

Descriptive Statistics of the NRW80+ Dataset

Prof. Dr. Stephan Huber^{1,2}

¹ Fresenius University of Applied Science

² Charlotte Fresenius University

Abstract

In this paper, I illustrate the process of importing NRW80+ data (see Zank, Woopen, Wagner, Rietz, & Kaspar, 2022) into R. Additionally, I present descriptive statistics and graphical visualizations to gain insights into Likert-scaled surveys. The paper adheres to the APA style, implementing the R template provided by the ‘papaja’ package (Aust & Barth, 2023).

Keywords: papaja, NRW80+, descriptive statistics

Word count: 25

Contents

1	Technical Note	2
2	Import Data	4
3	How to Use the NRW80+ Data	4
3.1	Load and Subset Data	4
3.2	Get an Overview by Counting	5
3.2.1	table() of R base	5
3.2.2	tabyl() of janitor	8
3.2.3	frq() of sjmisc	10
3.3	First Summary Statistics	14
3.3.1	Using summary() and get_summary_stats()	14
3.3.2	Using psych::describe()	16
3.3.3	Using summarize() and the tidyverse	17
3.4	Make APA Tables using apa_table()	17
3.5	Use the Likert Scale using gglikert()	19

All files related to that paper are hosted on github. see: <https://github.com/hubchev/ewa>.

Correspondence concerning this article should be addressed to Prof. Dr. Stephan Huber, Im Mediapark

4e. E-mail: stephan.huber@hs-fresenius.de

4 Cross-Referencing in R Markdown	21
References	22

1 Technical Note

In the following, I load (and install) packages that I use later on and I show information about my R session with `sessionInfo()`.

```
# (Install and) load pacman package
if (!require(pacman)) install.packages("pacman")

# load packages that are already installed and install packages that are not
# installed yet and then load them:
pacman::p_load(tinylabels,
               papaja,
               haven,
               labelled,
               janitor,
               skimr,
               rstatix,
               HH,
               likert,
               expss,
               tidyr,
               ggstats,
               psych,
               sjlabelled,
               sjmisc,
               tidyverse,
               MASS,
               dplyr)

sessionInfo()

## R version 4.2.2 Patched (2022-11-10 r83330)
## Platform: x86_64-pc-linux-gnu (64-bit)
## Running under: Debian GNU/Linux 12 (bookworm)
##
## Matrix products: default
## BLAS:   /usr/lib/x86_64-linux-gnu/openblas-pthread/libblas.so.3
## LAPACK: /usr/lib/x86_64-linux-gnu/openblas-pthread/libopenblas-p-r0.3.21.so
##
## locale:
##  [1] LC_CTYPE=en_US.UTF-8      LC_NUMERIC=C              LC_TIME=en_US.UTF-8
##  [4] LC_COLLATE=en_US.UTF-8    LC_MONETARY=en_US.UTF-8   LC_MESSAGES=en_US.UTF-8
##  [7] LC_PAPER=en_US.UTF-8      LC_NAME=C                 LC_ADDRESS=C
```

```
## [10] LC_TELEPHONE=C                      LC_MEASUREMENT=en_US.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] grid      stats      graphics  grDevices  utils      datasets  methods    base
##
## other attached packages:
## [1] ggthemes_5.0.0      stargazer_5.2.3      conflicted_1.2.0      sjmisc_2.8.9
## [5] sjlabelled_1.2.0    ggstats_0.5.1        expss_0.11.6          maditr_0.8.3
## [9] likert_1.3.5        xtable_1.8-4         HH_3.1-49             gridExtra_2.3
## [13] multcomp_1.4-25     TH.data_1.1-2        MASS_7.3-60           survival_3.5-7
## [17] mvtnorm_1.2-4       latticeExtra_0.6-30  lattice_0.22-5        rstatix_0.7.2
## [21] skimr_2.1.5         labelled_2.12.0      koRpus.lang.en_0.1-4  koRpus_0.13-8
## [25] sylly_0.1-6         kableExtra_1.3.4     papaja_0.1.2          tinylabels_0.2.4
## [29] knitr_1.45          car_3.1-1            carData_3.0-5         psych_2.3.9
## [33] janitor_2.2.0       haven_2.5.4          lubridate_1.9.3       forcats_1.0.0
## [37] stringr_1.5.1       dplyr_1.1.4          purrr_1.0.2           readr_2.1.4
## [41] tidyr_1.3.0         tibble_3.2.1         ggplot2_3.4.4         tidyverse_2.0.0
## [45] pacman_0.5.1
##
## loaded via a namespace (and not attached):
## [1] backports_1.4.1      Hmisc_4.8-0          systemfonts_1.0.5
## [4] plyr_1.8.9           repr_1.1.6           splines_4.2.2
## [7] gmp_0.7-3            digest_0.6.33        htmltools_0.5.7
## [10] magick_2.8.2         fansi_1.0.5          memoise_2.0.1
## [13] magrittr_2.0.3       checkmate_2.3.1      cluster_2.1.6
## [16] tzdb_0.4.0           matrixStats_1.2.0    rmdfltr_0.1.3
## [19] sandwich_3.1-0       svglite_2.1.3        timechange_0.2.0
## [22] jpeg_0.1-10          colorspace_2.1-0     rvest_1.0.3
## [25] xfun_0.41            crayon_1.5.2         jsonlite_1.8.7
## [28] zoo_1.8-12           glue_1.7.0           wordcountaddin_0.3.0.9000
## [31] gtable_0.3.4         emmeans_1.8.9        webshot_0.5.5
## [34] Rmpfr_0.9-4          abind_1.4-5          scales_1.3.0
## [37] Rcpp_1.0.12          viridisLite_0.4.2    htmlTable_2.4.1
## [40] foreign_0.8-86       Formula_1.2-5        vcd_1.4-11
## [43] datawizard_0.9.1     htmlwidgets_1.6.1    httr_1.4.7
## [46] RColorBrewer_1.1-3   ellipsis_0.3.2       farver_2.1.1
## [49] pkgconfig_2.0.3      nnet_7.3-19          deldir_2.0-2
## [52] utf8_1.2.4           labeling_0.4.3       tidyselect_1.2.0
## [55] rlang_1.1.2          reshape2_1.4.4       later_1.3.2
## [58] effectsize_0.8.6     cachem_1.0.8         munsell_0.5.0
## [61] tools_4.2.2          cli_3.6.2            generics_0.1.3
## [64] broom_1.0.5          evaluate_0.23        fastmap_1.1.1
## [67] yaml_2.3.8           nlme_3.1-164         mime_0.12
## [70] leaps_3.1            xml2_1.3.5           compiler_4.2.2
## [73] rstudioapi_0.15.0    png_0.1-8           broom.helpers_1.14.0
```

```
## [76] stringi_1.8.3          highr_0.10           parameters_0.21.3
## [79] Matrix_1.6-4           commonmark_1.9.0     markdown_1.12
## [82] vctrs_0.6.4            pillar_1.9.0         lifecycle_1.0.4
## [85] lmtest_0.9-40          estimability_1.4.1   data.table_1.14.10
## [88] insight_0.19.7         httpuv_1.6.13        syllly.en_0.1-3
## [91] R6_2.5.1               bookdown_0.36        promises_1.2.1
## [94] codetools_0.2-19       assertthat_0.2.1     pkgload_1.3.3
## [97] withr_2.5.2            mnormt_2.1.1         bayestestR_0.13.1
## [100] parallel_4.2.2         hms_1.1.3            rpart_4.1.23
## [103] coda_0.19-4            rmarkdown_2.25        snakecase_0.11.1
## [106] shiny_1.8.0            base64enc_0.1-3       tinytex_0.49
## [109] interp_1.1-5
```

