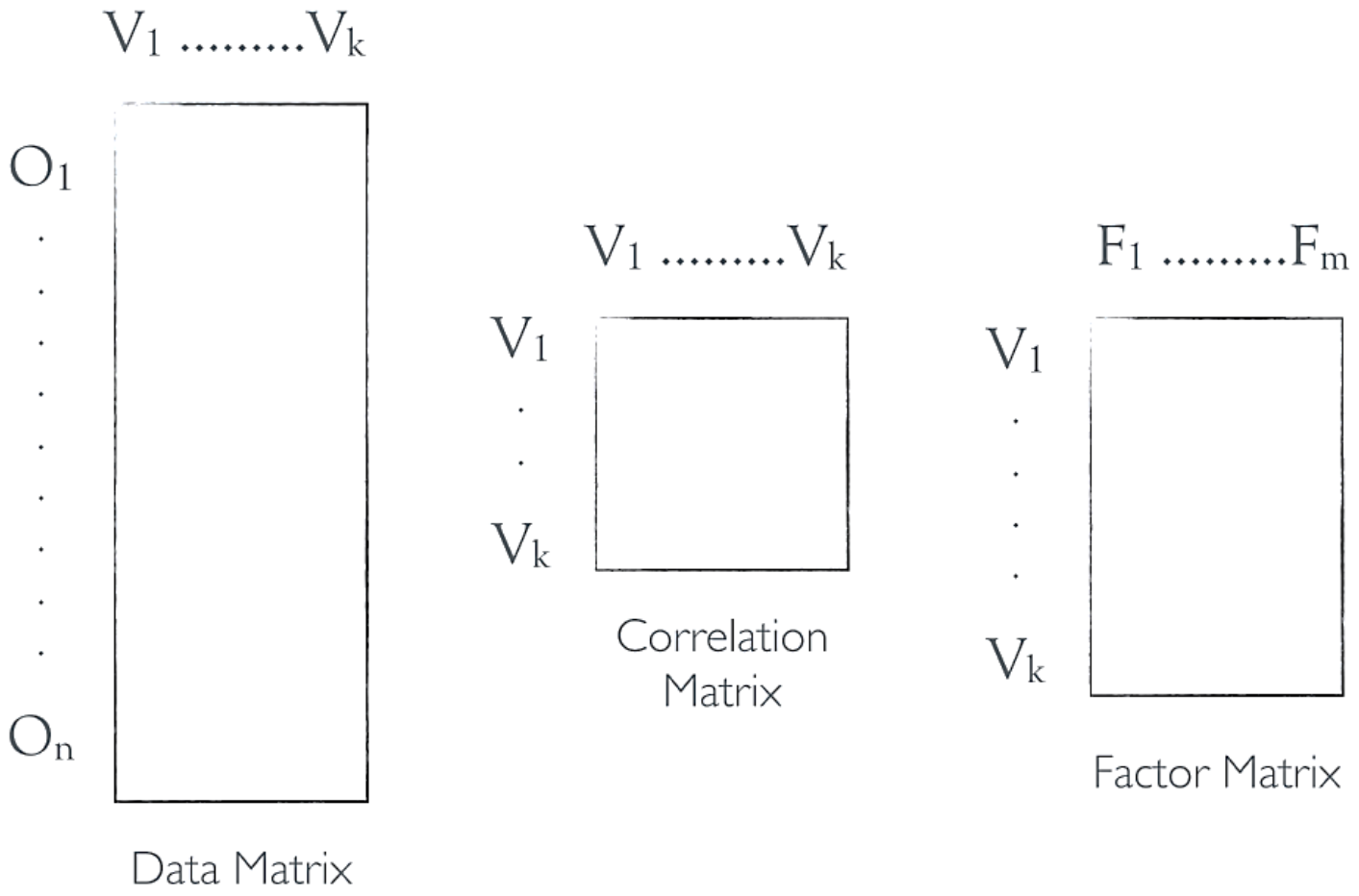
Factors

- If several observed variables correlate highly, they might measure aspects of a common underlying dimension – a *factor*

Loading

- The greater the loading of variables on a factor, the more that factor explains the relationship between those variables

Data Representation



Factor Model

$$X_1 = \lambda_{11}F_1 + \lambda_{12}F_2 + \cdots + \lambda_{1m}F_m + e_1$$
$$X_2 = \lambda_{21}F_1 + \lambda_{22}F_2 + \cdots + \lambda_{2m}F_m + e_2$$
$$\cdots$$
$$X_n = \lambda_{n1}F_1 + \lambda_{n2}F_2 + \cdots + \lambda_{nm}F_m + e_n$$

(**m** factors and **n** observed variables)

Assumptions

$$corr(F_s, X_j) = \lambda_{js}$$

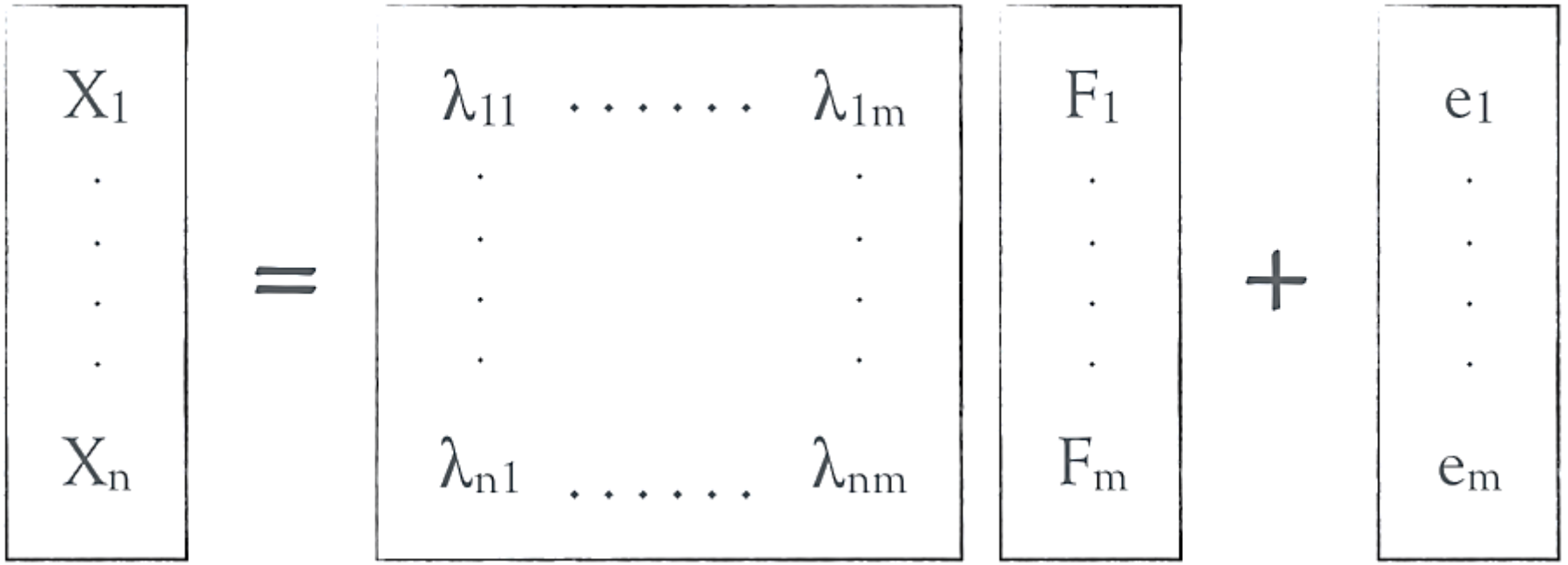
$$corr(F_s, F_r) = 0 \; for \; all \; s \neq r \; (i.e., independent)$$

$$corr(X_i, X_j) = \lambda_{i1}\lambda_{j1} + \lambda_{i2}\lambda_{j2} + \lambda_{i3}\lambda_{j3} + \cdots$$

Matrix Notation

$$X_{nx1} = \Lambda_{nxm} F_{mx1} + e_{nx1}$$

Loading matrix



Loading Matrix

Columns represent derived factors

Rows represent input variables

Individual cells = **loadings**

- Represent degree to which each of the variables correlates with each of the factors
- Range from -1 to 1
- Reveals extent to which each of the variables contributes to the meaning of each of the factors
- High loadings = more contribution
- $r > 0.7$ is good correlation, $r > 0.5$ is often used as elimination boundary

Factor Rotation

Allows for spreading variability more evenly among factor

Redefines factors to force loadings to be very high (-1 or 1) or very low (0)

Allows the researcher to make more clear-cut decisions

Different methods of factor rotation

- We will use “varimax” – maximizes squared loading variance across variables (sum over factors)

Types of Factor Analysis

Exploratory

Confirmatory

Exploratory Factor Analysis

Attempts to discover the nature of the constructs influencing a set of responses

No *a priori* assumptions about relationships

Process

Collect and explore data – choose relevant variables

Extract initial factors (via principal components)

Choose number of factors to retain

Choose estimation method, estimate model

Rotate and interpret

Decide if changes need to be made and estimate, rotate, and implement again

Construct scales and use in further analysis

Confirmatory Factor Analysis

Define the factor model

Collect measurements

Obtain the correlation matrix

Fit the model to the data

Evaluate model adequacy

Compare with other models

Questions?

Example: R

R Basics

Looking up functions

```
help(function)

?function

example(function)
```

Accessing the Data

Setting the workspace

```
setwd(“~/some_folder”)
```

Loading the data

```
qdata <- read.table("FactorAnalysis_Data.csv", sep=",", header=TRUE)
```

Accessing the data

```
qdata

q <- qdata[,3:21]

qdata$Cute
```

Descriptive Statistics

Basic statistics and plotting

```
mean(x), median(x), sd(x), var(x)

summary(x)

boxplot(x), boxplot(x~y), stripchart(x),
stripchart(x~y)

hist(y), qqnorm(y), plot(z~y)
```

Descriptive Statistics

Summaries with specified statistics

```
sapply(qdata, mean, na.rm=TRUE)
```

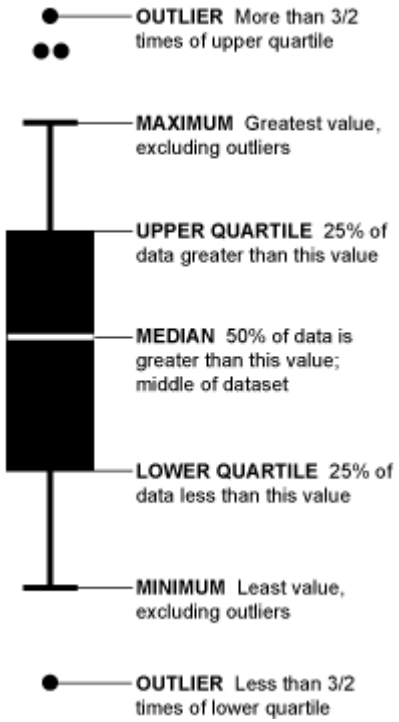
Possible functions to use:

```
mean, sd, var, min, max, med, range, quantile
```

Psych package summary function

```
library(psych)
describe(mydata)
describeBy(q, qdata$Condition)
```

Descriptive Statistics



Plotting data

```
boxplot(qdata$Happy)

boxplot(qdata$Happy ~ qdata$Condition)

boxplot(qdata$Happy ~ qdata$Condition,
main="Happiness vs. Gaze cue", xlab="Condition",
ylab="Happiness")

boxplot(qdata$Happy ~ qdata$Condition,
col=(c("grey","red")), main="Happiness vs. Gaze
cue", xlab="Condition", ylab="Happiness")
```

Exploratory Factor Analysis

Determining the number of factors

The Kaiser criterion

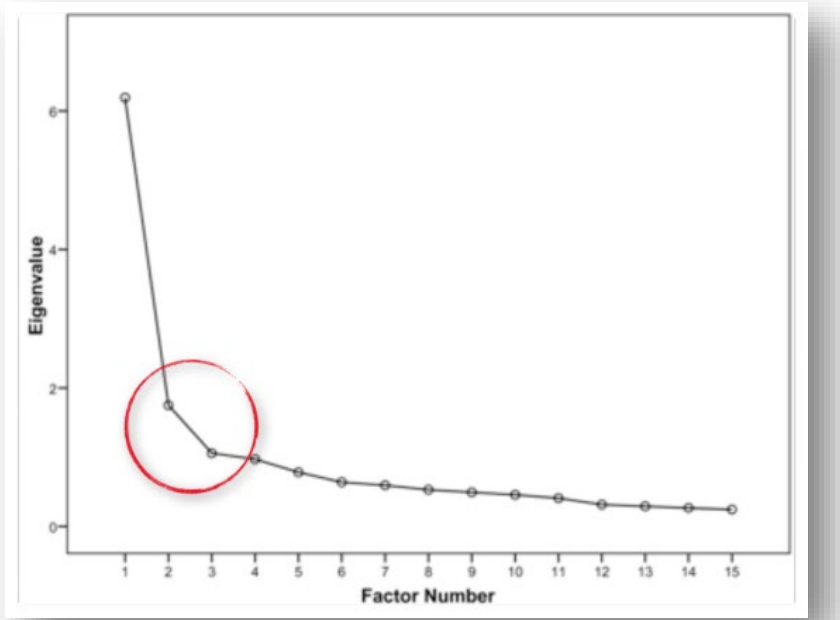
Retains only factors with eigenvalues greater than 1

(Kaiser, 1960)

Scree plot

Use point of inflexion

(Cattell, 1966)



