

# Making R accessible for sceptics

Stella Bollmann

June 24, 2020

# Questions

- ① Why would applied researchers use SPSS?
- ② Why should applied researchers use R?
- ③ How can one make R accessible to the sceptics?

# About myself

## Me as a social scientist

- Diplom (MSc.) in Psychology (2011)
- PhD (Dr. phil.) in Psychological Methods (2015)

## Me as a statistician

- Master in Statistics (2016)
- Postdoc and consultant at Psychological Institute of UZH

# About myself

## Me as a social scientist

- Diplom (MSc.) in Psychology (2011)
- PhD (Dr. phil.) in Psychological Methods (2015)

## Me as a statistician

- Master in Statistics (2016)
- Postdoc and consultant at Psychological Institute of UZH

## Me as an ambassador

- Statistical consultant at PH Lucerne
- Postdoc researcher in health care science at University Lucerne
- President of the Swiss Statistical Society



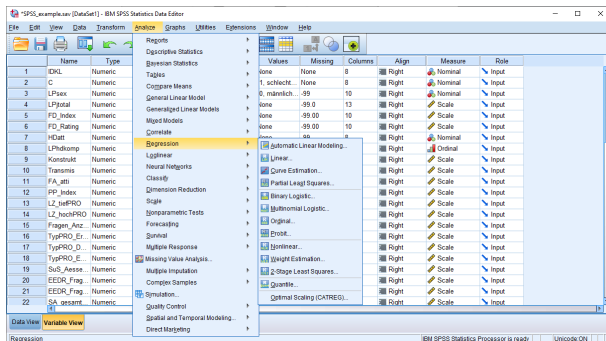
\*SPSS\_example.sav [DataSet1] - IBM SPSS Statistics Data Editor

File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help

|    | Name          | Type    | Width | Decimals | Label               | Values          | Missing | Columns | Align | Measure | Role  |
|----|---------------|---------|-------|----------|---------------------|-----------------|---------|---------|-------|---------|-------|
| 1  | IDKL          | Numeric | 8     | 0        | ID Klasse           | None            | None    | 8       | Right | Nominal | Input |
| 2  | C             | Numeric | 1     | 0        | teacher_quality     | {1, schlecht... | None    | 8       | Right | Nominal | Input |
| 3  | LPsex         | Numeric | 8     | 0        |                     | {0, männlich... | -99     | 10      | Right | Nominal | Input |
| 4  | LPtotal       | Numeric | 3     | 1        | Wie lange sind ...  | None            | -99.0   | 13      | Right | Scale   | Input |
| 5  | FD_Index      | Numeric | 8     | 2        | Fachdidaktik-W...   | None            | -99.00  | 10      | Right | Scale   | Input |
| 6  | FD_Rating     | Numeric | 8     | 2        | Score Fachdida...   | None            | -99.00  | 10      | Right | Scale   | Input |
| 7  | HDatt         | Numeric | 8     | 0        | Einstellung geg...  | None            | -99     | 8       | Right | Nominal | Input |
| 8  | LPhdkomp      | Numeric | 7     | 0        | Wie kompetent...    | {0, überhau...  | -99     | 8       | Right | Ordinal | Input |
| 9  | Konstrukt     | Numeric | 8     | 2        | Konstruktivistis... | None            | -99.00  | 11      | Right | Scale   | Input |
| 10 | Transmis      | Numeric | 8     | 2        | Transmissives ...   | None            | -99.00  | 10      | Right | Scale   | Input |
| 11 | FA_atti       | Numeric | 8     | 2        | Attitude toward...  | None            | -99.00  | 10      | Right | Scale   | Input |
| 12 | PP_Index      | Numeric | 8     | 2        | PP-Index: Vorw...   | None            | -99.00  | 10      | Right | Scale   | Input |
| 13 | LZ_tiefPRO    | Numeric | 8     | 2        | Prozentualer A...   | None            | None    | 12      | Right | Scale   | Input |
| 14 | LZ_hochPRO    | Numeric | 8     | 2        | Prozentualer A...   | None            | None    | 12      | Right | Scale   | Input |
| 15 | Fragen_Anz... | Numeric | 8     | 2        | Anzahl Intervall... | None            | None    | 15      | Right | Scale   | Input |
| 16 | TypPRO_Er...  | Numeric | 8     | 2        | Prozentualer A...   | None            | None    | 20      | Right | Scale   | Input |
| 17 | TypPRO_D...   | Numeric | 8     | 2        | Prozentualer A...   | None            | None    | 22      | Right | Scale   | Input |
| 18 | TypPRO_E...   | Numeric | 8     | 2        | Prozentualer A...   | None            | None    | 16      | Right | Scale   | Input |
| 19 | SuS_Aesse...  | Numeric | 8     | 2        | Anzahl Intervall... | None            | None    | 17      | Right | Scale   | Input |
| 20 | EEDR_Frag...  | Numeric | 8     | 0        | Anzahl Intervall... | None            | None    | 18      | Right | Scale   | Input |
| 21 | EEDR_Frag...  | Numeric | 8     | 2        | Prozentualer A...   | None            | None    | 22      | Right | Scale   | Input |
| 22 | SA_gesamt...  | Numeric | 8     | 2        | Prozentualer A...   | None            | None    | 18      | Right | Scale   | Input |