2 Import Data

I host a R script on my GitHub account (see https://raw.githubusercontent.com/hubchev/courses/main/scr/readin_GESIS.R) that explains how to import the NRW80+ data. I have manually saved the data, `gesis.RData`, in a subfolder named `data`.

3 How to Use the NRW80+ Data

3.1 Load and Subset Data

I load the data and select some variables that are of particular interest to me.

```
getwd()

## [1] "/home/sthu/Dropbox/hsf/23-ws/ewa/ewa_all/rmd_desc"

load("../data/gesis.RData")
df <- dfdata |>
  select(starts_with("alter"),
         ALT_agegroup,
         ALT_sex,
         famst1, famst7,
         demtectcorr,
         kogstat,
         final,
         geschlecht)

# Remove the common prefix from all variables
df <- df |>
  mutate_all(~ set_label(., gsub("^Alternserleben: ", "", get_label(.))))
```

For simplification, let us focus on the questions that refer to the “Experience of Ageing” and create a new dataset `df_alter1` that contains only those questions:

```
df_alter1 <- df |>
  select(alter11,
```

```

    alterl2,
    alterl3,
    alterl4,
    alterl5,
    alterl6,
    alterl7,
    alterl8,
    alterl9,
    alterl10) |>
drop_unused_labels()

# to remove unused labels you can use drop_unused_labels():
df_alterl_un <- df_alterl |>
  drop_unused_labels()

summary(df_alterl)

```

##	alterl1	alterl2	alterl3	alterl4	alterl5
##	Min. : -2.000	Min. : -2.000	Min. : -2.000	Min. : -2.000	Min. : -2.00
##	1st Qu.: 1.000	1st Qu.: 2.000	1st Qu.: 1.000	1st Qu.: 2.000	1st Qu.: 2.00
##	Median : 3.000	Median : 4.000	Median : 2.000	Median : 3.000	Median : 3.00
##	Mean : 2.656	Mean : 3.282	Mean : 2.349	Mean : 2.763	Mean : 2.99
##	3rd Qu.: 4.000	3rd Qu.: 4.000	3rd Qu.: 3.000	3rd Qu.: 4.000	3rd Qu.: 4.00
##	Max. : 5.000	Max. : 5.000	Max. : 5.000	Max. : 5.000	Max. : 5.00
##	alterl6	alterl7	alterl8	alterl9	alterl10
##	Min. : -2.000	Min. : -2.000	Min. : -2.000	Min. : -2.000	Min. : -2.000
##	1st Qu.: 2.000	1st Qu.: 2.000	1st Qu.: 1.000	1st Qu.: 2.000	1st Qu.: 1.000
##	Median : 4.000	Median : 3.000	Median : 3.000	Median : 3.000	Median : 2.000
##	Mean : 3.405	Mean : 3.237	Mean : 2.712	Mean : 2.969	Mean : 2.305
##	3rd Qu.: 5.000	3rd Qu.: 4.000	3rd Qu.: 4.000	3rd Qu.: 4.000	3rd Qu.: 3.000
##	Max. : 5.000	Max. : 5.000	Max. : 5.000	Max. : 5.000	Max. : 5.000

3.2 Get an Overview by Counting

3.2.1 table() of R base. With the `table()` function, you can count how many observations of each unique value a variable contains:

```
table(df_alterl$alterl1)
```

```

##
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      80          6       390       266       451       511       159