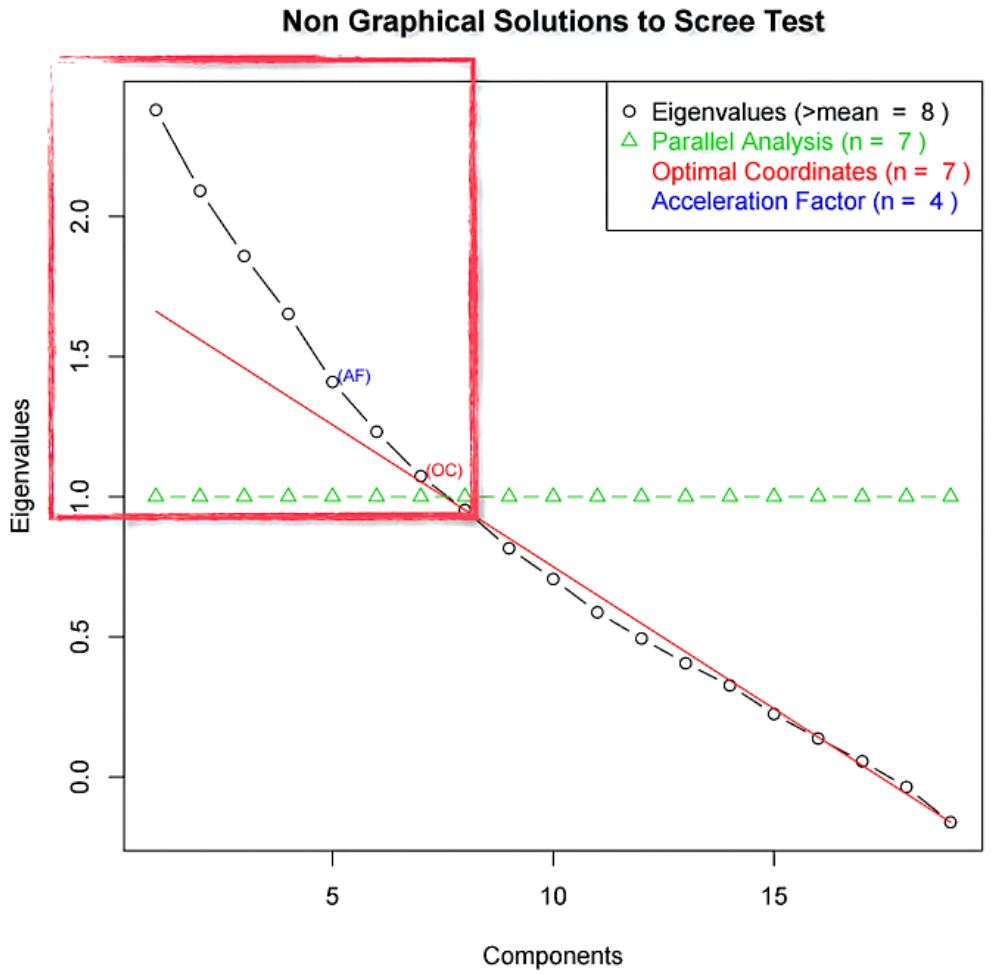
Exploratory Factor Analysis

Determining the number of factors to extract

```
library(nFactors)

ev <- eigen(cor(q))

ap <- parallel(subject=nrow(q),var=ncol(q),rep=100,cent=.05)

nS <- nScree(ev$values, ap$eigen$qevpea)

plotnScree(nS)
```

Exploratory Factor Analysis

7 factors



Exploratory Factor Analysis

Use the *factor.pa()* from the *psych* package

```
install.packages(c("psych", "GPArotation"),
                 dependencies = TRUE)

library(GPArotation)

fit <- fa(q, nfactors = 7)
```

Exploratory Factor Analysis

	item	PA1	PA2	PA4	PA3	PA5	PA6	PA7	h2	u2
Looks_humanlike	1			0.57					0.50	0.50
Behaves_humanlike	2			0.32				0.79	0.83	0.17
Attractive	3		0.35		0.71				0.72	0.28
Cute	4				0.76				0.64	0.36
Cheerful	5	0.55						0.59	0.71	0.29
Friendly	6	0.90							0.87	0.13
Optimistic	7						-0.71		0.61	0.39
Warm	8	0.64					-0.59		0.95	0.05
Happy	9	0.72				0.36			0.77	0.23
Knowledgeable	10			0.70					0.68	0.32
Responsible	11		0.38			0.46	-0.45		0.70	0.30
Intelligent	12			0.79					0.71	0.29
Sensible	13			0.71					0.60	0.40
Loyal	14		0.91						0.87	0.13
Honest	15		0.63						0.47	0.53
Cooperative	16		0.75			-0.49			0.85	0.15
Attentive	17					0.83			0.74	0.26
You_like_the_robot	18				0.84				0.83	0.17
Robot_likes_you	19	0.32							0.17	0.83

	PA1	PA2	PA4	PA3	PA5	PA6	PA7
Correlation	0.96	0.97	0.91	0.94	0.92	0.98	0.92

Exploratory Factor Analysis

Using the standard *factanal()*

```
fit <- factanal(q, 7, rotation="varimax")
print(fit, digits=2, cutoff=.3, sort=TRUE)
```

Exploratory Factor Analysis

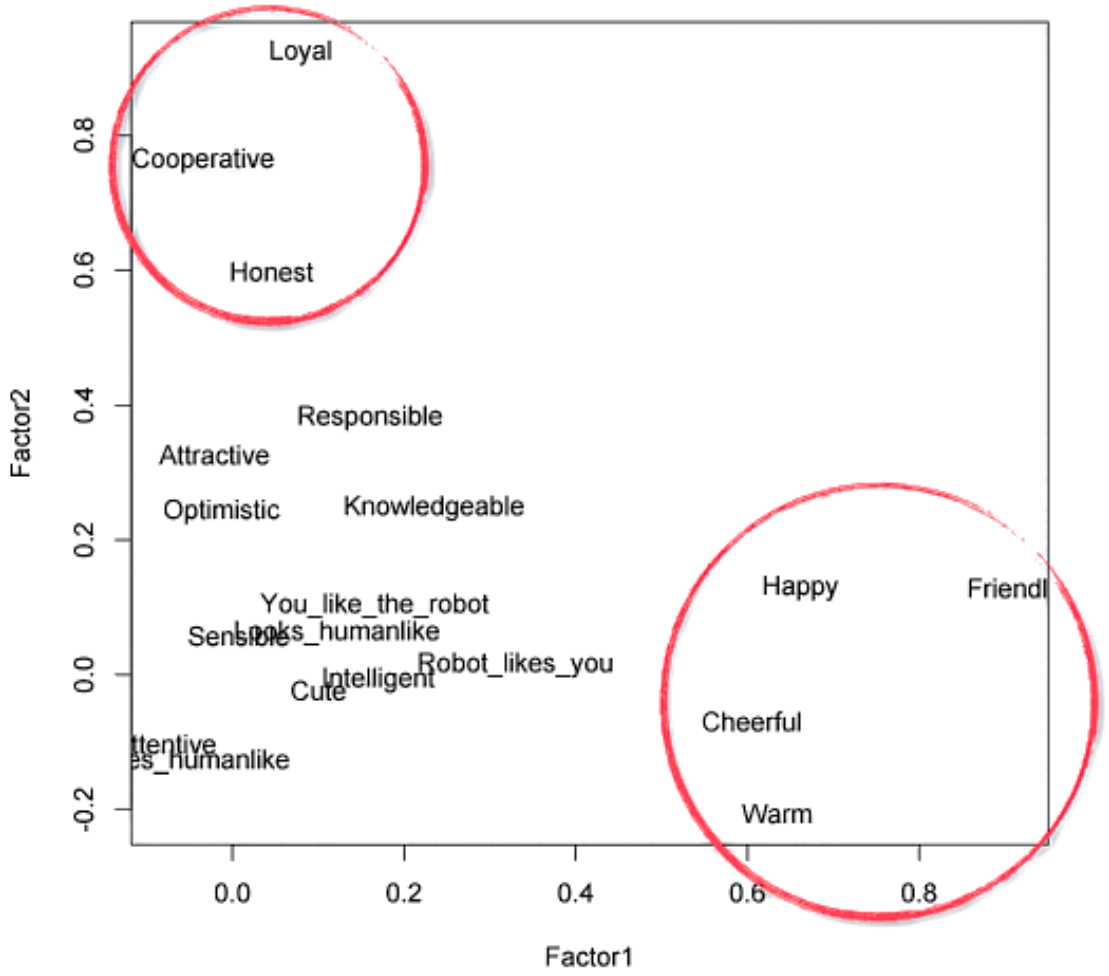
	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7
Cheerful	0.61				0.47		
Friendly	0.91						
Warm	0.64		0.34	0.32		0.57	
Happy	0.66						0.42
Loyal		0.92					
Honest		0.60					
Cooperative		0.76					-0.55
Knowledgeable			0.67				
Intelligent			0.94				
Sensible			0.64				
Attractive		0.33		0.71			
Cute				0.70			
You_like_the_robot				0.86			
Behaves_humanlike					0.93		
Optimistic						0.70	
Responsible		0.38		0.31		0.48	0.53
Attentive							0.69
Looks_humanlike			0.32		0.42		
Robot_likes_you	0.33						

Exploratory Factor Analysis

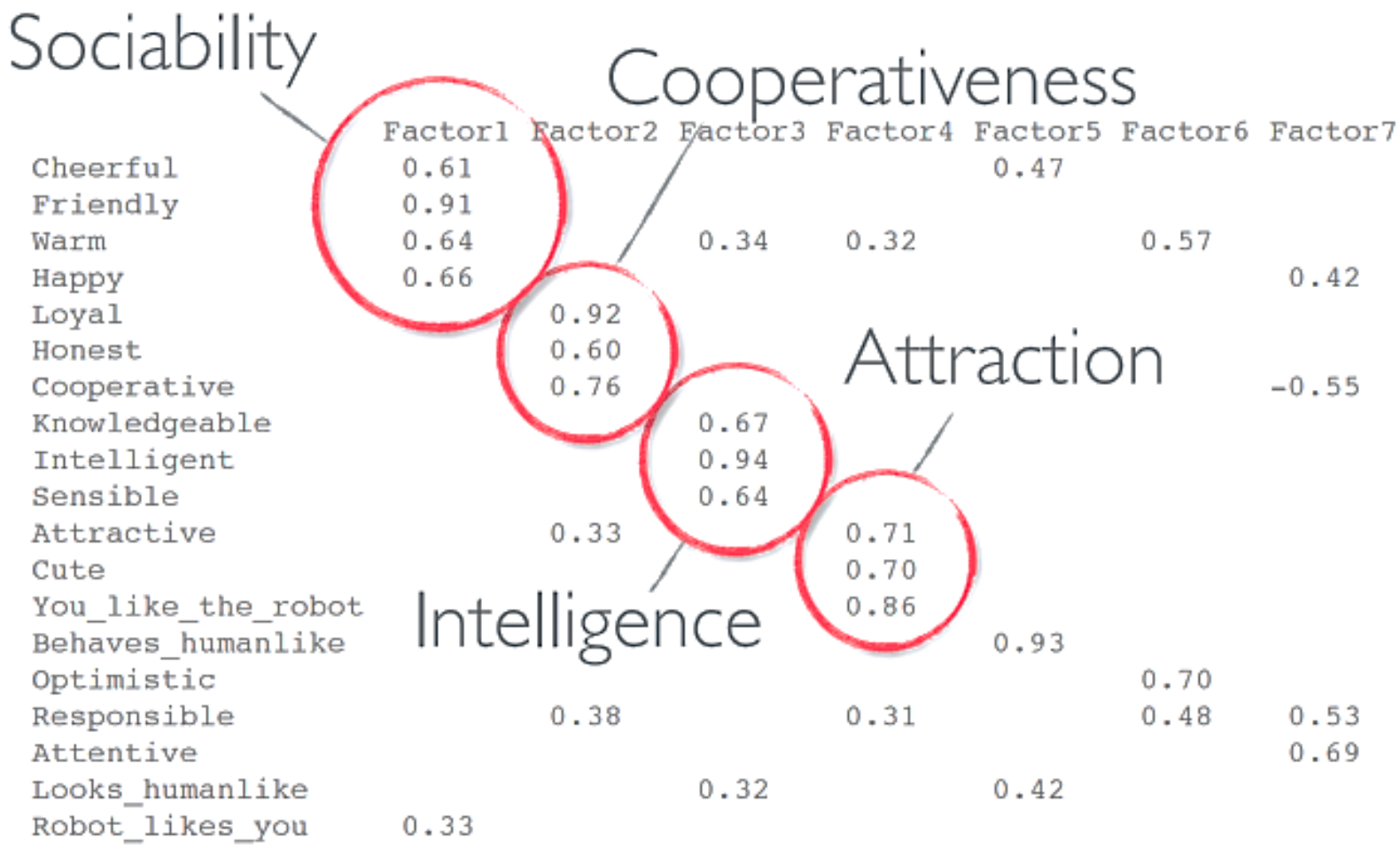
Plot variables across loading factors

```
load <- fit$loadings

plot(load,type="n")

text(load,labels=names(qdata),cex=.75)
```

Exploratory Factor Analysis



Exploratory Factor Analysis



	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7
Cheerful	0.61			0.47			
Friendly	0.91						
Warm	0.64		0.34	0.32		0.57	
Happy	0.66						0.42
Loyal		0.92					
Honest		0.60					
Cooperative		0.76					-0.55
Knowledgeable			0.67				
Intelligent			0.94				
Sensible			0.64				
Attractive		0.33			0.71		
Cute					0.70		
You_like_the_robot					0.86		
Behaves_humanlike				0.93			
Optimistic						0.70	
Responsible		0.38			0.31	0.48	0.53
Attentive							0.69
Looks_humanlike			0.32		0.42		
Robot_likes_you	0.33						

Questions?