Data View Variable View

IBM SPSS Statistics Processor is ready Unicode ON





SPSS exemplar (DataSet1) - IBM SPSS Statistics Data Editor

File Edit View Data Transform Analyze Graphs Utilities

|    | Name         | Type    |
|----|--------------|---------|
| 1  | IDKL         | Numeric |
| 2  | C            | Numeric |
| 3  | LPsex        | Numeric |
| 4  | LPtotal      | Numeric |
| 5  | FD_Index     | Numeric |
| 6  | FD_Rating    | Numeric |
| 7  | HDatt        | Numeric |
| 8  | LPdiskomp    | Numeric |
| 9  | Konstrukt    | Numeric |
| 10 | Transmis     | Numeric |
| 11 | FA_atti      | Numeric |
| 12 | PP_Index     | Numeric |
| 13 | LZ_tiefPRO   | Numeric |
| 14 | LZ_hochPRO   | Numeric |
| 15 | Fragen_Anz   | Numeric |
| 16 | TypPRO_Er... | Numeric |
| 17 | TypPRO_D...  | Numeric |
| 18 | TypPRO_E...  | Numeric |
| 19 | SuS_Aesse... | Numeric |
| 20 | EEDR_Frag... | Numeric |
| 21 | EEDR_Frag... | Numeric |
| 22 | SA_gesamt    | Numeric |

Data View Variable View

Regression

Automatic Linear Modeling

Objective: Standard model

Fields Build Options Model Options

☐ Use prefigured roles  
☒ Use custom field assignments

Fields:

Sort: None

Target:

Score Fachdidaktisches Rating (Mean 1-5)

Predictors (Inputs):

- ID Klasse
- LPsex
- Wie lange sind Sie schon insgesamt als Lehrperson t...
- Fachdidakt-Wissensindex (Rechenwege 2x, Fehler ...
- Einstellung gegenüber halbschriftlicher Division (Mea...
- Wie kompetent führen Sie sich, das halbschriftliche DI...
- Konstruktivistisches Lernverständnis
- Transmissives Lernverständnis
- Attitude towards FA 1-11
- PP-Index: Vorwissen\*2 + Reaktion\*0.5 + Gründe\*0.5 + ...
- Prozentualer Anteil LZtief an Phasen\_msth

Analysis Weight:

Run Paste Reset Cancel Help



IBM SPSS Statistics Data Editor

File Edit View Data Transform Analyze Graphs Windows Help

|    | Name         | Type    |
|----|--------------|---------|
| 1  | IDKL         | Numeric |
| 2  | C            | Numeric |
| 3  | LPsex        | Numeric |
| 4  | LPtotal      | Numeric |
| 5  | FD_Index     | Numeric |
| 6  | FD_Rating    | Numeric |
| 7  | HDatt        | Numeric |
| 8  | LPdiskomp    | Numeric |
| 9  | Konstrukt    | Numeric |
| 10 | Transmis     | Numeric |
| 11 | FA_atti      | Numeric |
| 12 | PP_Index     | Numeric |
| 13 | LZ_tiefPRO   | Numeric |
| 14 | LZ_hochPRO   | Numeric |
| 15 | Fragen_Anz   | Numeric |
| 16 | TypPRO_Er... | Numeric |
| 17 | TypPRO_D...  | Numeric |
| 18 | TypPRO_E...  | Numeric |
| 19 | SuS_Aesse... | Numeric |
| 20 | EEDR_Frag    | Numeric |
| 21 | EEDR_Frag    | Numeric |
| 22 | SA_gesamt    | Numeric |

Regression

Analysis: Weight

Didaktisches Rating (Mean 1-5)

ist):

sind Sie schon insgesamt als Lehrperson t...

re-Wissensindex (Rechenwege 2x Fehler ...

Wie kompetent führen Sie sich, das halbschriftliche Di...

Konstruktivistisches Lernverständnis

Transmissives Lernverständnis

Attitude towards FA 1-11

PP-Index: Vorwissen\*2 + Reaktion\*0.5 + Gründe\*0.5 + ...

Prozentualer Anteil LZtief an Phasen\_msth

Run Paste Reset Cancel Help





Simple advantages:

- Graphical interface
- Straightforward structure of available methods
- Straightforward structure of results
- (Almost) no estimation errors

# SPSS is convenient but. . .



SPSS is rather. . .

- Expensive
- Intransparent
- Not reproducible
- Focused on getting results instead of actually analyzing data
- Promotes analyzing data without understanding the process behind it

→ Potentially promotes **bad scientific practice**

# My first contact with R as a social scientist

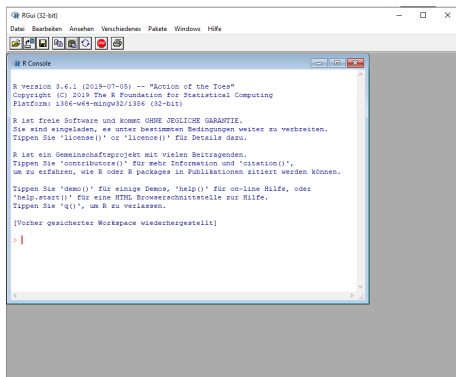


- 2009/10: As a student tutor for an R course

Problem:

- Back then, the main purpose of R was to replace SPSS
- People tried to make R resemble SPSS as closely as possible; yet, the same flaws remained
- For most users, R was just more inconvenient and less intuitive than SPSS

# My first contact with R as a social scientist

A screenshot of the R GUI (32-bit) window. The window has a menu bar with 'Datei', 'Bearbeiten', 'Ansichten', 'Verschiedenes', 'Pakete', 'Windows', and 'Hilfe'. Below the menu bar is a toolbar with icons for file operations and help. The main area is titled 'R Console' and contains the following text:

```
R version 3.6.1 (2019-07-05) -- "Action of the Toes"
Copyright (C) 2019 The R Foundation for Statistical Computing
Platform: i386-w64-mingw32/x86_64 (32-bit)

R ist freie Software und kommt OHNE JEGLICHE GARANTIE.
Sie wird eingeladen, es unter bestimmten Bedingungen weiter zu verbreiten.
Tippen Sie 'license()' or 'licence()' für Details dazu.

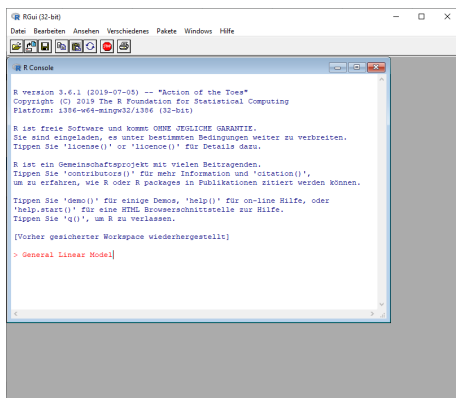
R ist ein Gemeinschaftsprojekt mit vielen Beitragenden.
Tippen Sie 'contributors()' für mehr Information und 'citation()',
um zu erfahren, wie R oder R packages in Publikationen zitiert werden können.

Tippen Sie 'demo()' für einige Demos, 'help()' für on-line Hilfe, oder
'help.start()' für eine HTML Browserschnittstelle zur Hilfe.
Tippen Sie 'q()', um R zu verlassen.

[Vorher gesicherter Workspace wiederhergestellt]

> |
```