```

To do that for each variable of a dataset is easy using `~`, the pipe operator, and `map()` of the package `purrr` (Wickham & Henry, 2023):

```
df_alterl |>
  map(~ table(.))
```

```
## $alterl1
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      80      6      390      266      451      511      159
##
## $alterl2
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      36      4      196      245      379      648      355
##
## $alterl3
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      20      3      500      577      403      244      116
##
## $alterl4
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##     122      8      222      260      527      543      181
##
## $alterl5
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##     101      4      199      211      452      680      216
##
## $alterl6
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      19      3      149      324      358      537      473
##
## $alterl7
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      20      2      145      362      471      525      338
##
## $alterl8
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      20      3      516      350      325      340      309
##
## $alterl9
## .
```

```
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      83      10      261      228      425      564      292
```

```
##
```

```
## $alterl10
```

```
## .
```

```
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      44      7      537      433      486      251      105
```

Using `proportions()` returns the conditional proportions:

```
df_alterl |>
  map(~ proportions(table(.)))
```

```
## $alterl1
```

```
## .
```

```
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
## 0.042941492 0.003220612 0.209339775 0.142780462 0.242082662 0.274288782 0.085346216
```

```
##
```

```
## $alterl2
```

```
## .
```

```
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
## 0.019323671 0.002147075 0.105206656 0.131508320 0.203435319 0.347826087 0.190552872
```

```
##
```

```
## $alterl3
```

```
## .
```

```
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
## 0.010735373 0.001610306 0.268384326 0.309715513 0.216317767 0.130971551 0.062265164
```

```
##
```

```
## $alterl4
```

```
## .
```

```
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
## 0.065485776 0.004294149 0.119162641 0.139559850 0.282877080 0.291465378 0.097155126
```

```
##
```

```
## $alterl5
```

```
## .
```

```
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
## 0.054213634 0.002147075 0.106816962 0.113258186 0.242619431 0.365002684 0.115942029
```

```
##
```

```
## $alterl6
```

```
## .
```

```
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
## 0.010198604 0.001610306 0.079978529 0.173913043 0.192163178 0.288244767 0.253891573
```

```
##
```

```
## $alterl7
```

```
## .
```

```
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
```

```
## 0.010735373 0.001073537 0.077831455 0.194310252 0.252818035 0.281803543 0.181427805
##
## $alterl8
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
## 0.010735373 0.001610306 0.276972625 0.187869028 0.174449812 0.182501342 0.165861514
##
## $alterl9
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
## 0.044551798 0.005367687 0.140096618 0.122383253 0.228126677 0.302737520 0.156736447
##
## $alterl10
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
## 0.023617821 0.003757381 0.288244767 0.232420827 0.260869565 0.134728932 0.056360709
```

3.2.2 tabyl() of janitor. With `tabyl()` which is part of `janitor` (Firke, 2023), we can get both nicely:

```
df_alterl |>
  tabyl(alterl1)
```

```
## alterl1    n    percent
##      -2  80 0.042941492
##      -1   6 0.003220612
##       1 390 0.209339775
##       2 266 0.142780462
##       3 451 0.242082662
##       4 511 0.274288782
##       5 159 0.085346216
```

```
df_alterl |>
  map(~ tabyl(.))
```

```
## $alterl1
## .    n    percent
## -2  80 0.042941492
## -1   6 0.003220612
##  1 390 0.209339775
##  2 266 0.142780462
##  3 451 0.242082662
##  4 511 0.274288782
##  5 159 0.085346216
##
## $alterl2
## .    n    percent
```



```

## -2 36 0.019323671
## -1 4 0.002147075
## 1 196 0.105206656
## 2 245 0.131508320
## 3 379 0.203435319
## 4 648 0.347826087
## 5 355 0.190552872
##
## $alterl3
## . n percent
## -2 20 0.010735373
## -1 3 0.001610306
## 1 500 0.268384326
## 2 577 0.309715513
## 3 403 0.216317767
## 4 244 0.130971551
## 5 116 0.062265164
##
## $alterl4
## . n percent
## -2 122 0.065485776
## -1 8 0.004294149
## 1 222 0.119162641
## 2 260 0.139559850
## 3 527 0.282877080
## 4 543 0.291465378
## 5 181 0.097155126
##
## $alterl5
## . n percent
## -2 101 0.054213634
## -1 4 0.002147075
## 1 199 0.106816962
## 2 211 0.113258186
## 3 452 0.242619431
## 4 680 0.365002684
## 5 216 0.115942029
##
## $alterl6
## . n percent
## -2 19 0.010198604
## -1 3 0.001610306
## 1 149 0.079978529
## 2 324 0.173913043
## 3 358 0.192163178

```

```
## 4 537 0.288244767
## 5 473 0.253891573
##
## $alterl7
## . n percent
## -2 20 0.010735373
## -1 2 0.001073537
## 1 145 0.077831455
## 2 362 0.194310252
## 3 471 0.252818035
## 4 525 0.281803543
## 5 338 0.181427805
##
## $alterl8
## . n percent
## -2 20 0.010735373
## -1 3 0.001610306
## 1 516 0.276972625
## 2 350 0.187869028
## 3 325 0.174449812
## 4 340 0.182501342
## 5 309 0.165861514
##
## $alterl9
## . n percent
## -2 83 0.044551798
## -1 10 0.005367687
## 1 261 0.140096618
## 2 228 0.122383253
## 3 425 0.228126677
## 4 564 0.302737520
## 5 292 0.156736447
##
## $alterl10
## . n percent
## -2 44 0.023617821
## -1 7 0.003757381
## 1 537 0.288244767
## 2 433 0.232420827
## 3 486 0.260869565
## 4 251 0.134728932
## 5 105 0.056360709
```

3.2.3 frq() of sjmisc. As the variables `df_alterl1` are factors. Thus, we can use the `sjmisc` package, see Lüdtke (2018) and the cheatsheet of `sjmisc` <http://strengeljac.ke.de/sjmisc-cheatsheet.pdf>. Also worth a reading is `browseVignettes("sjmisc")`.