Confirmatory Factor Analysis

Exploratory-confirmatory approach (Jöreskog, 1978)

- Perform an exploratory factor analysis and decide on the number of factors *m*
- Fit an m-factor model and rotate to simple structure using varimax
- For each column of the factor pattern, find the largest loading, then constrain all other loadings in that row to be zero, and fit the resulting model as a confirmatory factor model
- Examine the factor pattern and test all factor loadings. Delete "non-significant" loadings from the model

Confirmatory Factor Analysis

```
F <- matrix(fit$loadings,19,7)

rownames(F) <- colnames(q)

F
```

Confirmatory Factor Analysis

	[,1]	[,2]	[,3]	[,4]	[,5]	[,6]	[,7]
Looks_humanlike	0.121673718	0.06222817	0.32035949	0.028212725	0.418624606	-0.27603993	0.183921522
Behaves_humanlike	-0.072113047	-0.12945475	0.20704392	0.227147455	**0.927649296**	0.07026083	0.114493597
Attractive	-0.020732258	0.32559678	0.11514071	0.709502780	0.289124566	0.13075367	-0.090561105
Cute	0.100607713	-0.02357483	-0.02623257	0.701555536	-0.073994852	-0.08593651	-0.087313384
Cheerful	0.605297671	-0.06991740	0.11045931	0.070434618	0.469680702	-0.12048078	-0.099800893
Friendly	**0.910739547**	0.12490413	0.17526405	0.003881878	0.027095000	0.05572854	-0.047075593
Optimistic	-0.012550024	0.24147053	0.07707169	-0.162551700	-0.018882828	**0.69619940**	-0.059592714
Warm	0.635059815	-0.20667047	0.34358549	0.320358174	0.023565819	0.57250571	-0.002810197
Happy	0.661708643	0.12893726	0.18794295	-0.051681632	0.004409878	0.19959972	0.418745571
Knowledgeable	0.234925321	0.24733813	0.66561576	-0.122639970	0.148147696	0.05451256	-0.006122908
Responsible	0.160384316	0.38090655	0.08884898	0.307167598	-0.208151836	0.48417375	0.533369080
Intelligent	0.169972067	-0.00740013	**0.94458355**	0.039420229	0.091349952	-0.09211680	0.235453358
Sensible	0.007334789	0.05741771	0.63624405	0.132064377	0.116912230	0.26023088	-0.099075631
Loyal	0.079629987	**0.92267569**	0.09292844	0.136910224	-0.020533822	-0.07616241	0.068176743
Honest	0.045765749	0.59815252	0.14762840	0.116250332	-0.098801076	0.21860635	0.002800294
Cooperative	-0.034126572	0.76210031	-0.04282778	-0.045699138	0.052645349	0.26016209	-0.548668740
Attentive	-0.078144110	-0.10332231	0.03588948	-0.082756643	0.160884287	-0.07258576	**0.691667686**
You_like_the_robot	0.166042158	0.10254418	0.02745014	**0.856894296**	0.208947805	-0.04379564	0.147827037
Robot_likes_you	0.329787638	0.01427178	-0.00985612	0.160097008	-0.075323500	-0.05963366	-0.042585644

Confirmatory Factor Analysis

```
F1 <- rbind(F[6,], F[14,], F[12,], F[18,], F[2,], F[7,], F[17,])

F1

T <- solve(F1) %*% diag ( sqrt(diag(F1 %*% t(F1))))

rotated.F <- zapsmall(F %*% T)

rotated.F

solve(T) %*% t( solve(T) )

colnames(rotated.F) <-
c("Sociability","Cooperativeness","Intelligence","Attraction","x","
x","x")

rotated.F
```

Confirmatory Factor Analysis

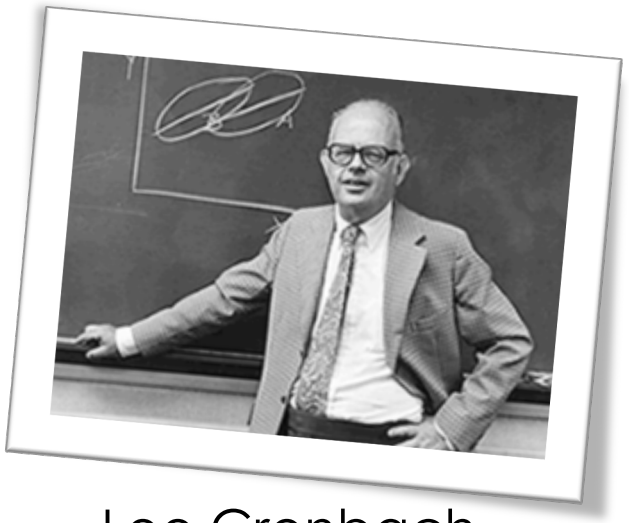
	Sociability	Cooperativeness	Intelligence	Attraction	x	x	x
Looks_humanlike	0.1374055	0.2378276	0.2224748	-0.1852102	0.4478452	-0.3027950	0.0802459
Behaves_humanlike	0.0000000	0.0000000	0.0000000	0.0000000	0.9974971	0.0000000	0.0000000
Attractive	-0.1879691	0.2173050	0.0626708	**0.6775873**	0.2169554	0.1704584	-0.2655571
Cute	-0.0802232	-0.1445691	0.0459679	**0.7884804**	-0.2305021	-0.0605241	-0.2084245
Cheerful	**0.6903995**	-0.0153703	-0.1006915	-0.1228943	0.5422355	-0.2479455	-0.1079703
Friendly	**0.9390613**	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Optimistic	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.7612030	0.0000000
Warm	**0.5432436**	-0.5737669	0.2667157	**0.5901935**	-0.1527811	0.6066176	-0.0289008
Happy	**0.7052879**	-0.0036678	0.0387591	0.0942243	-0.1543742	0.2464628	0.4936501
Knowledgeable	0.1592446	0.2403468	**0.6093786**	-0.2395455	0.1950764	0.0887917	-0.1438619
Responsible	0.0586807	0.1022748	0.0604396	**0.6523807**	-0.5011221	0.6729710	0.5493032
Intelligent	0.0000000	0.0000000	**0.9974998**	0.0000000	0.0000000	0.0000000	0.0000000
Sensible	-0.1463329	-0.0640868	**0.6599536**	0.1381140	0.1052341	0.3235408	-0.2817825
Loyal	0.0000000	**0.9465315**	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Honest	-0.0481098	**0.4826862**	0.1066102	0.1387119	-0.1187265	0.3066778	-0.0467951
Cooperative	-0.0614244	**0.6944245**	-0.1568153	-0.2351829	0.2895552	0.2369817	-0.5723671
Attentive	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.7310782
You_like_the_robot	0.0000000	0.0000000	0.0000000	**0.9168079**	0.0000000	0.0000000	0.0000000
Robot_likes_you	0.2996796	-0.0456011	-0.0326332	0.1867530	-0.1264070	-0.0768468	-0.0403707

Scale Construction Reliability

Cronbach's **α**

Internal consistency reliability

(Cronbach, 1951)



Lee Cronbach

Cronbach's alpha	**Internal Consistency**
α ≥ .9	*Excellent*
.9 > **α** ≥ .8	*Good*
.8 > **α** ≥ .7	*Acceptable*
.7 > **α** ≥ .6	*Questionable*
.6 > **α** ≥ .5	*Poor*
.5 > **α**	*Unacceptable*

Scale Construction

Sociability

	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7
Cheerful	0.61				0.47		
Friendly	0.91						
Warm	0.64		0.34	0.32		0.57	
Happy	0.66						0.42
Loyal		0.92					
Honest		0.60					
Cooperative		0.76					-0.55
Knowledgeable			0.67				
Intelligent			0.94				
Sensible			0.64				
Attractive		0.33		0.71			
Cute				0.70			
You_like_the_robot				0.86			
Behaves_humanlike					0.93		
Optimistic						0.70	
Responsible		0.38		0.31		0.48	0.53
Attentive							0.69
Looks_humanlike			0.32		0.42		
Robot_likes_you	0.33						

Scale Construction

```
sociability <- qdata[,7:11]

sociability <- sociability[,-3]

sociability

alpha(sociability, na.rm = TRUE)
```

Scale Construction

```
Reliability analysis
Call: alpha(x = sociability, na.rm = TRUE)

raw_alpha std.alpha G6(smc) average_r mean  sd
     0.81      0.81    0.79      0.52  3.5 1.0
```

```
Reliability if an item is dropped:
         raw_alpha std.alpha G6(smc) average_r
Cheerful      0.83      0.83    0.77      0.62
Friendly      0.69      0.69    0.62      0.43
Warm          0.76      0.75    0.71      0.51
Happy         0.78      0.77    0.72      0.53
```

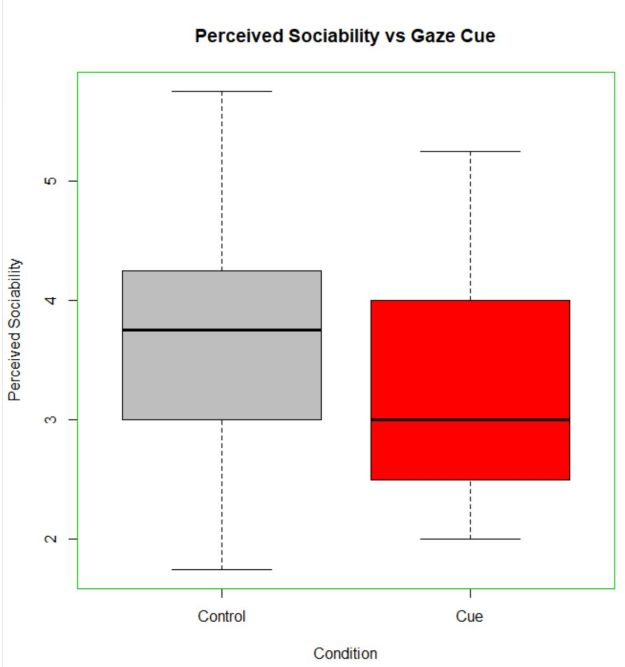
```
Item statistics
           n    r r.cor mean  sd
Cheerful  29 0.71  0.56  3.0 1.2
Friendly  29 0.89  0.86  3.9 1.3
Warm      29 0.81  0.73  3.5 1.2
Happy     29 0.79  0.70  3.7 1.4
```

Add New Scale to Data Frame

```
qdata <- cbind(qdata, Sociability=rowMeans(sociability))

boxplot(qdata$Sociability ~ qdata$Condition,
col=(c("grey","red")), main="Perceived Sociability vs
Gaze Cue", xlab="Condition", ylab="Perceived
Sociability")
```

Now could do inferential tests…

More on that next week!

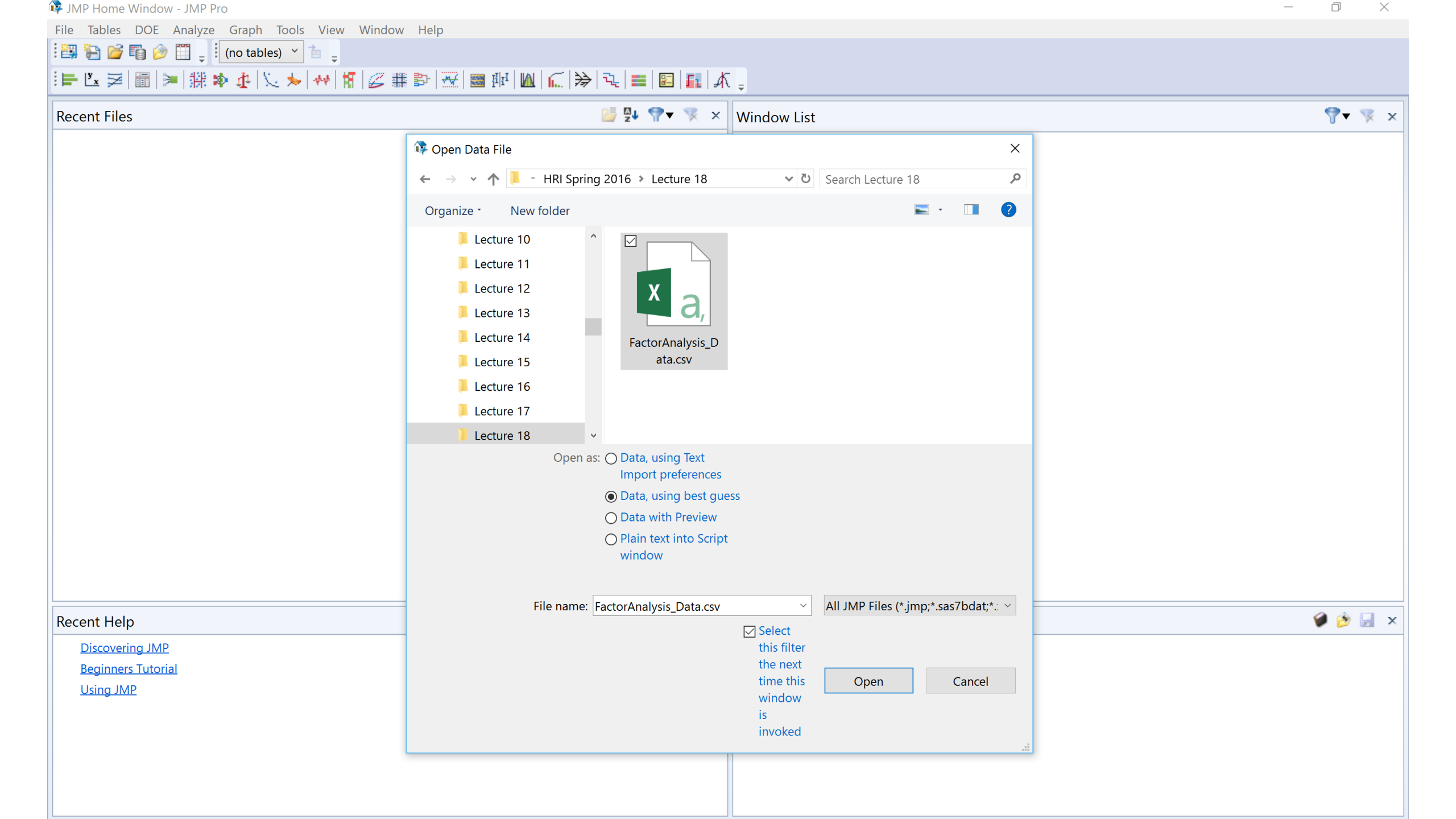


Try Out

```
data(bfi)

-

library(nFactors)

ev <- eigen(cor(bfi))

ap <- parallel(subject=nrow(bfi),var=ncol(bfi),rep=100,cent=.05)

nS <- nScree(ev$values, ap$eigen$qevpea)

plotnScree(nS)

-

library(psych)

fit <- factor.pa(bfi, nfactors=11)

fit

-

newScale <- bfi[, 16:20]

newScale

alpha(newScale, na.rm = TRUE)
```

Questions?