# My first contact with R as a social scientist

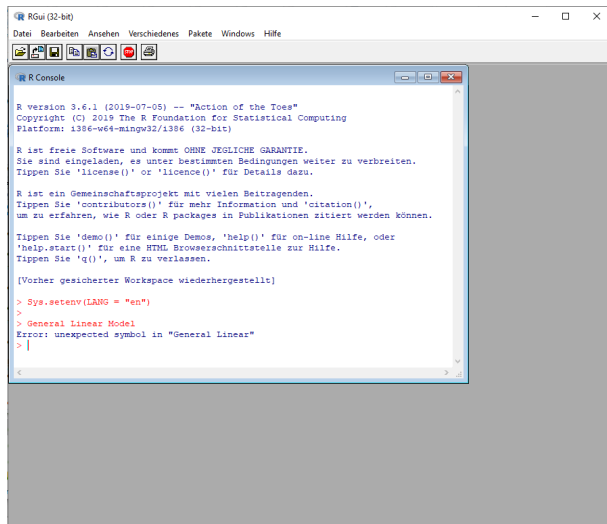
A screenshot of the RGui (32-bit) application window. The window has a menu bar with 'Datei', 'Bearbeiten', 'Ansichten', 'Verschiedenes', 'Pakete', 'Windows', and 'Hilfe'. Below the menu bar is a toolbar with icons for file operations and running code. The main area is the 'R Console', which displays the R version 3.6.1 (2019-07-05) startup message, copyright information, and instructions for using R. The console text includes: 'R version 3.6.1 (2019-07-05) -- "Action of the Toss"', 'Copyright (C) 2019 The R Foundation for Statistical Computing', 'Platform: i386-w64-mingw32/x64 (32-bit)', 'R ist freie Software und kommt OHNE JEGLICHE GARANTIE.', 'Sie sind eingeladen, es unter bestimmten Bedingungen weiter zu verbreiten.', 'Tippen Sie 'license()' or 'licence()' für Details dazu.', 'R ist ein Gemeinschaftsprojekt mit vielen Beitragenden.', 'Tippen Sie 'contributors()' für mehr Information und 'citation()', um zu erfahren, wie R oder R packages in Publikationen zitiert werden können.', 'Tippen Sie 'demo()' für einige Demos, 'help()' für on-line Hilfe, oder 'help.start()' für eine HTML Browserschnittstelle zur Hilfe.', 'Tippen Sie 'q()', um R zu verlassen.', '[Vorher gesicherter Workspace wiederhergestellt]', and the prompt '> General Linear Model|'.

# Experience with R as a statistician

- Several R courses as a statistics student (2011 – 2016)
- Discovery of the endless potential of R
  - Data simulation and shiny apps
  - Writing own functions / packages
  - Availability of source code
  - Contactable developers
  - Textmining
  - Analysis of geographical data
  - ...