For example, we can use `frq()` for nice frequency tables:

```
df_alter1 |>
  map(~ frq(. , show.na = T))
```

```
## $alter11
## Beziehungen und andere Menschen mehr schätzen (x) <numeric>
## # total N=1863 valid N=1863 mean=2.66 sd=1.61
##
## Value |      Label |   N | Raw % | Valid % | Cum. %
## -----
##   -2 | Weiß nicht |    0 |  0.00 |   0.00 |   0.00
##   -1 | Verweigert |    0 |  0.00 |   0.00 |   0.00
##    1 | Gar nicht  |   80 |  4.29 |   4.29 |   4.29
##    2 | Ein wenig  |    6 |  0.32 |   0.32 |   4.62
##    3 | Mäßig     |  390 | 20.93 |  20.93 |  25.55
##    4 | Stark     |  266 | 14.28 |  14.28 |  39.83
##    5 | Sehr stark |  451 | 24.21 |  24.21 |  64.04
##    6 | <NA>      |  511 | 27.43 |  27.43 |  91.47
##    7 | <NA>      |  159 |  8.53 |   8.53 | 100.00
## <NA> | <NA>      |    0 |  0.00 |   <NA> |   <NA>
##
## $alter12
## Gesundheit mehr Aufmerksamkeit widmen (x) <numeric>
## # total N=1863 valid N=1863 mean=3.28 sd=1.45
##
## Value |      Label |   N | Raw % | Valid % | Cum. %
## -----
##   -2 | Weiß nicht |    0 |  0.00 |   0.00 |   0.00
##   -1 | Verweigert |    0 |  0.00 |   0.00 |   0.00
##    1 | Gar nicht  |   36 |  1.93 |   1.93 |   1.93
##    2 | Ein wenig  |    4 |  0.21 |   0.21 |   2.15
##    3 | Mäßig     |  196 | 10.52 |  10.52 |  12.67
##    4 | Stark     |  245 | 13.15 |  13.15 |  25.82
##    5 | Sehr stark |  379 | 20.34 |  20.34 |  46.16
##    6 | <NA>      |  648 | 34.78 |  34.78 |  80.94
##    7 | <NA>      |  355 | 19.06 |  19.06 | 100.00
## <NA> | <NA>      |    0 |  0.00 |   <NA> |   <NA>
##
## $alter13
## geistige Leistungsfähigkeit nimmt ab (x) <numeric>
## # total N=1863 valid N=1863 mean=2.35 sd=1.28
##
## Value |      Label |   N | Raw % | Valid % | Cum. %
## -----
##   -2 | Weiß nicht |    0 |  0.00 |   0.00 |   0.00
```

```

##      -1 | Verweigert | 0 | 0.00 | 0.00 | 0.00
##      1 | Gar nicht | 20 | 1.07 | 1.07 | 1.07
##      2 | Ein wenig | 3 | 0.16 | 0.16 | 1.23
##      3 | Mäßig | 500 | 26.84 | 26.84 | 28.07
##      4 | Stark | 577 | 30.97 | 30.97 | 59.04
##      5 | Sehr stark | 403 | 21.63 | 21.63 | 80.68
##      6 | <NA> | 244 | 13.10 | 13.10 | 93.77
##      7 | <NA> | 116 | 6.23 | 6.23 | 100.00
## <NA> | <NA> | 0 | 0.00 | <NA> | <NA>
##
## $alter14
## mehr Erfahrung, um Dinge und Menschen einzuschätzen (x) <numeric>
## # total N=1863 valid N=1863 mean=2.76 sd=1.72
##
## Value | Label | N | Raw % | Valid % | Cum. %
## -----
##      -2 | Weiß nicht | 0 | 0.00 | 0.00 | 0.00
##      -1 | Verweigert | 0 | 0.00 | 0.00 | 0.00
##      1 | Gar nicht | 122 | 6.55 | 6.55 | 6.55
##      2 | Ein wenig | 8 | 0.43 | 0.43 | 6.98
##      3 | Mäßig | 222 | 11.92 | 11.92 | 18.89
##      4 | Stark | 260 | 13.96 | 13.96 | 32.85
##      5 | Sehr stark | 527 | 28.29 | 28.29 | 61.14
##      6 | <NA> | 543 | 29.15 | 29.15 | 90.28
##      7 | <NA> | 181 | 9.72 | 9.72 | 100.00
## <NA> | <NA> | 0 | 0.00 | <NA> | <NA>
##
## $alter15
## besseres Gespür, was wichtig ist (x) <numeric>
## # total N=1863 valid N=1863 mean=2.99 sd=1.66
##
## Value | Label | N | Raw % | Valid % | Cum. %
## -----
##      -2 | Weiß nicht | 0 | 0.00 | 0.00 | 0.00
##      -1 | Verweigert | 0 | 0.00 | 0.00 | 0.00
##      1 | Gar nicht | 101 | 5.42 | 5.42 | 5.42
##      2 | Ein wenig | 4 | 0.21 | 0.21 | 5.64
##      3 | Mäßig | 199 | 10.68 | 10.68 | 16.32
##      4 | Stark | 211 | 11.33 | 11.33 | 27.64
##      5 | Sehr stark | 452 | 24.26 | 24.26 | 51.91
##      6 | <NA> | 680 | 36.50 | 36.50 | 88.41
##      7 | <NA> | 216 | 11.59 | 11.59 | 100.00
## <NA> | <NA> | 0 | 0.00 | <NA> | <NA>
##
## $alter16