JMP Steps


JMP Home Window - JMP Pro
File Tables DOE Analyze Graph Tools View Window Help
(no tables)
Recent Files
Window List
Open Data File
HRI Spring 2016 › Lecture 18
Search Lecture 18
Organize
New folder
Lecture 10
Lecture 11
Lecture 12
Lecture 13
Lecture 14
Lecture 15
Lecture 16
Lecture 17
Lecture 18
FactorAnalysis_Data.csv
Open as:
Data, using Text Import preferences
Data, using best guess
Data with Preview
Plain text into Script window
File name: FactorAnalysis_Data.csv
All JMP Files (*.jmp;*.sas7bdat;*.
Select this filter the next time this window is invoked
Open
Cancel
Recent Help
Discovering JMP
Beginners Tutorial
Using JMP

FactorAnalysis_Data - JMP Pro

File Edit Tables Rows Cols DOE Analyze Graph Tools View Window Help

Distribution
Fit Y by X
Matched Pairs
Tabulate
Fit Model
Modeling
Multivariate Methods
Quality and Process
Reliability and Survival
Consumer Research

Multivariate
Cluster
Principal Components
Discriminant
Partial Least Squares

FactorAna
Source

Columns (
Participan
Condition
Looks_hur
Behaves_h
Attractive
Cute
Cheerful
Friendly
Optimistic
Warm
Happy
Knowledgeable
Responsible
Intelligent
Sensible
Loyal
Honest
Cooperative
Attentive
You_like_the_robot
Robot_likes_you

Rows
All rows 29
Selected 0
Excluded 0
Hidden 0
Labelled 0

	ipant ID	Condition	Looks_humanlike	Behaves_humanlike	Attractive	Cute	Cheerful	Friendly	Optimistic	Warm	Happy	Knowledgeable	Responsible	Intelligent	Sensible	Lo
		Control	6	4	7	1	1	2	3	2	2	4	6	6	6	
		Control	6	5	7	3	4	6	5	6	7	7	7	7	7	
		Control	5	3	5	1	1	5	4	4	4	5	5	5	2	
		Control	7	4	7	4	4	6	4	5	4	6	6	5	5	
		Cue	7	5	6	3	3	4	4	3	5	6	4	6	5	
			6	5	6	2	4	5	3	3	4	5	5	6	5	
			7	5	7	2	4	5	4	3	4	5	5	4	4	
			6	2	6	3	2	5	5	5	5	7	7	7	7	
			6	4	7	4	3	5	5	5	5	5	6	6	6	
			6	6	6	2	5	3	4	4	4	6	5	6	5	
			6	4	6	2	2	3	6	3	4	5	6	5	6	
12	p12		6	4	7	2	2	2	4	2	2	6	3	6	5	
13	p13	Cue	5	3	5	1	2	3	4	3	2	3	3	3	5	
14	p14	Control	6	4	6	2	3	5	4	4	5	6	4	7	6	
15	p15	Control	6	6	7	5	4	3	3	5	2	4	5	5	6	
16	p16	Cue	6	5	6	2	5	5	5	5	6	5	6	6	4	
17	p17	Cue	6	3	7	7	2	3	3	3	2	5	5	6	5	
18	p18	Control	7	5	6	3	2	3	2	3	4	3	5	6	4	
19	p19	Control	6	3	5	1	3	3	5	3	2	5	3	5	5	
20	p20	Cue	7	5	7	5	3	4	4	2	3	5	4	4	5	
21	p21	Control	6	6	7	4	3	3	4	4	3	5	5	7	5	
22	p22	Cue	3	4	7	1	2	3	5	3	1	5	6	4	2	
23	p23	Control	6	2	6	1	4	5	2	3	4	6	6	6	4	
24	p24	Cue	5	2	6	4	1	2	4	2	4	2	7	2	2	
25	p25	Control	7	5	7	2	4	5	3	5	3	5	5	6	6	
26	p26	Cue	7	4	5	2	2	3	5	3	4	6	7	7	6	
27	p27	Control	4	2	6	5	4	6	4	5	5	3	5	5	4	
28	p28	Cue	7	4	5	2	5	5	2	2	3	5	3	6	3	
29	p29	Cue	4	3	5	2	3	2	3	2	3	4	3	4	4	

FactorAnalysis_Data - JMP Pro

File Edit Tables Rows Cols DOE Analyze Graph Tools View Window Help

FactorAnalysis_Data
Source

Columns (21/0)
- Participant ID
- Condition
- Looks_humanlike
- Behaves_humanlike
- Attractive
- Cute
- Cheerful
- Friendly
- Optimistic
- Warm
- Happy
- Knowledgeable
- Responsible
- Intelligent
- Sensible
- Loyal
- Honest
- Cooperative
- Attentive
- You_like_the_robot
- Robot_likes_you

Rows
- All rows 29
- Selected 0
- Excluded 0
- Hidden 0
- Labelled 0

	Participant ID	Condition	Looks_humanlike	Behaves_humanlike	Attractive	Cute	Cheerful	Friendly	Optimistic	Warm	Happy	Knowledgeable	Responsible	Intelligent	Sensible	Lo
1	p01	Control	6	4	7	1	1	2	3	2	2	4	6	6	6	
2	p02	Control								6	7	7	7	7	7	
3	p03	Control								4	4	5	5	5	2	
4	p04	Control								5	4	6	6	5	5	
5	p05	Cue								3	5	6	4	6	5	
6	p06	Cue								3	4	5	5	6	5	
7	p07	Cue								3	4	5	5	4	4	
8	p08	Cue								5	5	7	7	7	7	
9	p09	Cue								5	5	5	6	6	6	
10	p10	Control								4	4	6	5	6	5	
11	p11	Control								3	4	5	6	5	6	
12	p12	Cue								2	2	6	3	6	5	
13	p13	Cue								3	2	3	3	3	5	
14	p14	Control								4	5	6	4	7	6	
15	p15	Control								5	2	4	5	5	6	
16	p16	Cue								5	6	5	6	6	4	
17	p17	Cue								3	2	5	5	6	5	
18	p18	Control								3	4	3	5	6	4	
19	p19	Control								3	2	5	3	5	5	
20	p20	Cue								2	3	5	4	4	5	
21	p21	Control								4	3	5	5	7	5	
22	p22	Cue								3	1	5	6	4	2	
23	p23	Control								3	4	6	6	6	4	
24	p24	Cue								2	4	2	7	2	2	
25	p25	Control								5	3	5	5	6	6	
26	p26	Cue	7	4	5	2	2	3	5	3	4	6	7	7	6	
27	p27	Control	4	2	6	5	4	6	4	5	5	3	5	5	4	
28	p28	Cue	7	4	5	2	5	5	2	2	3	5	3	6	3	
29	p29	Cue	4	3	5	2	3	2	3	2	3	4	3	4	4	

Multivariate and Correlations - JMP Pro

Pairwise and higher relationships among a number of columns

Select Columns
21 Columns
Participant ID
Condition
Looks_humanlike
Behaves_humanlike
Attractive
Cute
Cheerful
Friendly
Optimistic
Warm
Happy
Knowledgeable
Responsible
Intelligent
Sensible

Cast Selected Columns into Roles
Y, Columns: Looks_humanlike, Behaves_humanlike, Attractive, Cute
Weight: optional numeric
Freq: optional numeric
By: optional

Action
OK
Cancel
Remove
Recall
Help

Estimation Method: Default
Matrix Format: Square

FactorAnalysis_Data - Multivariate - JMP Pro

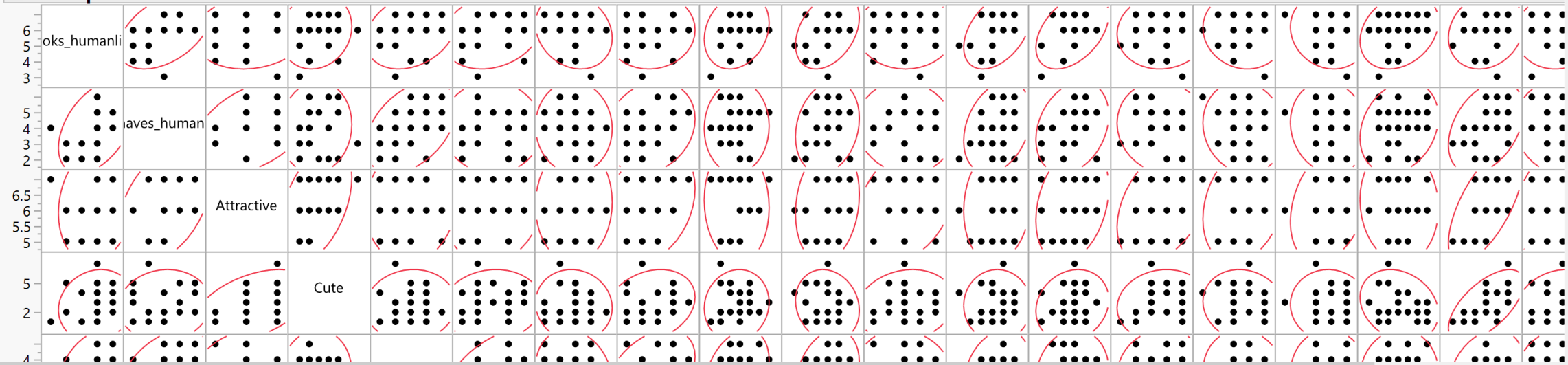
File Edit Tables Rows Cols DOE Analyze Graph Tools View Window Help

Multivariate

Correlations

	Looks_humanlike	Behaves_humanlike	Attractive	Cute	Cheerful	Friendly	Optimistic	Warm	Happy	Knowledgeable	Responsible	Intelligent	Sensible	Loyal	Honest	Cooperative	Attentive	You_li
Looks_humanlike	1.0000	0.4460	0.1580	0.1272	0.2696	0.2153	-0.1842	0.0313	0.2172	0.3621	0.0039	0.4295	0.4410	0.0742	-0.0893	-0.1144	0.2641	
Behaves_humanlike	0.4460	1.0000	0.4119	0.0645	0.4200	-0.0210	-0.0262	0.1866	0.0290	0.2011	-0.0708	0.2985	0.2677	-0.0914	-0.1001	-0.1112	0.2301	
Attractive	0.1580	0.4119	1.0000	0.4531	0.0772	0.0852	0.0283	0.2689	-0.0651	0.1646	0.3097	0.1231	0.2826	0.3971	0.2598	0.3073	-0.0731	
Cute	0.1272	0.0645	0.4531	1.0000	0.0592	0.0790	-0.0683	0.2322	0.0843	-0.1462	0.1404	0.0007	0.1601	0.0743	-0.1116	-0.0285	-0.2290	
Cheerful	0.2696	0.4200	0.0772	0.0592	1.0000	0.5485	-0.1771	0.4038	0.3272	0.2786	-0.1401	0.2406	0.1110	0.0246	-0.0831	-0.0291	0.0542	
Friendly	0.2153	-0.0210	0.0852	0.0790	0.5485	1.0000	0.0484	0.6469	0.6442	0.3921	0.2164	0.3057	0.1133	0.1915	0.1345	0.0992	-0.1286	
Optimistic	-0.1842	-0.0262	0.0283	-0.0683	-0.1771	0.0484	1.0000	0.3145	0.2824	0.2960	0.3365	-0.0186	0.2458	0.1533	0.2607	0.3986	-0.1853	
Warm	0.0313	0.1866	0.2689	0.2322	0.4038	0.6469	0.3145	1.0000	0.5543	0.3201	0.4235	0.3954	0.4056	-0.1088	0.1167	-0.0568	-0.0830	
Happy	0.2172	0.0290	-0.0651	0.0843	0.3272	0.6442	0.2824	0.5543	1.0000	0.3239	0.4418	0.3670	0.2310	0.2057	0.2068	-0.1113	0.2841	
Knowledgeable	0.3621	0.2011	0.1646	-0.1462	0.2786	0.3921	0.2960	0.3201	0.3239	1.0000	0.1672	0.6692	0.4675	0.2682	0.2149	0.1731	-0.1079	
Responsible	0.0039	-0.0708	0.3097	0.1404	-0.1401	0.2164	0.3365	0.4235	0.4418	0.1672	1.0000	0.1821	0.1537	0.4246	0.3802	0.0891	0.2494	
Intelligent	0.4295	0.2985	0.1231	0.0007	0.2406	0.3057	-0.0186	0.3954	0.3670	0.6692	0.1821	1.0000	0.5701	0.1217	0.1196	-0.2021	0.2026	
Sensible	0.4410	0.2677	0.2826	0.1601	0.1110	0.1133	0.2458	0.4056	0.2310	0.4675	0.1537	0.5701	1.0000	0.0557	0.1705	0.1597	0.0741	
Loyal	0.0742	-0.0914	0.3971	0.0743	0.0246	0.1915	0.1533	-0.1088	0.2057	0.2682	0.4246	0.1217	0.0557	1.0000	0.5614	0.6317	-0.0937	
Honest	-0.0893	-0.1001	0.2598	-0.1116	-0.0831	0.1345	0.2607	0.1167	0.2068	0.2149	0.3802	0.1196	0.1705	0.5614	1.0000	0.5045	-0.0393	
Cooperative	-0.1144	-0.1112	0.3073	-0.0285	-0.0291	0.0992	0.3986	-0.0568	-0.1113	0.1731	0.0891	-0.2021	0.1597	0.6317	0.5045	1.0000	-0.4542	
Attentive	0.2641	0.2301	-0.0731	-0.2290	0.0542	-0.1286	-0.1853	-0.0830	0.2841	-0.1079	0.2494	0.2026	0.0741	-0.0937	-0.0393	-0.4542	1.0000	
You_like_the_robot	0.1805	0.3827	0.6648	0.6284	0.2797	0.1574	-0.1524	0.3476	0.1502	0.0218	0.3416	0.1450	0.1337	0.2329	0.2147	-0.0502	0.0466	
Robot_likes_you	0.0775	-0.0711	0.2309	0.1777	0.0793	0.3008	-0.0570	0.2171	0.3975	0.0194	-0.0111	0.0404	0.1723	0.0278	0.1536	-0.0032	-0.0033	