# Advantages of R

Forces you to know what you are doing



```
RGui (32-bit)
Datei Bearbeiten Ansehen Verschiedenes Pakete Windows Hilfe

R Console

R version 3.6.1 (2019-07-05) -- "Action of the Toes"
Copyright (C) 2019 The R Foundation for Statistical Computing
Platform: i386-w64-mingw32/i386 (32-bit)

R ist freie Software und kommt OHNE JEGliche GARANTIE.
Sie sind eingeladen, es unter bestimmten Bedingungen weiter zu verbreiten.
Tippen Sie 'license()' or 'licence()' für Details dazu.

R ist ein Gemeinschaftsprojekt mit vielen Beitragenden.
Tippen Sie 'contributors()' für mehr Information und 'citation()',
um zu erfahren, wie R oder R packages in Publikationen zitiert werden können.

Tippen Sie 'demo()' für einige Demos, 'help()' für on-line Hilfe, oder
'help.start()' für eine HTML Browserschnittstelle zur Hilfe.
Tippen Sie 'q()', um R zu verlassen.

[Vorher gesicherter Workspace wiederhergestellt]

> Sys.setenv(LANG = "en")
>
> General Linear Model
Error: unexpected symbol in "General Linear"
> |
```

# Advantages of R

## Open Source

```
library(multilevel)
```

```
## Warning: package 'multilevel' was built under R version 4.0.2
```

```
## Loading required package: nlme
```

```
## Loading required package: MASS
```

```
ICC1
```

```
## function (object)
## {
##     MOD <- summary(object)
##     MSB <- MOD[[1]][1, 3]
##     MSW <- MOD[[1]][2, 3]
##     GSIZE <- (MOD[[1]][2, 1] + (MOD[[1]][1, 1] + 1))/(MOD[[1]][1,
##     1] + 1)
##     OUT <- (MSB - MSW)/(MSB + ((GSIZE - 1) * MSW))
##     return(OUT)
## }
## <bytecode: 0x0000000016016340>
## <environment: namespace:multilevel>
```

```
ICC2
```

```
## function (object)
## {
##     MOD <- summary(object)
##     MSB <- MOD[[1]][1, 3]
##     MSW <- MOD[[1]][2, 3]
##     OUT <- (MSB - MSW)/MSB
##     return(OUT)
## }
```



# Advantages of R

Open Code / Open Data

The screenshot shows the OSFHOME web interface for the 'Reproducibility Project: Psychology'. The top navigation bar includes links for Search, Support, Donate, Sign Up, and Sign In. Below the navigation bar, the project name 'Reproducibility Project: Psychology' is displayed, along with tabs for Files, Wiki, Analytics, and Registrations. The main content area is divided into three sections: Wiki, Files, and Citation.

**Wiki**

### Estimating the Reproducibility of Psychological Science

Open Science Collaboration

**Abstract:** Reproducibility is a defining feature of science, but the extent to which it characterizes current research is unknown. We conducted replications of 100 experimental and correlational studies published in three psychology journals using high-powered designs and original materials when available. Replicatio...

[Read More](#)

**Files**

| Name                          | Modified            |
|-------------------------------|---------------------|
| .gitignore                    |                     |
| data_xifomats                 |                     |
| figures                       |                     |
| functions.r                   |                     |
| masterscript.R                |                     |
| output.txt                    |                     |
| README.md                     |                     |
| RPP_figures.R                 |                     |
| rpp_reproduce.zip             |                     |
| vianello_evidence_nonsig.R    |                     |
| OSF Storage (United States)   |                     |
| Analysis Audit                |                     |
| Researcher Results Survey.pdf | 2015-08-20 05:11 PM |
| rpp_data.csv                  | 2015-09-11 09:34 AM |

**Citation**

**Components**

- Estimating the Reproducibility of Psychological Science**  
Nosek, Cohoon, Kidwell & 1 more  
Reproducibility is a defining feature of science, but the extent to which it characterizes current research is unknown. We conducted replications of 1...
- Analysis**  
Bakker, Burdoo, Bosco & 26 more
- Replicator Resources**  
Nosek, Cohoon & Kidwell
- Presentations**  
Nosek, Lai, Lebel & 4 more
- Post-Publication Additions and Revisions**  
Cohoon & Kidwell
- Comments**  
Kidwell
- Replication of janiszewski & Uy (2008, P5, Study 4b)**  
Chandler
- Replication of Reynolds & Besner (2008, JEP-LMC, Study 5)**  
Lai & Simpson
- Replication of Richeson & Trawalter (2008, P5, Study 1)**  
Lai
- Replication of Payne, Burkley & Stokes (2008, JPSP, Study 4)**  
Vianello
- Replication of Dai, Wertenbroch, & Brendl (2008, P5, Study 1)**  
Fuchs, Edel & Goefiner