```

```
## Einschränkung der Aktivitäten (x) <numeric>
## # total N=1863 valid N=1863 mean=3.40 sd=1.38
##
## Value |      Label |   N | Raw % | Valid % | Cum. %
## -----
##    -2 | Weiß nicht |   0 |  0.00 |   0.00 |   0.00
##    -1 | Verweigert |   0 |  0.00 |   0.00 |   0.00
##     1 | Gar nicht  |  19 |  1.02 |   1.02 |   1.02
##     2 | Ein wenig  |   3 |  0.16 |   0.16 |   1.18
##     3 | Mäßig     | 149 |  8.00 |   8.00 |   9.18
##     4 | Stark      | 324 | 17.39 |  17.39 |  26.57
##     5 | Sehr stark | 358 | 19.22 |  19.22 |  45.79
##     6 |           | 537 | 28.82 |  28.82 |  74.61
##     7 |           | 473 | 25.39 |  25.39 | 100.00
##    <NA> |           |   0 |  0.00 |   <NA> |   <NA>
##
## $alterl7
## weniger Energie (x) <numeric>
## # total N=1863 valid N=1863 mean=3.24 sd=1.32
##
## Value |      Label |   N | Raw % | Valid % | Cum. %
## -----
##    -2 | Weiß nicht |   0 |  0.00 |   0.00 |   0.00
##    -1 | Verweigert |   0 |  0.00 |   0.00 |   0.00
##     1 | Gar nicht  |  20 |  1.07 |   1.07 |   1.07
##     2 | Ein wenig  |   2 |  0.11 |   0.11 |   1.18
##     3 | Mäßig     | 145 |  7.78 |   7.78 |   8.96
##     4 | Stark      | 362 | 19.43 |  19.43 |  28.40
##     5 | Sehr stark | 471 | 25.28 |  25.28 |  53.68
##     6 |           | 525 | 28.18 |  28.18 |  81.86
##     7 |           | 338 | 18.14 |  18.14 | 100.00
##    <NA> |           |   0 |  0.00 |   <NA> |   <NA>
##
## $alterl8
## Abhängigkeit von der Hilfe Anderer (x) <numeric>
## # total N=1863 valid N=1863 mean=2.71 sd=1.53
##
## Value |      Label |   N | Raw % | Valid % | Cum. %
## -----
##    -2 | Weiß nicht |   0 |  0.00 |   0.00 |   0.00
##    -1 | Verweigert |   0 |  0.00 |   0.00 |   0.00
##     1 | Gar nicht  |  20 |  1.07 |   1.07 |   1.07
##     2 | Ein wenig  |   3 |  0.16 |   0.16 |   1.23
##     3 | Mäßig     | 516 | 27.70 |  27.70 |  28.93
##     4 | Stark      | 350 | 18.79 |  18.79 |  47.72
```

```
##      5 | Sehr stark | 325 | 17.44 | 17.44 | 65.16
##      6 |      <NA> | 340 | 18.25 | 18.25 | 83.41
##      7 |      <NA> | 309 | 16.59 | 16.59 | 100.00
## <NA> |      <NA> |  0 |  0.00 |  <NA> |  <NA>
##
## $alterl9
## Freiheit, Tage nach eigenem Willen zu verleben (x) <numeric>
## # total N=1863 valid N=1863 mean=2.97 sd=1.68
##
## Value |      Label |   N | Raw % | Valid % | Cum. %
## -----
##    -2 | Weiß nicht |   0 |  0.00 |  0.00 |  0.00
##    -1 | Verweigert |   0 |  0.00 |  0.00 |  0.00
##     1 | Gar nicht  |  83 |  4.46 |  4.46 |  4.46
##     2 | Ein wenig  |  10 |  0.54 |  0.54 |  4.99
##     3 | Mäßig     | 261 | 14.01 | 14.01 | 19.00
##     4 | Stark      | 228 | 12.24 | 12.24 | 31.24
##     5 | Sehr stark | 425 | 22.81 | 22.81 | 54.05
##     6 |      <NA> | 564 | 30.27 | 30.27 | 84.33
##     7 |      <NA> | 292 | 15.67 | 15.67 | 100.00
## <NA> |      <NA> |   0 |  0.00 |  <NA> |  <NA>
##
## $alterl10
## Motivation fällt schwerer (x) <numeric>
## # total N=1863 valid N=1863 mean=2.31 sd=1.38
##
## Value |      Label |   N | Raw % | Valid % | Cum. %
## -----
##    -2 | Weiß nicht |   0 |  0.00 |  0.00 |  0.00
##    -1 | Verweigert |   0 |  0.00 |  0.00 |  0.00
##     1 | Gar nicht  |  44 |  2.36 |  2.36 |  2.36
##     2 | Ein wenig  |   7 |  0.38 |  0.38 |  2.74
##     3 | Mäßig     | 537 | 28.82 | 28.82 | 31.56
##     4 | Stark      | 433 | 23.24 | 23.24 | 54.80
##     5 | Sehr stark | 486 | 26.09 | 26.09 | 80.89
##     6 |      <NA> | 251 | 13.47 | 13.47 | 94.36
##     7 |      <NA> | 105 |  5.64 |  5.64 | 100.00
## <NA> |      <NA> |   0 |  0.00 |  <NA> |  <NA>
```