Scatterplot Matrix



FactorAnalysis_Data - Multivariate - JMP Pro

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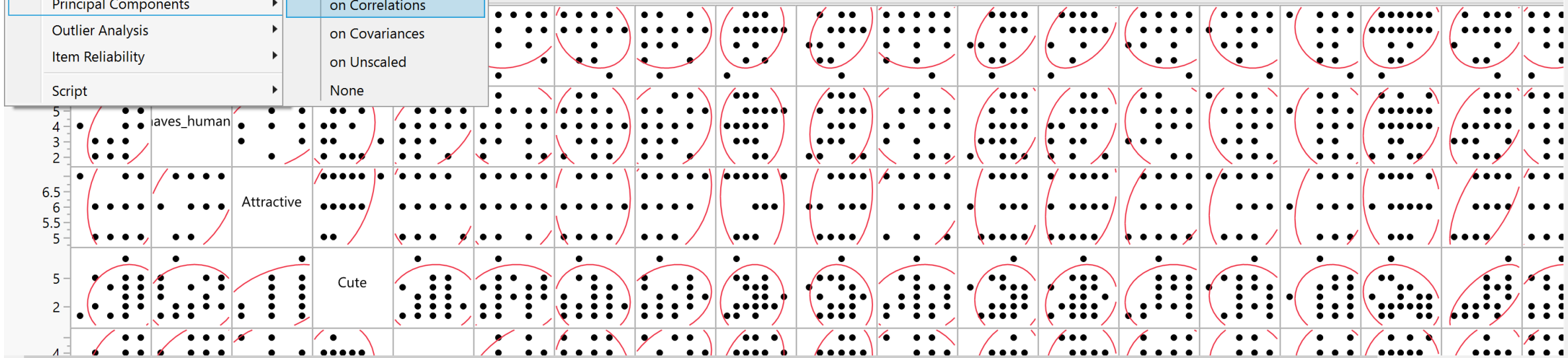
Multivariate

- ✓ Correlations Multivariate
- Correlation Probability
- CI of Correlation
- Inverse Correlations
- Partial Correlations
- Covariance Matrix
- Pairwise Correlations
- Hotelling's T^2 Test
- Simple Statistics ▸
- Nonparametric Correlations ▸
- Set α Level ▸
- ✓ Scatterplot Matrix
- Color Maps ▸
- Parallel Coord Plot
- Ellipsoid 3D Plot
- Principal Components ▸
  - on Correlations
  - on Covariances
  - on Unscaled
  - None
- Outlier Analysis ▸
- Item Reliability ▸
- Script ▸

ehaves_humanlike	Attractive	Cute	Cheerful	Friendly	Optimistic	Warm	Happy	Knowledgeable	Responsible	Intelligent	Sensible	Loyal	Honest	Cooperative	Attentive	You_li
0.4460	0.1580	0.1272	0.2696	0.2153	-0.1842	0.0313	0.2172	0.3621	0.0039	0.4295	0.4410	0.0742	-0.0893	-0.1144	0.2641	
1.0000	0.4119	0.0645	0.4200	-0.0210	-0.0262	0.1866	0.0290	0.2011	-0.0708	0.2985	0.2677	-0.0914	-0.1001	-0.1112	0.2301	
0.4119	1.0000	0.4531	0.0772	0.0852	0.0283	0.2689	-0.0651	0.1646	0.3097	0.1231	0.2826	0.3971	0.2598	0.3073	-0.0731	
0.0645	0.4531	1.0000	0.0592	0.0790	-0.0683	0.2322	0.0843	-0.1462	0.1404	0.0007	0.1601	0.0743	-0.1116	-0.0285	-0.2290	
0.4200	0.0772	0.0592	1.0000	0.5485	-0.1771	0.4038	0.3272	0.2786	-0.1401	0.2406	0.1110	0.0246	-0.0831	-0.0291	0.0542	
-0.0210	0.0852	0.0790	0.5485	1.0000	0.0484	0.6469	0.6442	0.3921	0.2164	0.3057	0.1133	0.1915	0.1345	0.0992	-0.1286	
-0.0262	0.0283	-0.0683	-0.1771	0.0484	1.0000	0.3145	0.2824	0.2960	0.3365	-0.0186	0.2458	0.1533	0.2607	0.3986	-0.1853	
0.1866	0.2689	0.2322	0.4038	0.6469	0.3145	1.0000	0.5543	0.3201	0.4235	0.3954	0.4056	-0.1088	0.1167	-0.0568	-0.0830	
0.0290	-0.0651	0.0843	0.3272	0.6442	0.2824	0.5543	1.0000	0.3239	0.4418	0.3670	0.2310	0.2057	0.2068	-0.1113	0.2841	
0.2011	0.1646	-0.1462	0.2786	0.3921	0.2960	0.3201	0.3239	1.0000	0.1672	0.6692	0.4675	0.2682	0.2149	0.1731	-0.1079	
-0.0708	0.3097	0.1404	-0.1401	0.2164	0.3365	0.4235	0.4418	0.1672	1.0000	0.1821	0.1537	0.4246	0.3802	0.0891	0.2494	
0.2985	0.1231	0.0007	0.2406	0.3057	-0.0186	0.3954	0.3670	0.6692	0.1821	1.0000	0.5701	0.1217	0.1196	-0.2021	0.2026	
0.2677	0.2826	0.1601	0.1110	0.1133	0.2458	0.4056	0.2310	0.4675	0.1537	0.5701	1.0000	0.0557	0.1705	0.1597	0.0741	
-0.0914	0.3971	0.0743	0.0246	0.1915	0.1533	-0.1088	0.2057	0.2682	0.4246	0.1217	0.0557	1.0000	0.5614	0.6317	-0.0937	
-0.1001	0.2598	-0.1116	-0.0831	0.1345	0.2607	0.1167	0.2068	0.2149	0.3802	0.1196	0.1705	0.5614	1.0000	0.5045	-0.0393	
-0.1112	0.3073	-0.0285	-0.0291	0.0992	0.3986	-0.0568	-0.1113	0.1731	0.0891	-0.2021	0.1597	0.6317	0.5045	1.0000	-0.4542	
0.2301	-0.0731	-0.2290	0.0542	-0.1286	-0.1853	-0.0830	0.2841	-0.1079	0.2494	0.2026	0.0741	-0.0937	-0.0393	-0.4542	1.0000	
0.3827	0.6648	0.6284	0.2797	0.1574	-0.1524	0.3476	0.1502	0.0218	0.3416	0.1450	0.1337	0.2329	0.2147	-0.0502	0.0466	
-0.0711	0.2309	0.1777	0.0793	0.3008	-0.0570	0.2171	0.3975	0.0194	-0.0111	0.0404	0.1723	0.0278	0.1536	-0.0032	-0.0033	

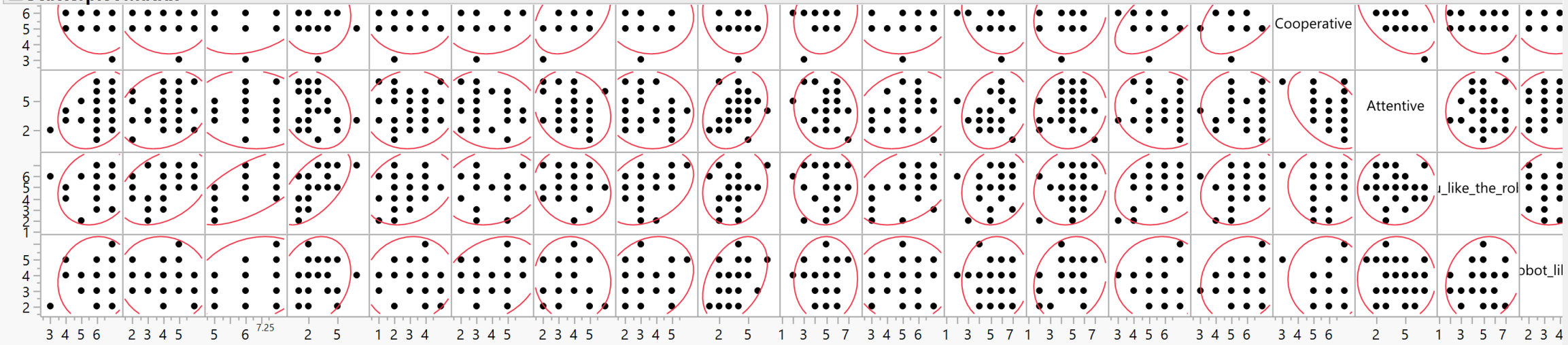


FactorAnalysis_Data - Multivariate - JMP Pro

File Edit Tables Rows Cols DOE Analyze Graph Tools View Window Help

Multivariate

Scatterplot Matrix



Principal Components / Factor Analysis

Principal Components: on Correlations

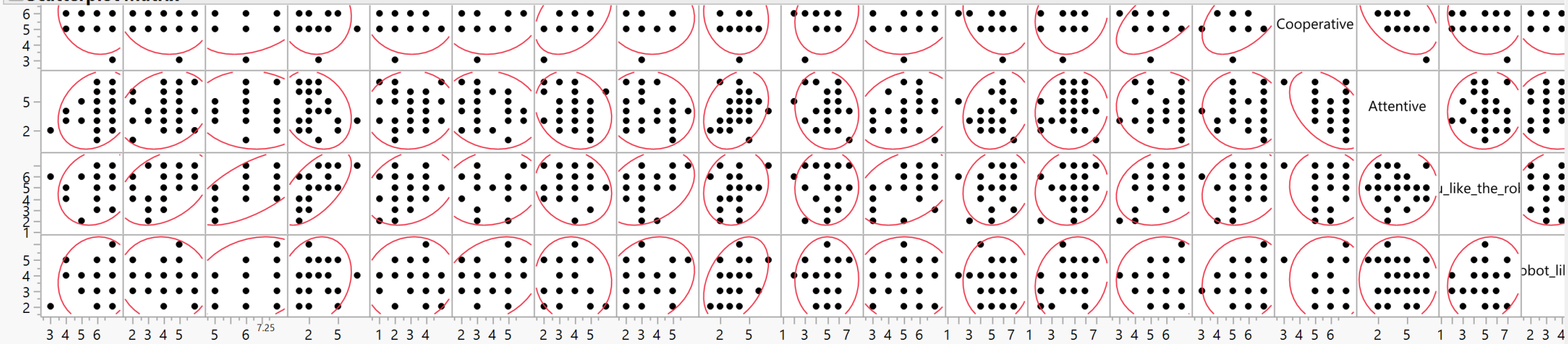
Number	Eigenvalue	Percent	20 40 60 80	Cum Percent
1	4.4955	23.661		23.661
2	2.7706	14.582		38.243
3	2.1935	11.545		49.787
4	1.7949	9.447		59.234
5	1.5651	8.237		67.471
6	1.3008	6.846		74.318
7	1.0883	5.728		80.045
8	0.8770	4.616		84.661
9	0.7200	3.789		88.451
10	0.5062	2.664		91.115
11	0.4467	2.351		93.466
12	0.3839	2.021		95.487
13	0.2562	1.349		96.835
14	0.1852	0.975		97.810
15	0.1238	0.652		98.462
16	0.1150	0.605		99.067
17	0.0919	0.484		99.550
18	0.0596	0.314		99.864
19	0.0258	0.136		100.000

FactorAnalysis_Data - Multivariate - JMP Pro

File Edit Tables Rows Cols DOE Analyze Graph Tools View Window Help

Multivariate

Scatterplot Matrix



Principal Components / Factor Analysis

- Eigenvectors
- Bartlett Test
- Scree Plot
- Loading Plot
- Score Plot
- 3D Score Plot
- Factor Rotation
- Save Principal Components
- Save Principal Components with Imputation

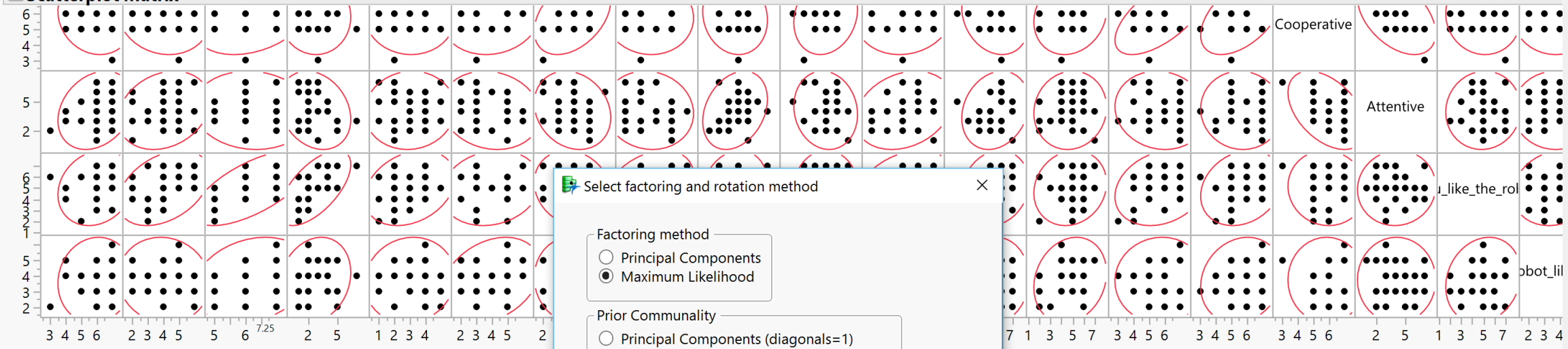
			Cum Percent
			23.661
			38.243
			49.787
			59.234
			67.471
			74.318
			80.045
			84.661
			88.451
			91.115
			93.466
			95.487
13	0.2362	1.549	96.835
14	0.1852	0.975	97.810
15	0.1238	0.652	98.462
16	0.1150	0.605	99.067
17	0.0919	0.484	99.550
18	0.0596	0.314	99.864
19	0.0258	0.136	100.000