# Advantages of R

## Open Code / Open Data

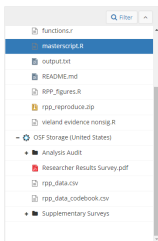


t Analysis Files Wiki Analytics Registrations

Search Support Donate Sign Up Sign In

masterscript.R

Download Share View Revisions



View this file on GitHub.

```
#####
# Master script: Tilburg University Analysis
# Responsible for this file: O.S. Hartgerink (o.s.hartgerink@tilburguniversity.edu) #
# ROL van Aert (r.v.aert@tilburguniversity.edu) #
# M.M. van Assen (m.m.vanassen@tilburguniversity.edu) #
#####

setwd(choose.dir())

# If you are having problems with reading in the data run this
# Thanks @hpc475
# Sys.setenv("LC_ALL", "English")

# source functions
if(!require(httr)){install.packages("httr")}
library(httr)
info <- GET("https://osf.io/bbvn7/?action=download", write_disk("functions.r", overwrite = TRUE)) #downloads data file from the OSF
source("functions.r")
if(!require(hmisc)){install.packages("hmisc")}
library(hmisc)
if(!require(metafor)){install.packages("metafor")}
library(metafor)

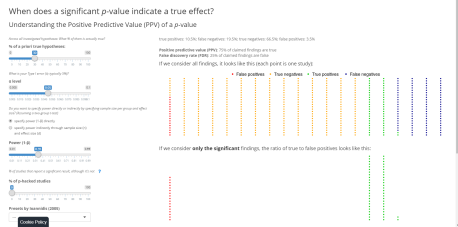
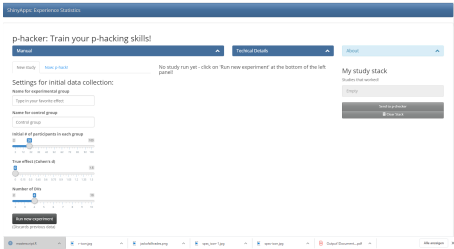
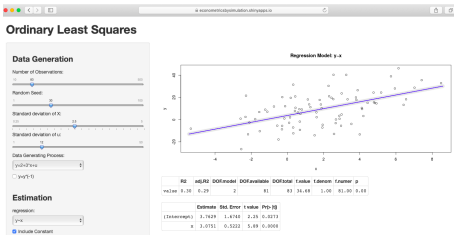
# Read in Tilburg data
info <- GET("https://osf.io/gfjwv/?action=download", write_disk("rpp_data.csv", overwrite = TRUE)) #downloads data file from the OSF
MASTER <- read.csv("rpp_data.csv")[1:167, ]
colnames(MASTER)[1] <- "ID" # Change first column name to ID to be able to load .csv file

# All ANALYSES INCLUDE pairwise selection.
#-----
jour <- numeric()

for(i in 1:nrow(MASTER)) {
  if(as.character(MASTER$journal..0.[i]) == "JEPHUNC") {
    jour[i] <- 1
  } else if(as.character(MASTER$journal..0.[i]) == "JPSP") {
    jour[i] <- 2
  } else if(as.character(MASTER$journal..0.[i]) == "ps") {
    if(as.character(MASTER$discipline..0.[i]) == "Cognitive") {
      jour[i] <- 3
    } else if(as.character(MASTER$discipline..0.[i]) == "Social") {
      jour[i] <- 4
    } else { jour[i] <- 5 }
  } else { jour[i] <- NA }
}
#-----
```