3.3 First Summary Statistics

3.3.1 Using `summary()` and `get_summary_stats()`. First, I am interested in the class of the data and some very basic summary statistics.

```
summary(df)
```

```
##      alterl1      alterl2      alterl3      alterl4      alterl5
## Min.    :-2.000  Min.    :-2.000  Min.    :-2.000  Min.    :-2.000  Min.    :-2.00
## 1st Qu.: 1.000  1st Qu.: 2.000  1st Qu.: 1.000  1st Qu.: 2.000  1st Qu.: 2.00
## Median : 3.000  Median : 4.000  Median : 2.000  Median : 3.000  Median : 3.00
## Mean   : 2.656  Mean   : 3.282  Mean   : 2.349  Mean   : 2.763  Mean   : 2.99
## 3rd Qu.: 4.000  3rd Qu.: 4.000  3rd Qu.: 3.000  3rd Qu.: 4.000  3rd Qu.: 4.00
## Max.   : 5.000  Max.   : 5.000  Max.   : 5.000  Max.   : 5.000  Max.   : 5.00
##
##      alterl6      alterl7      alterl8      alterl9      alterl10
## Min.    :-2.000  Min.    :-2.000  Min.    :-2.000  Min.    :-2.000  Min.    :-2.000
## 1st Qu.: 2.000  1st Qu.: 2.000  1st Qu.: 1.000  1st Qu.: 2.000  1st Qu.: 1.000
## Median : 4.000  Median : 3.000  Median : 3.000  Median : 3.000  Median : 2.000
## Mean   : 3.405  Mean   : 3.237  Mean   : 2.712  Mean   : 2.969  Mean   : 2.305
## 3rd Qu.: 5.000  3rd Qu.: 4.000  3rd Qu.: 4.000  3rd Qu.: 4.000  3rd Qu.: 3.000
## Max.   : 5.000  Max.   : 5.000  Max.   : 5.000  Max.   : 5.000  Max.   : 5.000
##
##      alter_int      alter_cont      alterl_m1      alterl_m2      alterp
## Min.    : 80.00  Min.    : 80.11  Min.    :1.000  Min.    :1.000  Min.    :-4.000
## 1st Qu.: 82.00  1st Qu.: 82.99  1st Qu.:2.600  1st Qu.:2.200  1st Qu.: -4.000
## Median : 86.00  Median : 86.59  Median :3.200  Median :2.800  Median : -4.000
## Mean   : 86.48  Mean   : 86.98  Mean   :3.168  Mean   :2.877  Mean   : 2.632
## 3rd Qu.: 90.00  3rd Qu.: 90.56  3rd Qu.:3.800  3rd Qu.:3.600  3rd Qu.: -4.000
## Max.   :102.00  Max.   :102.92  Max.   :5.000  Max.   :5.000  Max.   :99.000
## NA's   :6      NA's   :6      NA's   :16      NA's   :14
##      ALT_agegroup      ALT_sex      famst1      famst7      demtectcorr
## Min.    :1.000  Min.    :1.000  Min.    :-1.000  Min.    :-3.000  Min.    :-11.000
## 1st Qu.:1.000  1st Qu.:1.000  1st Qu.: 1.000  1st Qu.: -3.000  1st Qu.: -1.000
## Median :2.000  Median :2.000  Median : 4.000  Median : 0.000  Median : 0.000
## Mean   :1.883  Mean   :1.502  Mean   : 2.765  Mean   :-1.179  Mean   : -1.742
## 3rd Qu.:3.000  3rd Qu.:2.000  3rd Qu.: 4.000  3rd Qu.: 0.000  3rd Qu.: 0.000
## Max.   :3.000  Max.   :2.000  Max.   : 5.000  Max.   : 1.000  Max.   : 2.000
##
##      kogstat      final      geschlecht
## Min.    :-4.00  Min.    :81.00  Min.    :1.000
## 1st Qu.: -4.00  1st Qu.:81.00  1st Qu.:1.000
## Median : -4.00  Median :81.00  Median :2.000
## Mean   : -3.21  Mean   :81.09  Mean   :1.502
## 3rd Qu.: -4.00  3rd Qu.:81.00  3rd Qu.:2.000
## Max.   : 7.00  Max.   :82.00  Max.   :2.000
##
```

```
sumstat_alter <- df |>
  get_summary_stats(
    alterl1,
    alterl2,
```

```

alterl3,
alterl4,
alterl5,
alterl6,
alterl7,
alterl8,
alterl9,
alterl10,
type = "five_number")

sumstat_alter

```

```

## # A tibble: 10 x 7
##   variable      n   min   max    q1 median    q3
##   <fct>      <dbl> <dbl> <dbl> <dbl>  <dbl> <dbl>
## 1 alterl1    1863    -2     5     1     3     4
## 2 alterl2    1863    -2     5     2     4     4
## 3 alterl3    1863    -2     5     1     2     3
## 4 alterl4    1863    -2     5     2     3     4
## 5 alterl5    1863    -2     5     2     3     4
## 6 alterl6    1863    -2     5     2     4     5
## 7 alterl7    1863    -2     5     2     3     4
## 8 alterl8    1863    -2     5     1     3     4
## 9 alterl9    1863    -2     5     2     3     4
## 10 alterl10  1863    -2     5     1     2     3

```

3.3.2 Using `psych::describe()`. A powerful alternative for descriptive summary statistics is provided by the function `describe()` of the `psych` package (William Revelle, 2023).

```

sumstat_alter_psych <- df |>
  select(starts_with("alterl")) |>
  psych::describe() |>
  as_tibble(rownames="Question") |>
  select(-skew, -kurtosis, -range, -vars)

sumstat_alter_psych

```

```

## # A tibble: 12 x 10
##   Question      n mean   sd median trimmed  mad   min   max    se
##   <chr>      <dbl> <dbl> <dbl>  <dbl>   <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 alterl1    1863  2.66  1.61     3    2.76  1.48    -2     5 0.0374
## 2 alterl2    1863  3.28  1.45     4    3.43  1.48    -2     5 0.0336
## 3 alterl3    1863  2.35  1.28     2    2.28  1.48    -2     5 0.0296
## 4 alterl4    1863  2.76  1.72     3    2.96  1.48    -2     5 0.0398
## 5 alterl5    1863  2.99  1.66     3    3.20  1.48    -2     5 0.0385
## 6 alterl6    1863  3.40  1.38     4    3.54  1.48    -2     5 0.0321