FactorAnalysis_Data - Multivariate - JMP Pro

File Edit Tables Rows Cols DOE Analyze Graph Tools View Window Help

Multivariate

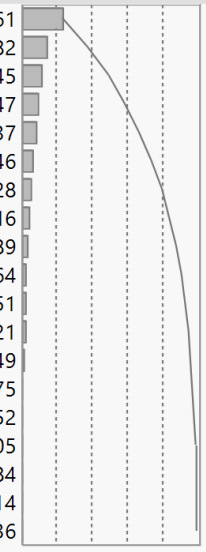
Scatterplot Matrix



Principal Components / Factor Analysis

Principal Components: on Correlations

Number	Eigenvalue	Percent	20 40 60 80	Cum Percent
1	4.4955	23.661		23.661
2	2.7706	14.582		38.243
3	2.1935	11.545		49.787
4	1.7949	9.447		59.234
5	1.5651	8.237		67.471
6	1.3008	6.846		74.318
7	1.0883	5.728		80.045
8	0.8770	4.616		84.661
9	0.7200	3.789		88.451
10	0.5062	2.664		91.115
11	0.4467	2.351		93.466
12	0.3839	2.021		95.487
13	0.2562	1.349		96.835
14	0.1852	0.975		97.810
15	0.1238	0.652		98.462
16	0.1150	0.605		99.067
17	0.0919	0.484		99.550
18	0.0596	0.314		99.864
19	0.0258	0.136		100.000



Select factoring and rotation method

Factoring method
- ○ Principal Components
- ◉ Maximum Likelihood

Prior Communality
- ○ Principal Components (diagonals=1)
- ◉ Common Factor Analysis (diagonals=SMC)

Number of factors: 7

Rotation method: Varimax

Note: Varimax recommended for orthogonal rotations and Quartimin recommended for oblique rotations.

OK Cancel

FactorAnalysis_Data - Multivariate - JMP Pro

File Edit Tables Rows Cols DOE Analyze Graph Tools View Window Help

Multivariate

Principal Components / Factor Analysis

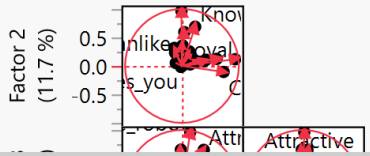
Factor Analysis: Maximum Likelihood / Varimax

- Prior Communality Estimates:SMC
- Eigenvalues of the Reduced Correlation Matrix
- Unrotated Factor Loading
- Rotation Matrix
- Final Communality Estimates
- Std Score Coefs
- Variance Explained by Each Factor
- Significance Test

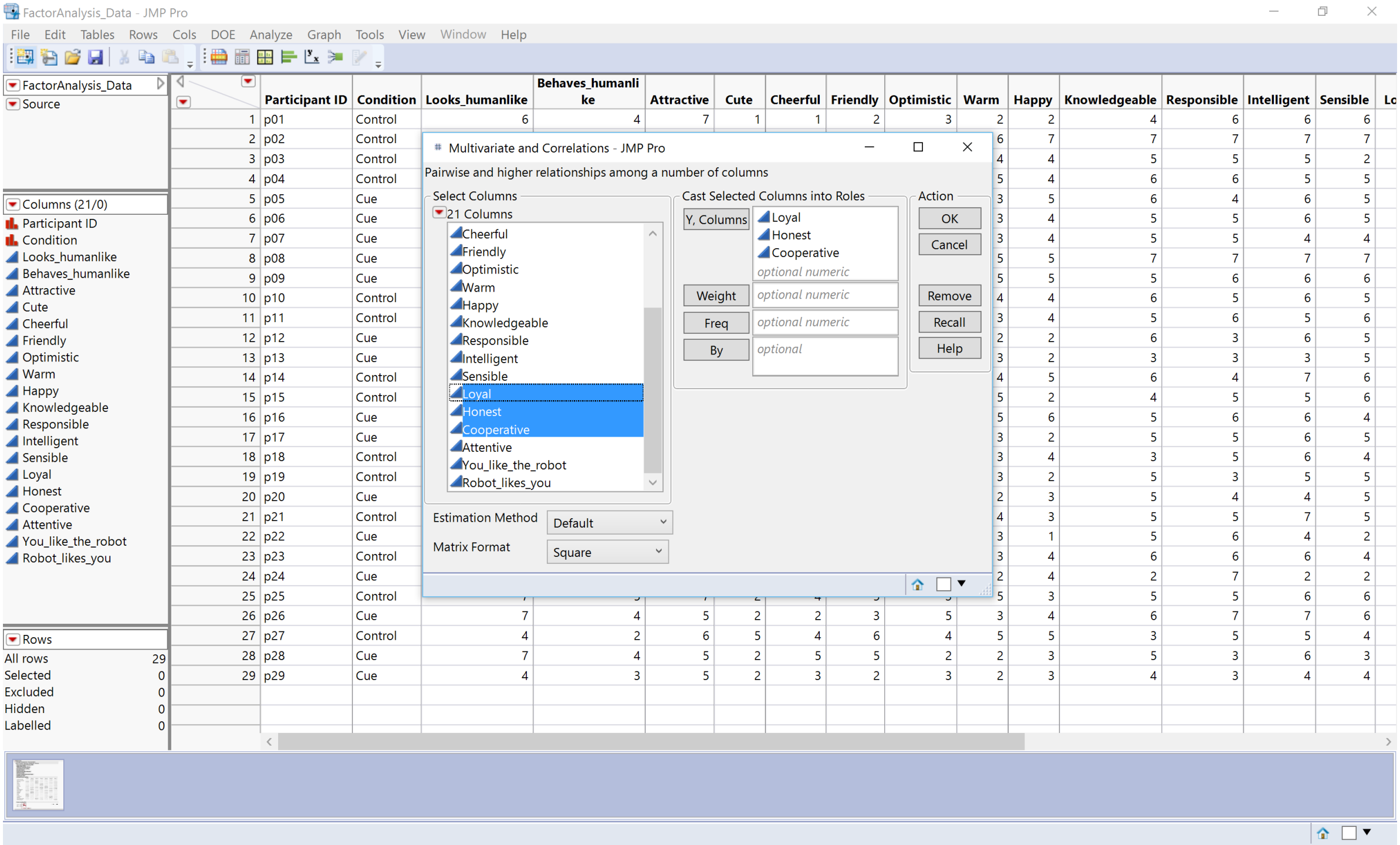
Rotated Factor Loading

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Looks_humanlike	0.010674	0.359939	0.098120	0.110862	-0.332713	0.183882	0.140240
Behaves_humanlike	-0.120750	0.230842	0.381937	0.068349	-0.076857	0.188789	-0.082207
Attractive	0.382846	0.081359	0.650131	0.111751	0.101652	-0.026334	-0.207640
Cute	-0.018463	-0.016920	0.653011	-0.006188	0.014808	-0.203228	0.241820
Cheerful	-0.047822	0.114420	0.167549	0.623800	-0.177910	0.021843	0.146504
Friendly	0.147385	0.191543	-0.021919	0.833128	0.046418	-0.087476	0.357553
Optimistic	0.245095	0.079068	-0.140161	-0.130419	0.690762	-0.142745	0.191209
Warm	-0.133631	0.316016	0.296281	0.637145	0.605129	-0.002040	0.149466
Happy	0.128568	0.255211	-0.049345	0.376992	0.247177	0.326610	0.778462
Knowledgeable	0.232590	0.687943	-0.056190	0.188241	0.026009	-0.114623	0.097184
Responsible	0.421742	0.108124	0.239000	0.117088	0.472510	0.404057	0.101318
Intelligent	-0.008967	0.966303	0.072810	0.157573	-0.061448	0.177167	0.029662
Sensible	-0.042521	0.593710	0.131118	0.017009	0.287994	0.013213	-0.001798
Loyal	0.935237	0.117794	0.077008	0.003887	-0.102574	0.003213	0.105430
Honest	0.609623	0.122739	0.128200	-0.002628	0.189733	0.042415	0.056037
Cooperative	0.732497	-0.105724	-0.083577	0.011265	0.180708	-0.419829	-0.121306
Attentive	-0.108391	0.052128	-0.048140	-0.069568	-0.102081	0.890517	0.055162
You_like_the_robot	0.145190	0.025888	0.961531	0.146453	-0.061548	0.117383	0.120743
Robot_likes_you	0.004643	-0.000507	0.088701	0.173186	0.027398	-0.022677	0.432633

Factor Loading Plot



Label variables


FactorAnalysis_Data - JMP Pro
File Edit Tables Rows Cols DOE Analyze Graph Tools View Window Help
FactorAnalysis_Data
Source
Columns (21/0)
Participant ID
Condition
Looks_humanlike
Behaves_humanlike
Attractive
Cute
Cheerful
Friendly
Optimistic
Warm
Happy
Knowledgeable
Responsible
Intelligent
Sensible
Loyal
Honest
Cooperative
Attentive
You_like_the_robot
Robot_likes_you
Rows
All rows 29
Selected 0
Excluded 0
Hidden 0
Labelled 0
Participant ID Condition Looks_humanlike Behaves_humanlike Attractive Cute Cheerful Friendly Optimistic Warm Happy Knowledgeable Responsible Intelligent Sensible
1 p01 Control 6 4 7 1 1 2 3 2 2 4 6 6 6
2 p02 Control 6 7 7 7 7
3 p03 Control 4 4 5 5 5 2
4 p04 Control 5 4 6 6 5 5
5 p05 Cue 3 5 6 4 6 5
6 p06 Cue 3 4 5 5 6 5
7 p07 Cue 3 4 5 5 4 4
8 p08 Cue 5 5 7 7 7 7
9 p09 Cue 5 5 5 6 6 6
10 p10 Control 4 4 6 5 6 5
11 p11 Control 3 4 5 6 5 6
12 p12 Cue 2 2 6 3 6 5
13 p13 Cue 3 2 3 3 3 5
14 p14 Control 4 5 6 4 7 6
15 p15 Control 5 2 4 5 5 6
16 p16 Cue 5 6 5 6 6 4
17 p17 Cue 3 2 5 5 6 5
18 p18 Control 3 4 3 5 6 4
19 p19 Control 3 2 5 3 5 5
20 p20 Cue 2 3 5 4 4 5
21 p21 Control 4 3 5 5 7 5
22 p22 Cue 3 1 5 6 4 2
23 p23 Control 3 4 6 6 6 4
24 p24 Cue 2 4 2 7 2 2
25 p25 Control 5 3 5 5 6 6
26 p26 Cue 7 4 5 2 2 3 5 3 4 6 7 7 6
27 p27 Control 4 2 6 5 4 6 4 5 5 3 5 5 4
28 p28 Cue 7 4 5 2 5 5 2 2 3 5 3 6 3
29 p29 Cue 4 3 5 2 3 2 3 2 3 4 3 4 4
Multivariate and Correlations - JMP Pro
Pairwise and higher relationships among a number of columns
Select Columns
21 Columns
Cheerful
Friendly
Optimistic
Warm
Happy
Knowledgeable
Responsible
Intelligent
Sensible
Loyal
Honest
Cooperative
Attentive
You_like_the_robot
Robot_likes_you
Cast Selected Columns into Roles
Y, Columns
Loyal
Honest
Cooperative
optional numeric
Weight
optional numeric
Freq
optional numeric
By
optional
Action
OK
Cancel
Remove
Recall
Help
Estimation Method
Default
Matrix Format
Square

FactorAnalysis_Data - Multivariate 2 - JMP Pro

File Edit Tables Rows Cols DOE Analyze Graph Tools View Window Help

Multivariate

Correlations Multivariate
Correlation Probability
CI of Correlation
Inverse Correlations
Partial Correlations
Covariance Matrix
Pairwise Correlations
Hotelling's T² Test
Simple Statistics
Nonparametric Correlations
Set α Level
Scatterplot Matrix
Color Maps
Parallel Coord Plot
Ellipsoid 3D Plot
Principal Components
Outlier Analysis
Item Reliability
Script