# Advantages of R

## Shiny Apps



# How to make R accessible

## In teaching

- First R, not SPSS
- Constantly use R while teaching statistical methods
- Make introduction (vectors, objects, mode, ...) as long as needed but as short as possible
- Practice A LOT: R is a language, languages need to be practiced
- Teach loops and functions only when needed (doctoral students)
- Specific R courses for what is currently needed rather than general R courses

# Available packages that can help

## For transferring from SPSS:

- **foreign**
- **haven**
- **expss**
- **sjlabelled**
- **labelled**

## For teaching R:

- **swirl**
- graphical packages (e.g., **lattice**, **ggplot**)

## For analyzing data in the social sciences:

- |                   |                 |
|-------------------|-----------------|
| • <b>psych</b>    | • <b>lavaan</b> |
| • <b>gvlma</b>    | • <b>lme4</b>   |
| • <b>Hmisc</b>    | • <b>afex</b>   |
| • <b>Multcomp</b> | • <b>MASS</b>   |

# Examples

## foreign vs haven

```
dat.hv <- read_sav(file="Masterfile CODINGS_Basis Phasen Strategien_LONG_05.08.2019.sav")
dat.fr <- read.spss(file="Masterfile CODINGS_Basis Phasen Strategien_LONG_05.08.2019.sav", to.data.frame=T)
```

```
## re-encoding from UTF-8
```

```
str(dat.hv$IDKL)
```

```
## num [1:28391] 100 100 100 100 100 100 100 100 100 100 ...
## - attr(*, "label")= chr "ID Klasse"
## - attr(*, "format.spss")= chr "F6.0"
## - attr(*, "display_width")= int 10
```

```
str(dat.fr$IDKL)
```

```
## num [1:28391] 100 100 100 100 100 100 100 100 100 100 ...
```

```
str(dat.hv$Basis_Form)
```

```
## dbl+lbl [1:28391] 10, 10, 10, 10, 10, 10, 2, 2, 2, 7, 7, 7, 7, 7, ...
## @ label      : chr "Basis_Arbeitsformen"
## @ format.spss : chr "F3.0"
## @ display_width: int 11
## @ labels     : Named num [1:11] 0 1 2 3 4 5 6 7 8 9 ...
## ..- attr(*, "names")= chr [1:11] "keine Sozialform" "Sonstiges" "Übergänge" "SA Statement LP" ...
```

```
str(dat.fr$Basis_Form)
```

```
## Factor w/ 11 levels "keine Sozialform",...: 11 11 11 11 11 11 3 3 3 8 ...
```

# Examples

expss

```
table(dat.fr$Basis_Form)
```

```
##
## keine Sozialform      Sonstiges      Übergänge  SA Statement LP
##          1445          657          1009          120
##          SA Förder      SA GA          SA PA          SA EA
##          1165          2073          1478          10085
##          KU Förder      KU Kreis      KU frontal
##          802          4315          5242
```

```
table(dat.hv$Basis_Form)
```

```
##
##      0      1      2      3      4      5      6      7      8      9     10
## 1445  657 1009  120 1165 2073 1478 10085  802 4315 5242
```

```
cro(dat.hv$Basis_Form)
```

|                     |                  | #Total |
|---------------------|------------------|--------|
| Basis_Arbeitsformen | keine Sozialform | 1445   |
|                     | Sonstiges        | 657    |
|                     | Übergänge        | 1009   |
|                     | SA Statement LP  | 120    |
|                     | SA Förder        | 1165   |
|                     | SA GA            | 2073   |
|                     | SA PA            | 1478   |
|                     | SA EA            | 10085  |
|                     | KU Förder        | 802    |
|                     | KU Kreis         | 4315   |
|                     | KU frontal       | 5242   |
|                     | #Total cases     | 28391  |