```



```
## 7 alterl7      1863  3.24 1.32      3      3.33 1.48      -2      5 0.0306
## 8 alterl8      1863  2.71 1.53      3      2.68 1.48      -2      5 0.0355
## 9 alterl9      1863  2.97 1.68      3      3.14 1.48      -2      5 0.0389
## 10 alterl10    1863  2.31 1.38      2      2.28 1.48      -2      5 0.0321
## 11 alterl_m1   1847  3.17 0.829    3.2    3.21 0.890      1      5 0.0193
## 12 alterl_m2   1849  2.88 0.958    2.8    2.86 1.04      1      5 0.0223
```

3.3.3 Using `summarize()` and the `tidyverse`. As you may be aware, the `tidyverse` package provides powerful and flexible functions such as `filter`, `select`, `group_by`, and `summarize`. Here is an example demonstrating how these functions can be utilized to create descriptive statistic tables:

```
descriptives <- dfdta |>
  # filter(alterl1 > 0) |>
  group_by(geschlecht) |>
  summarize(
    Mean = mean(alterl1)
    , Count = n()
    , SD = sd(alterl1)
    , Min = min(alterl1)
    , Max = max(alterl1)
  )
```

```
descriptives
```

```
## # A tibble: 2 x 6
##   geschlecht   Mean Count      SD Min      Max
##   <dbl+lbl>   <dbl> <int> <dbl> <dbl+lbl> <dbl+lbl>
## 1 1 [Männlich]  2.71   927  1.50 -2 [Weiß nicht] 5 [Sehr stark]
## 2 2 [Weiblich]  2.60   936  1.72 -2 [Weiß nicht] 5 [Sehr stark]
```

3.4 Make APA Tables using `apa_table()`

The R output shown above might not meet publishable standards as it requires proper formatting, including a table with a caption and adherence to APA rules. To achieve this, the `apa_table()` function is recommended, and further details can be found in Aust and Barth (2020, sec. 4.2).

```
apa_table(
  sumstat_alter
  , caption = "Summary Statistics: Experience of Ageing."
  , note = "This table contains all variables of `alterl*`."
  , escape = TRUE
)
```

```
apa_table(
  sumstat_alter_psych
  , caption = "Summary Statistics: Experience of Ageing (psych)"
```

Table 1

Summary Statistics: Experience of Ageing.

variable	n	min	max	q1	median	q3
alterl1	1,863.00	-2.00	5.00	1.00	3.00	4.00
alterl2	1,863.00	-2.00	5.00	2.00	4.00	4.00
alterl3	1,863.00	-2.00	5.00	1.00	2.00	3.00
alterl4	1,863.00	-2.00	5.00	2.00	3.00	4.00
alterl5	1,863.00	-2.00	5.00	2.00	3.00	4.00
alterl6	1,863.00	-2.00	5.00	2.00	4.00	5.00
alterl7	1,863.00	-2.00	5.00	2.00	3.00	4.00
alterl8	1,863.00	-2.00	5.00	1.00	3.00	4.00
alterl9	1,863.00	-2.00	5.00	2.00	3.00	4.00
alterl10	1,863.00	-2.00	5.00	1.00	2.00	3.00

Note. This table contains all variables of ‘alterl*’.

```

, note = "This table contains all variables of `alterl*`."
, escape = TRUE
)

apa_table(
  descriptives
  , caption = "Experience of Ageing: Valuing Relationships and Other People
  More (By Gender)"
  , escape = TRUE
)

```

Table 2

Summary Statistics: Experience of Ageing (psych)

Question	n	mean	sd	median	trimmed	mad	min	max	se
alterl1	1,863.00	2.66	1.61	3.00	2.76	1.48	-2.00	5.00	0.04
alterl2	1,863.00	3.28	1.45	4.00	3.43	1.48	-2.00	5.00	0.03
alterl3	1,863.00	2.35	1.28	2.00	2.28	1.48	-2.00	5.00	0.03
alterl4	1,863.00	2.76	1.72	3.00	2.96	1.48	-2.00	5.00	0.04
alterl5	1,863.00	2.99	1.66	3.00	3.20	1.48	-2.00	5.00	0.04
alterl6	1,863.00	3.40	1.38	4.00	3.54	1.48	-2.00	5.00	0.03
alterl7	1,863.00	3.24	1.32	3.00	3.33	1.48	-2.00	5.00	0.03
alterl8	1,863.00	2.71	1.53	3.00	2.68	1.48	-2.00	5.00	0.04
alterl9	1,863.00	2.97	1.68	3.00	3.14	1.48	-2.00	5.00	0.04
alterl10	1,863.00	2.31	1.38	2.00	2.28	1.48	-2.00	5.00	0.03
alterl_m1	1,847.00	3.17	0.83	3.20	3.21	0.89	1.00	5.00	0.02
alterl_m2	1,849.00	2.88	0.96	2.80	2.86	1.04	1.00	5.00	0.02

Note. This table contains all variables of ‘alterl*’.

Table 3
Experience of Ageing: Valuing Relationships and Other People More (By Gender)

geschlecht	Mean	Count	SD	Min	Max
1	2.71	927	1.50	-2	5
2	2.60	936	1.72	-2	5

Table 1 was created with the function `get_summary_stats()` of the `rstatix` package (Kassambara, 2023), Tables 2 and 4 were created with the function `describe()` of the `psych` package (William Revelle, 2023), and Table 3 was created with the function `summarize()` of the `dplyr` package (Wickham, François, Henry, Müller, & Vaughan, 2023).