Cronbach's α
Standardized α

	Honest	Cooperative
	0.5614	0.6317
	1.0000	0.5045
	0.5045	1.0000

Honest
Cooperative

Source
Rows
All rows
Selected
Excluded
Hidden
Labelled

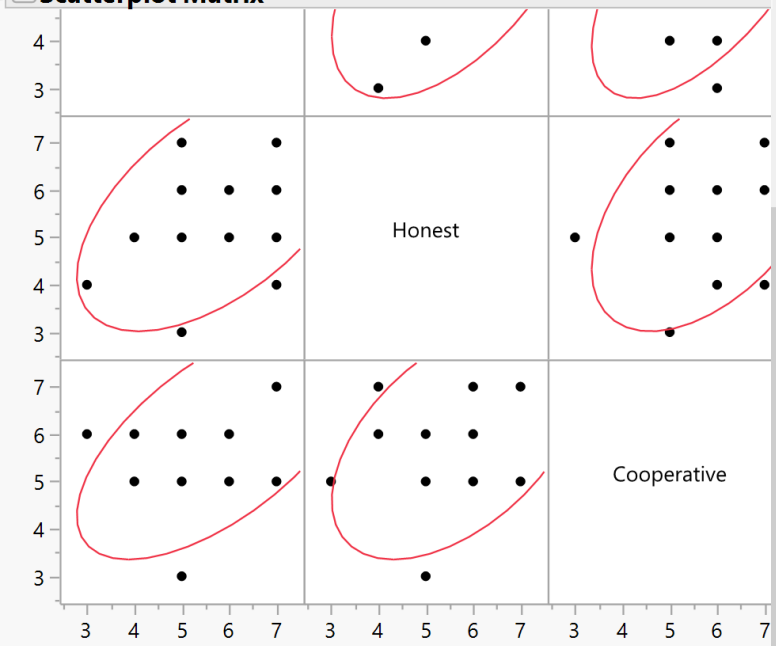
es_humanlike	Attractive	Cute	Cheerful	Friendly	Optimistic	Warm	Happy	Knowledgeable	Responsible	Intelligent	Sensible	Lo
4	7	1	1	2	3	2	2	4	6	6	6	
5	7	3	4	6	5	6	7	7	7	7	7	
3	5	1	1	5	4	4	4	5	5	5	2	
4	7	4	4	6	4	5	4	6	6	5	5	
5	6	3	3	4	4	3	5	6	4	6	5	
5	6	2	4	5	3	3	4	5	5	6	5	
5	7	2	4	5	4	3	4	5	5	4	4	
2	6	3	2	5	5	5	5	7	7	7	7	
4	7	4	3	5	5	5	5	5	6	6	6	
6	6	2	5	3	4	4	4	6	5	6	5	
4	6	2	2	3	6	3	4	5	6	5	6	
4	7	2	2	2	4	2	2	6	3	6	5	
3	5	1	2	3	4	3	2	3	3	3	5	
4	6	2	3	5	4	4	5	6	4	7	6	
6	7	5	4	3	3	5	2	4	5	5	6	
5	6	2	5	5	5	5	6	5	6	6	4	
3	7	7	2	3	3	3	2	5	5	6	5	
5	6	3	2	3	2	3	4	3	5	6	4	
3	5	1	3	3	5	3	2	5	3	5	5	
5	7	5	3	4	4	2	3	5	4	4	5	
6	7	4	3	3	4	4	3	5	5	7	5	
4	7	1	2	3	5	3	1	5	6	4	2	
2	6	1	4	5	2	3	4	6	6	6	4	
2	6	4	1	2	4	2	4	2	7	2	2	
5	7	2	4	5	3	5	3	5	5	6	6	
4	5	2	2	3	5	3	4	6	7	7	6	
2	6	5	4	6	4	5	5	3	5	5	4	
4	5	2	5	5	2	2	3	5	3	6	3	
3	5	2	3	2	3	2	3	4	3	4	4	

FactorAnalysis_Data - Multivariate 2 - JMP Pro

File Edit Tables Rows Cols DOE Analyze Graph Tools View Window Help

Multivariate

Scatterplot Matrix



Cronbach's α

	α	-.8 -.6 -.4 -.2 0 .2 .4 .6 .8
Entire set	0.7949	

Excluded Col	α	-.8 -.6 -.4 -.2 0 .2 .4 .6 .8
Loyal	0.6701	
Honest	0.7676	
Cooperative	0.7158	

Cronbach's alpha	Internal Consistency
α ≥ .9	Excellent
.9 > α ≥ .8	Good
.8 > α ≥ .7	Acceptable
.7 > α ≥ .6	Questionable
.6 > α ≥ .5	Poor
.5 > α	Unacceptable

FactorAnalysis_Data - JMP Pro

File Edit Tables Rows Cols DOE Analyze Graph Tools View Window Help

- New Columns...
- Column Selection
- Reorder Columns
- Column Info...
- Standardize Attributes...
- Preselect Role
- Formula...
- Label/Unlabel
- Scroll Lock/Unlock
- Hide/Unhide
- Exclude/Unexclude
- Use for Marker
- Recode...
- Columns Viewer
- Utilities
- Group Columns
- Ungroup Columns
- Delete Columns

	Participant ID	Condition	Looks_humanlike	Behaves_humanlike	Attractive	Cute	Cheerful	Friendly	Optimistic	Warm	Happy	Knowledgeable	Responsible	Intelligent	Sensible	Loyal
1	p01	Control	6	4	7	1	1	2	3	2	2	4	6	6	6	
2	p02	Control	6	5	7	3	4	6	5	6	7	7	7	7	7	
3	p03	Control	5	3	5	1	1	5	4	4	4	5	5	5	2	
4	p04	Control	7	4	7	4	4	6	4	5	4	6	6	5	5	
5	p05	Cue	7											6	5	
6	p06	Cue	6											6	5	
7	p07	Cue	7											4	4	
8	p08	Cue	6											7	7	
9	p09	Cue	6											6	6	
10	p10	Control	6											6	5	
11	p11	Control	6											5	6	
12	p12	Cue	6											6	5	
13	p13	Cue	5											3	5	
14	p14	Control	6											7	6	
15	p15	Control	6											5	6	
16	p16	Cue	6											6	4	
17	p17	Cue	6											6	5	
18	p18	Control	7											6	4	
19	p19	Control	6											5	5	
20	p20	Cue	7											4	5	
21	p21	Control	6											7	5	
22	p22	Cue	3											4	2	
23	p23	Control	6											6	4	
24	p24	Cue	5											2	2	
25	p25	Control	7											6	6	
26	p26	Cue	7											7	6	
27	p27	Control	4											5	4	
28	p28	Cue	7											6	3	
29	p29	Cue	4											4	4	

Cooperative
Attentive
You_like_the_robot
Robot_likes_you

Rows
All rows 29
Selected 0
Excluded 0
Hidden 0
Labelled 0

New Column - JMP Pro

Add columns to 'FactorAnalysis_Data'

Column Name: Cooperativeness

Lock

Data Type: Numeric

Modeling Type: Continuous

Format: Best Width 12

Use thousands separator (,)