# Examples

## psych

```
IQdata <- read.table(file="data/IQdata.txt",header=T,dec=",")
```

```
psych::describe(IQdata)
```

```
##          vars   n mean   sd median trimmed   mad min max range  skew kurtosis
## schule      1 500  3.15 0.57      3   3.17  0.00   2   5     3  0.13    0.17
## alter       2 500 18.95 2.09     19  18.69  1.48  16  25     9  0.96    0.47
## sex         3 499  0.45 0.50      0   0.44  0.00   0   1     1  0.20   -1.96
## figural1    4 500 10.56 3.42     10  10.55  2.97   1  20    19  0.00   -0.33
## figural2    5 500 10.79 3.86     11  10.89  4.45   0  20    20 -0.24   -0.37
## figural3    6 500  8.02 3.33      8   7.75  2.97   0  19    19  0.67    0.24
## verbal      7 500 32.75 8.48     33  33.02  8.90   4  54    50 -0.28   -0.04
## numerisch   8 500 34.40 9.62     35  34.66 10.38   7  58    51 -0.25   -0.43
##
##          se
## schule    0.03
## alter     0.09
## sex       0.02
## figural1  0.15
## figural2  0.17
## figural3  0.15
## verbal    0.38
## numerisch 0.43
```



# Examples

## psych

```
library(psych)
load("data/finalOCB.RData")

psych::alpha(finalOCB[c("SE02_01", "SE02_02", "SE02_03", "SE02_04", "SE02_05", "SE02_06")])

##
## Reliability analysis
## Call: psych::alpha(x = finalOCB[c("SE02_01", "SE02_02", "SE02_03",
## "SE02_04", "SE02_05", "SE02_06")])
##
##      raw_alpha std.alpha G6(smc) average_r S/N   ase mean sd median_r
##      0.87      0.87    0.86      0.53 6.7 0.015  51 23      0.52
##
## lower alpha upper      95% confidence boundaries
## 0.84 0.87 0.9
##
## Reliability if an item is dropped:
##      raw_alpha std.alpha G6(smc) average_r S/N alpha se  var.r med.r
## SE02_01      0.83      0.84 0.81      0.50 5.1  0.020 0.0067 0.50
## SE02_02      0.85      0.85 0.84      0.54 5.8  0.018 0.0091 0.53
## SE02_03      0.86      0.86 0.84      0.55 6.0  0.017 0.0077 0.53
## SE02_04      0.84      0.85 0.82      0.52 5.5  0.019 0.0070 0.52
## SE02_05      0.83      0.83 0.81      0.50 4.9  0.020 0.0047 0.50
## SE02_06      0.86      0.86 0.84      0.56 6.3  0.017 0.0059 0.54
##
## Item statistics
##      n raw.r std.r r.cor r.drop mean sd
## SE02_01 178 0.83 0.83 0.80 0.74 42 29
## SE02_02 178 0.75 0.76 0.68 0.64 49 29
## SE02_03 178 0.74 0.74 0.66 0.61 62 32
## SE02_04 178 0.78 0.79 0.74 0.68 57 29
## SE02_05 178 0.84 0.84 0.82 0.76 51 28
```

# Examples

## Hmisc

```
cormat <- as.data.frame(finalOCB[c("SD01", "SD02_01", "OI", "OCB")])  
  
mycor <- rcorr(as.matrix(cormat))  
mycor
```

```
##          SD01 SD02_01   OI   OCB  
## SD01      1.00  -0.11 -0.31 -0.08  
## SD02_01 -0.11   1.00  0.06  0.21  
## OI      -0.31   0.06  1.00  0.34  
## OCB     -0.08   0.21  0.34  1.00  
##  
## n= 178  
##  
##  
## P  
##          SD01   SD02_01 OI      OCB  
## SD01      0.1467   0.0000 0.3100  
## SD02_01 0.1467   0.4347 0.0052  
## OI      0.0000 0.4347   0.0000  
## OCB     0.3100 0.0052 0.0000
```

# How to make R accessible

## In developing

- Create more inclusive environment
- Make documentation / help functions easier understandable
- Better manners on platforms, such as Stack Overflow, etc.

# Conclusion

- SPSS is convenient but may enhance bad scientific practice
- R is inconvenient but may help improving scientific practice
- Tools for making R more accessible are available and should be used
- Developers could and should help making R more accessible