3.5 Use the Likert Scale using `gglikert()`

We have seen that the data contain not only the five different (Likert scaled) answers. Thus, let us remove all values that have, in one or multiple questions, no answer of the Likert scale. The cleaned dataset is named `df_alterl_balance`.

```
df_alterl_balance <- df_alterl %>%
  rowwise() %>%
  mutate(has_negative = ifelse(any(c(across(alterl1:alterl10)) < 0), 1, 0)) |>
  filter(has_negative == 0) |>
  select(starts_with("alter")) |>
  as_tibble()
```

Using the `gglikert()` of the `ggstats` package (Larmarange, 2023) allows us to draw nice graphs. I highly recommend reading the vignette of the package in the R documentation which you get with `vignette("gglikert")`.

Figures 1 and 3 shows the proportions of answers using `df_alterl` data and Figures 2 and 4 does so using the `df_alterl_balance` data whereby the latter to show the proportions stacked. Do you see any difference and can you explain the differences?

```
gglikert(df_alterl,
  exclude_fill_values = c("Weiß nicht", "Verweigert"),
  sort = "ascending"
)
```

Figure 1. Experience of Ageing: Proportions of Answers (`df_alterl`)

```
gglikert(df_alterl_balance,
  sort = "ascending"
)
```

Figure 2. Experience of Ageing: Proportions of Answers (`df_alterl_balance`)

Table 4

Summary Statistics: Experience of Ageing - balanced (psych)

Question	n	mean	sd	median	trimmed	mad	min	max	se
alterl1	1,596.00	2.89	1.28	3.00	2.87	1.48	1.00	5.00	0.03
alterl2	1,596.00	3.44	1.22	4.00	3.55	1.48	1.00	5.00	0.03
alterl3	1,596.00	2.33	1.15	2.00	2.23	1.48	1.00	5.00	0.03
alterl4	1,596.00	3.16	1.16	3.00	3.20	1.48	1.00	5.00	0.03
alterl5	1,596.00	3.32	1.15	4.00	3.40	1.48	1.00	5.00	0.03
alterl6	1,596.00	3.38	1.26	4.00	3.46	1.48	1.00	5.00	0.03
alterl7	1,596.00	3.21	1.19	3.00	3.24	1.48	1.00	5.00	0.03
alterl8	1,596.00	2.66	1.43	2.00	2.57	1.48	1.00	5.00	0.04
alterl9	1,596.00	3.27	1.27	3.00	3.34	1.48	1.00	5.00	0.03
alterl10	1,596.00	2.35	1.17	2.00	2.26	1.48	1.00	5.00	0.03

Note. This table contains all variables of ‘alterl*’ and only observations where all questions had been answered.

```
gglikert_stacked(df_alterl,
  sort = "ascending",
  sort_method = "mean"
)
```

Figure 3. Experience of Ageing: Proportions of Answers - Stacked (df_alter)

```
gglikert_stacked(df_alterl_balance,
  sort = "ascending",
  sort_method = "mean"
)
```

Figure 4. Experience of Ageing: Proportions of Answers - Stacked (df_alterl_balance)

As we are interested in the differences of the two samples, it makes sense to look at the summary statistics for the `df_alterl_balance` sample. This is shown in Table 4.

```
sumstat_alter_psych_bal <- df_alterl_balance |>
  psych::describe() |>
  as_tibble(rownames="Question") |>
  dplyr::select(-skew, -kurtosis, -range, -vars)

apa_table(
  sumstat_alter_psych_bal
  , caption = "Summary Statistics: Experience of Ageing - balanced (psych)"
  , note = "This table contains all variables of `alterl*` and only observations where all"
  , escape = TRUE
)
```

4 Cross-Referencing in R Markdown

In adherence to the APA style guidelines (Association et al., 2022), it is imperative to reference all figures and tables by their respective numbers within the text. Avoid using generic phrases like “the table above” or “the figure below.” Additionally, refrain from hard-coding the numbers for a more dynamic and standardized approach. Xie, Dervieux, and Riederer (2023) explains concisely how to do that with R Markdown, see: <https://bookdown.org/yihui/rmarkdown-cookbook/cross-ref.html>.

For example, I can refer to Table 1 with `\@ref(tab:tabrstatix)` because I have specified the corresponding label in the R code-chunk, see:

```
```{r tabrstatix, echo=TRUE}
apa_table(
 sumstat_alter
 , caption = "Summary Statistics: Experience of Ageing."
 , note = "This table contains all variables of `alterl*`."
 , escape = TRUE
)
```
```

`\clearpage`

Exercises

1. With ``knitr::purl("desc_NRW80.Rmd")`` you can extract the whole R code from the R Markdown file.
2. The dataset ``gesis.RData`` comes with two different tibbles: ``dfsav`` and ``dfdta``. Is there a difference in the variables?
3. Check possible differences in the ``gglikert`` plots when using ``df_alterl_un`` instead of ``df``.
4. The stats above show that dealing with missing or non-standard answers is a crucial thing when working with survey data.
5. The labels of the variables ``alterl1:alterl10`` have "Alternserleben: " at the beginning.

```
```r
Remove the common prefix from all variables
df <- df |>
 mutate_all(~ set_label(., gsub("^Alternserleben: ", "", get_label(.))))
```

### References

- Association, A. P. et al. (2022). *Publication manual of the american psychological association*. : American Psychological Association.
- Aust, F., & Barth, M. (2020). *Papaja: Reproducible APA manuscripts with r markdown*. Retrieved from [https://frederikaust.com/papaja\\_man/](https://frederikaust.com/papaja_man/)
- Aust, F., & Barth, M. (2023). *papaja: Prepare reproducible APA journal articles with R Markdown*. Retrieved from <https://github.com/crsh/papaja>
- Firke, S. (2023). *Janitor: Simple tools for examining and cleaning dirty data*. Retrieved from <https://CRAN.R-project.org/package=janitor>
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