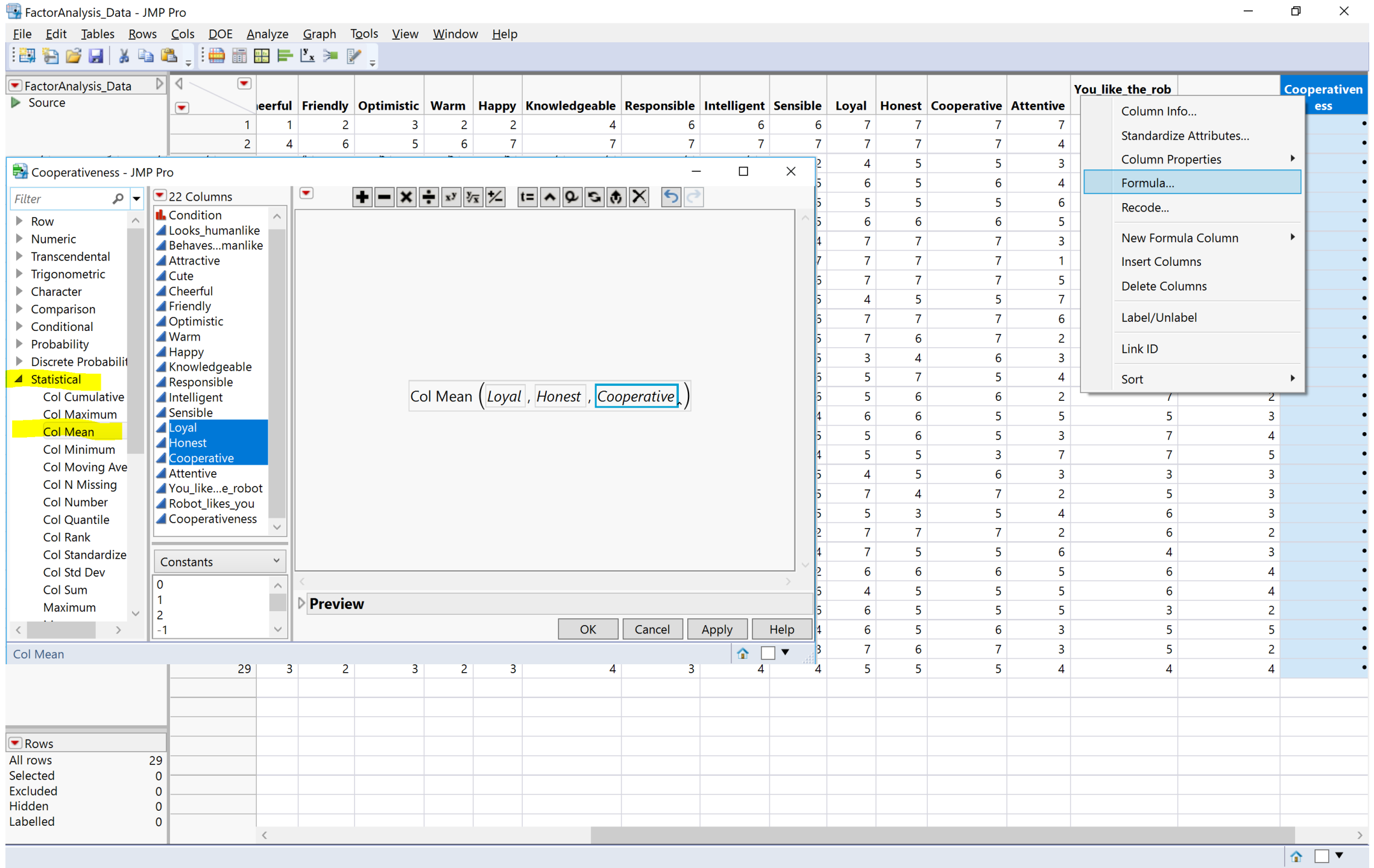
Initialize Data: Missing/Empty

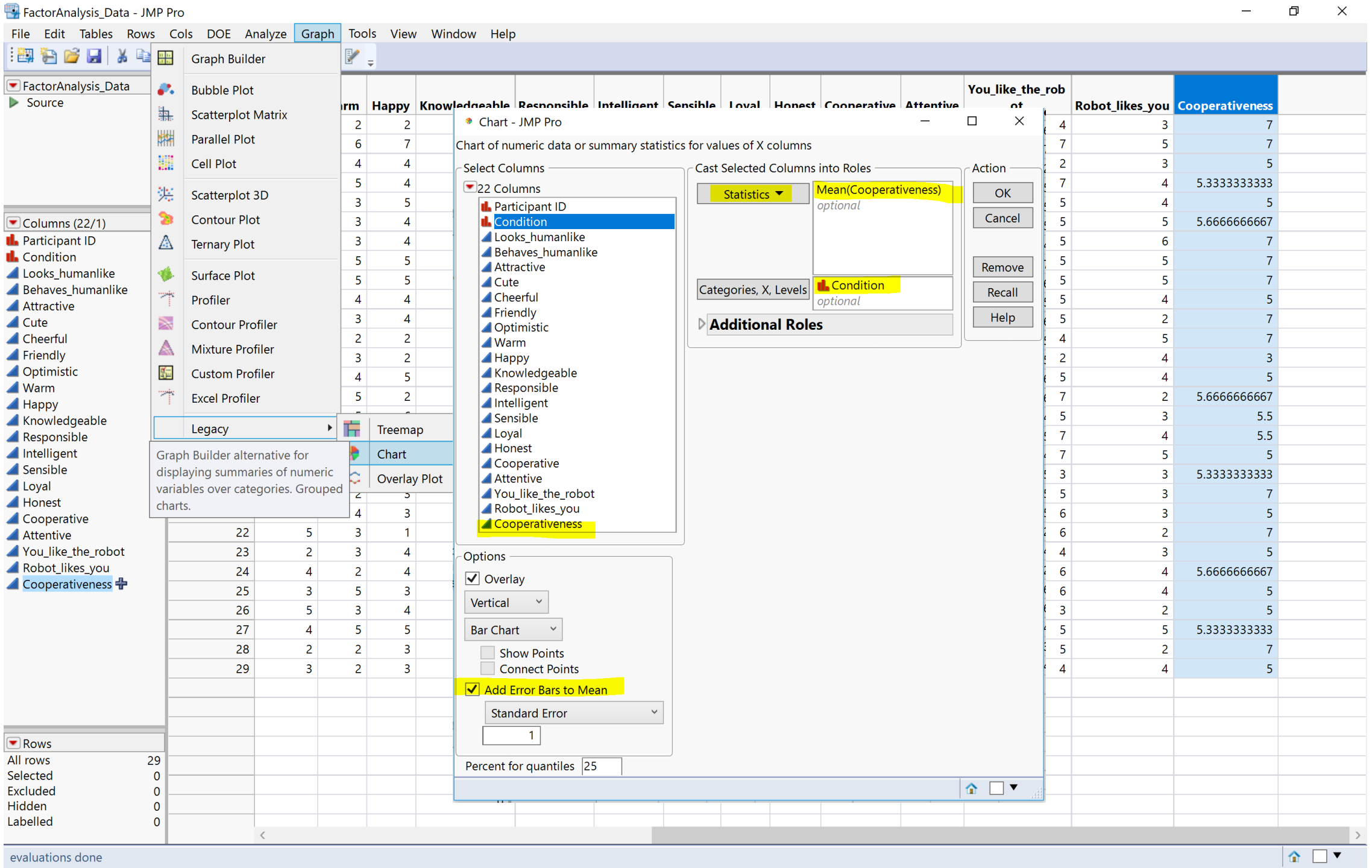
Number of columns to add: 1

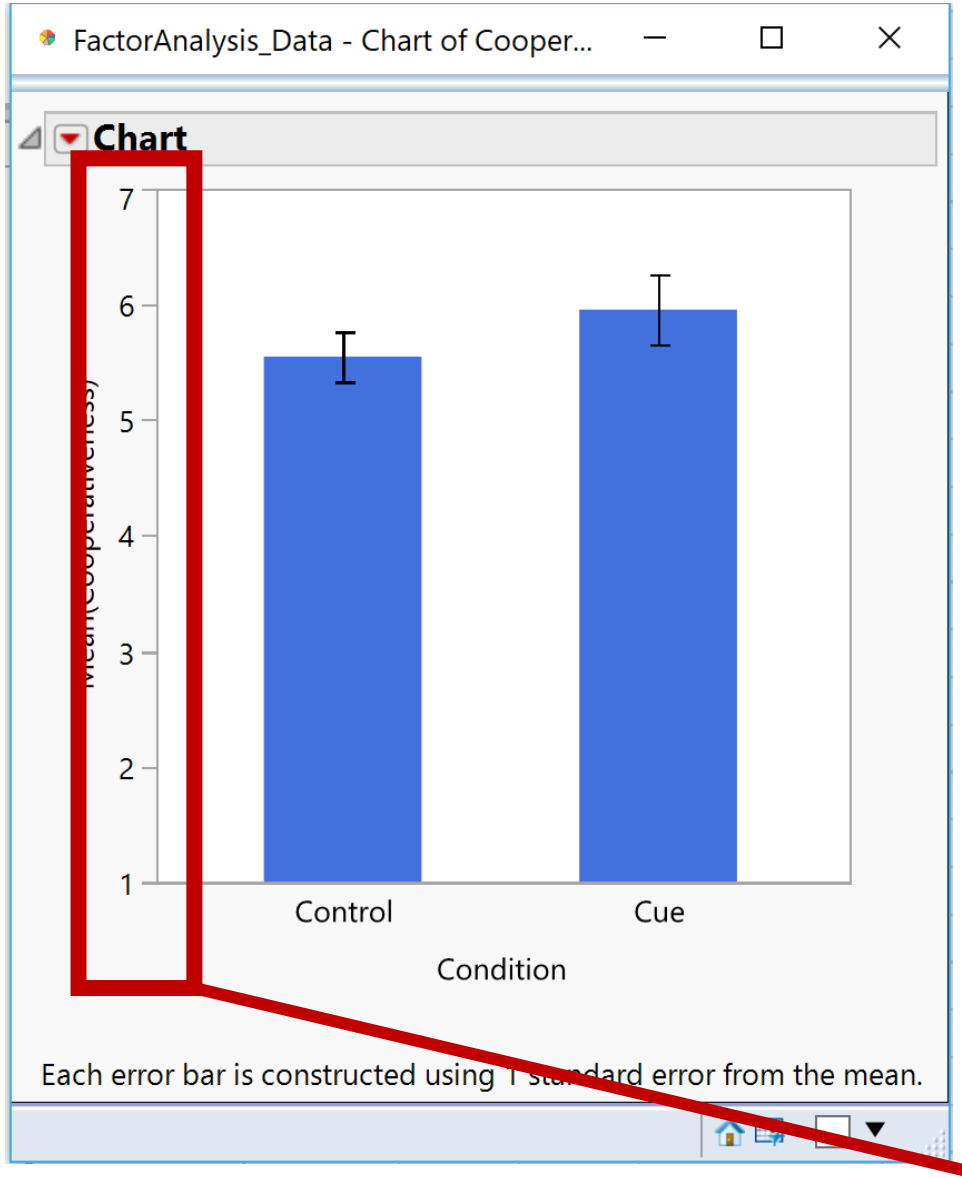
After last column

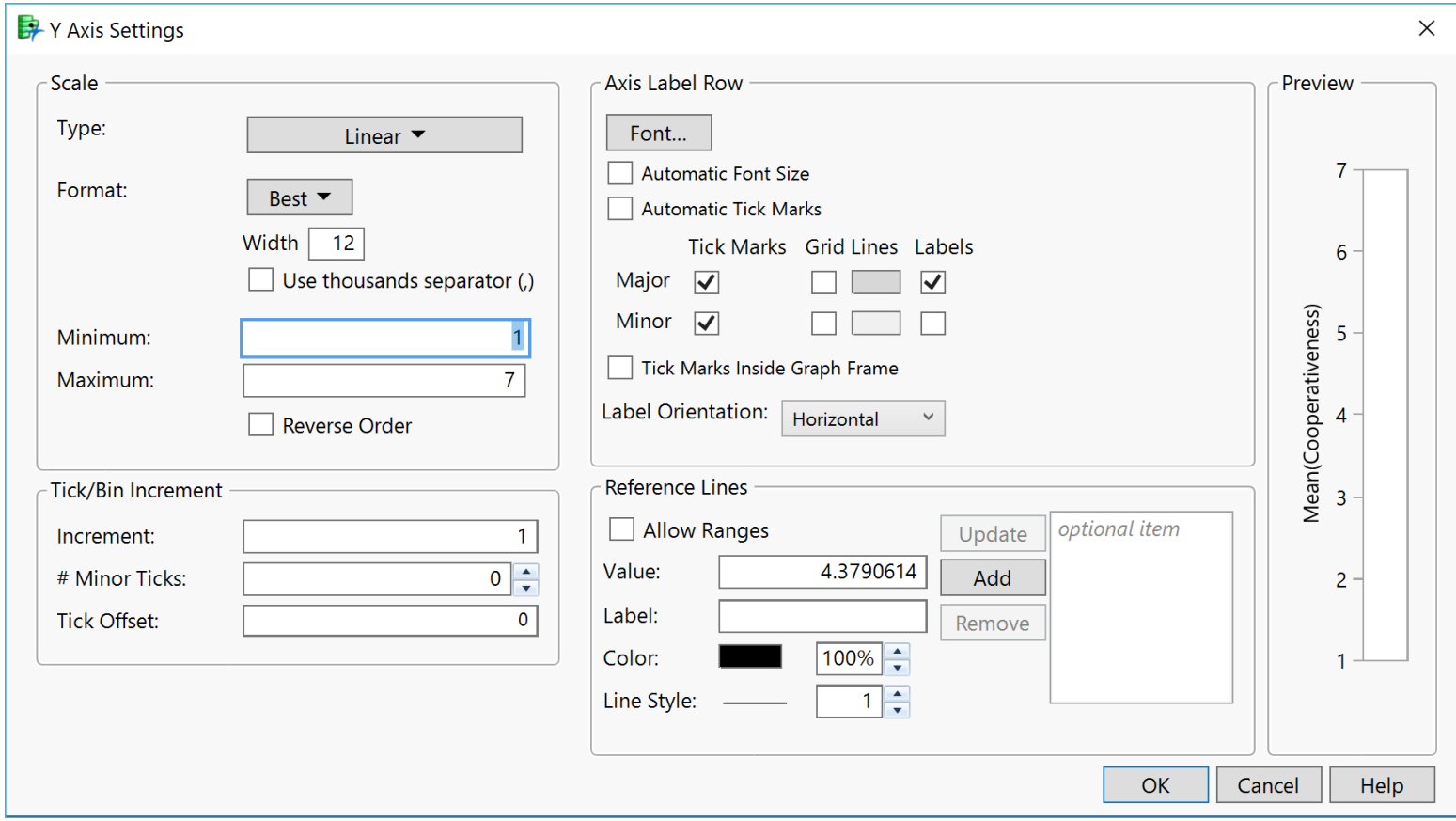
Column Properties

OK
Cancel
Apply
Next
Help

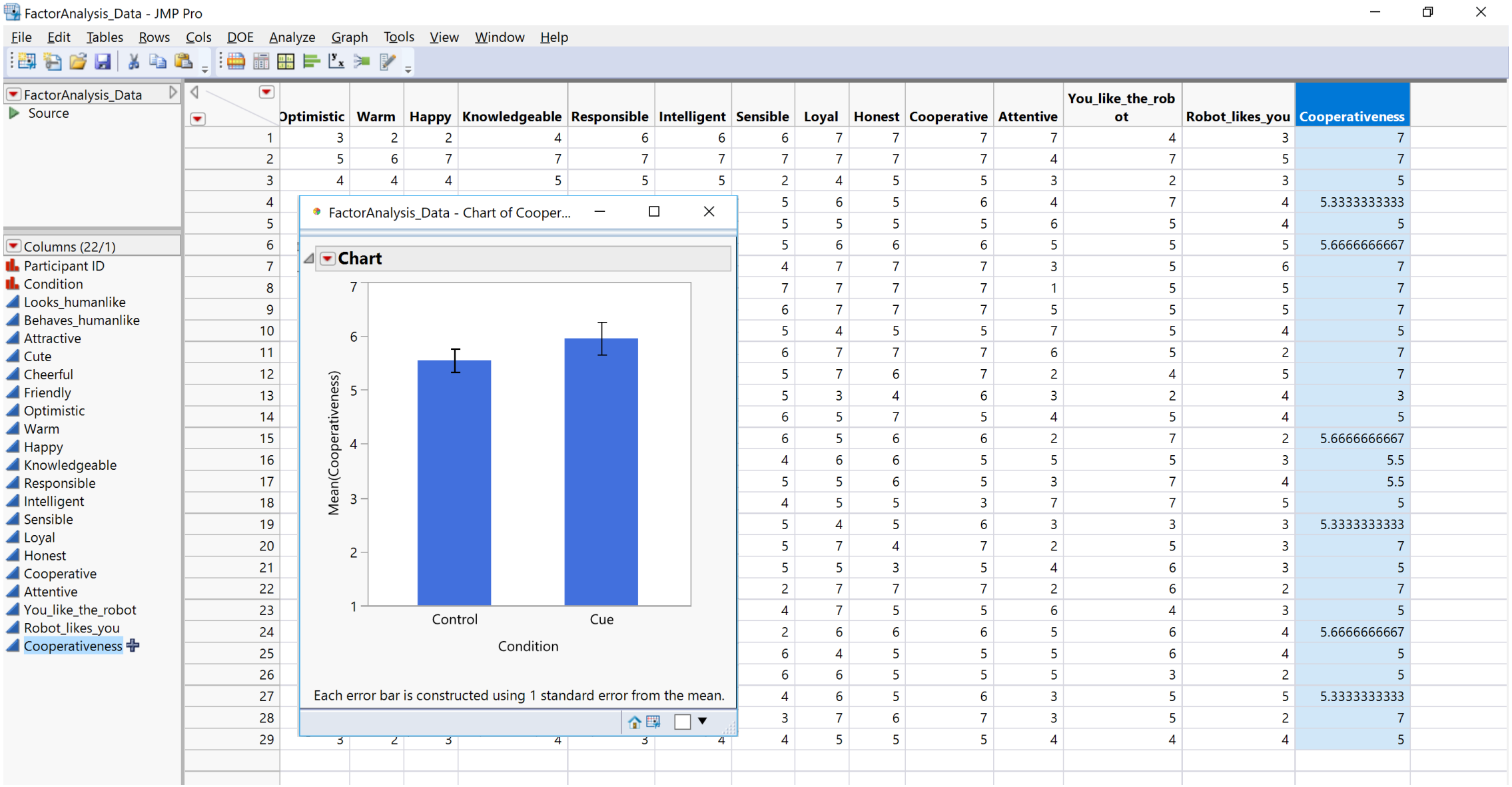

FactorAnalysis_Data - JMP Pro
File Edit Tables Rows Cols DOE Analyze Graph Tools View Window Help
FactorAnalysis_Data
Source
Column Info...
Standardize Attributes...
Column Properties
Formula...
Recode...
New Formula Column
Insert Columns
Delete Columns
Label/Unlabel
Link ID
Sort
Cooperativeness - JMP Pro
Filter
Row
Numeric
Transcendental
Trigonometric
Character
Comparison
Conditional
Probability
Discrete Probabilit
Statistical
Col Cumulative
Col Maximum
Col Mean
Col Minimum
Col Moving Ave
Col N Missing
Col Number
Col Quantile
Col Rank
Col Standardize
Col Std Dev
Col Sum
Maximum
22 Columns
Condition
Looks_humanlike
Behaves...manlike
Attractive
Cute
Cheerful
Friendly
Optimistic
Warm
Happy
Knowledgeable
Responsible
Intelligent
Sensible
Loyal
Honest
Cooperative
Attentive
You_like...e_robot
Robot_likes_you
Cooperativeness
Constants
0
1
2
-1
Col Mean (Loyal , Honest , Cooperative)
Preview
OK
Cancel
Apply
Help
Col Mean
Rows
All rows 29
Selected 0
Excluded 0
Hidden 0
Labelled 0


FactorAnalysis_Data - JMP Pro
File Edit Tables Rows Cols DOE Analyze Graph Tools View Window Help
Graph Builder
Bubble Plot
Scatterplot Matrix
Parallel Plot
Cell Plot
Scatterplot 3D
Contour Plot
Ternary Plot
Surface Plot
Profiler
Contour Profiler
Mixture Profiler
Custom Profiler
Excel Profiler
Legacy
Treemap
Chart
Overlay Plot
Graph Builder alternative for displaying summaries of numeric variables over categories. Grouped charts.
FactorAnalysis_Data
Source
Columns (22/1)
Participant ID
Condition
Looks_humanlike
Behaves_humanlike
Attractive
Cute
Cheerful
Friendly
Optimistic
Warm
Happy
Knowledgeable
Responsible
Intelligent
Sensible
Loyal
Honest
Cooperative
Attentive
You_like_the_robot
Robot_likes_you
Cooperativeness
Rows
All rows 29
Selected 0
Excluded 0
Hidden 0
Labelled 0
Chart - JMP Pro
Chart of numeric data or summary statistics for values of X columns
Select Columns
22 Columns
Participant ID
Condition
Looks_humanlike
Behaves_humanlike
Attractive
Cute
Cheerful
Friendly
Optimistic
Warm
Happy
Knowledgeable
Responsible
Intelligent
Sensible
Loyal
Honest
Cooperative
Attentive
You_like_the_robot
Robot_likes_you
Cooperativeness
Cast Selected Columns into Roles
Statistics
Mean(Cooperativeness)
optional
Categories, X, Levels
Condition
optional
Additional Roles
Action
OK
Cancel
Remove
Recall
Help
Options
Overlay
Vertical
Bar Chart
Show Points
Connect Points
Add Error Bars to Mean
Standard Error
1
Percent for quantiles 25
Happy
Robot_likes_you
Cooperativeness
evaluations done





May need to adjust axis, if so just double-click



Now could do inferential tests…

More on that next week!

Questions?

Next

Reading #7-8:

Will discuss on Monday 4/8

Individual Assignment 3: Scale Construction

Due Wednesday 4/10

See guidelines on Moodle

University of Colorado
Boulder

THANKS!

Professor **Dan Szafir**

Computer Science & ATLAS Institute
University of Colorado Boulder