

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

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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

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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(tinylab,
               papaja,
               haven,
               labelled,
               janitor,
               skimr,
               rstatix,
               HH,
               likert,
               expss,
               tidyr,
               ggstats,
               psych,
               sjlabelled,
               sjmisc,
               tidyverse,
               MASS,
               dplyr,
               magick)

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/blas/libblas.so.3.11.0
## LAPACK: /usr/lib/x86_64-linux-gnu/lapack/liblapack.so.3.11.0
##
## locale:
##  [1] LC_CTYPE=en_US.UTF-8      LC_NUMERIC=C
##  [3] LC_TIME=en_US.UTF-8      LC_COLLATE=en_US.UTF-8
```

```
## [5] LC_MONETARY=en_US.UTF-8    LC_MESSAGES=en_US.UTF-8
## [7] LC_PAPER=en_US.UTF-8       LC_NAME=C
## [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_US.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] grid      stats      graphics  grDevices  utils      datasets  methods
## [8] base
##
## other attached packages:
## [1] magick_2.8.2      lubridate_1.9.3    forcats_1.0.0
## [4] stringr_1.5.1     dplyr_1.1.4        purrr_1.0.2
## [7] readr_2.1.4       tibble_3.2.1       tidyverse_2.0.0
## [10] sjmisc_2.8.9      sjlabelled_1.2.0   psych_2.3.12
## [13] ggstats_0.5.1     tidyr_1.3.0        expss_0.11.6
## [16] maditr_0.8.3      likert_1.3.5       xtable_1.8-4
## [19] ggplot2_3.4.4     HH_3.1-49          gridExtra_2.3
## [22] multcomp_1.4-25   TH.data_1.1-2      MASS_7.3-60
## [25] survival_3.5-7    mvtnorm_1.2-4      latticeExtra_0.6-30
## [28] lattice_0.22-5    rstatix_0.7.2      skimr_2.1.5
## [31] janitor_2.2.0     labelled_2.12.0    haven_2.5.4
## [34] papaja_0.1.2      tinylabels_0.2.4   pacman_0.5.1
##
## loaded via a namespace (and not attached):
## [1] colorspace_2.1-0  deldir_2.0-2       ellipsis_0.3.2     estimability_1.4.1
## [5] snakecase_0.11.1  htmlTable_2.4.2    parameters_0.21.3  base64enc_0.1-3
## [9] rstudioapi_0.15.0 fansi_1.0.6        codetools_0.2-19   splines_4.2.2
## [13] leaps_3.1         mnormt_2.1.1       knitr_1.45         Formula_1.2-5
## [17] jsonlite_1.8.8    broom_1.0.5        cluster_2.1.6      Rmpfr_0.9-4
## [21] png_0.1-8         effectsize_0.8.6   shiny_1.8.0        compiler_4.2.2
## [25] emmeans_1.9.0     backports_1.4.1    Matrix_1.6-4       fastmap_1.1.1
## [29] cli_3.6.2         later_1.3.2        htmltools_0.5.7    tools_4.2.2
## [33] gmp_0.7-3         coda_0.19-4        gtable_0.3.4       glue_1.6.2
## [37] reshape2_1.4.4    Rcpp_1.0.11        carData_3.0-5      vctr_0.6.5
## [41] nlme_3.1-164      lmtest_0.9-40      insight_0.19.7     xfun_0.41
## [45] timechange_0.2.0  mime_0.12          lifecycle_1.0.4    zoo_1.8-12
## [49] scales_1.3.0      hms_1.1.3          promises_1.2.1     parallel_4.2.2
## [53] sandwich_3.1-0    RColorBrewer_1.1-3 yaml_2.3.8          rpart_4.1.23
## [57] stringi_1.8.3     bayestestR_0.13.1  checkmate_2.3.1    repr_1.1.6
## [61] matrixStats_1.2.0 rlang_1.1.2        pkgconfig_2.0.3    evaluate_0.23
## [65] htmlwidgets_1.6.4 tidyselect_1.2.0   plyr_1.8.9         magrittr_2.0.3
## [69] bookdown_0.37     R6_2.5.1           generics_0.1.3     Hmisc_5.1-1
## [73] pillar_1.9.0      foreign_0.8-86     withr_2.5.2        datawizard_0.9.1
## [77] abind_1.4-5       nnet_7.3-19        car_3.1-2          interp_1.1-5
## [81] utf8_1.2.4        tzdb_0.4.0         rmarkdown_2.25     jpeg_0.1-10
```

```
## [85] data.table_1.14.10 vcd_1.4-12          digest_0.6.33      httpuv_1.6.13
## [89] munsell_0.5.0
```

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/courses/ewa/ewa_all/rmd_desc"

load("../data/gesis.RData")
df <- dfdta |>
  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,
         alter12,
         alter13,
         alter14,
         alter15,
         alter16,
         alter17,
         alter18,
         alter19,
         alter110) |>
  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
## Min.   :-2.000   Min.   :-2.000   Min.   :-2.000   Min.   :-2.000
## 1st Qu.: 1.000   1st Qu.: 2.000   1st Qu.: 1.000   1st Qu.: 2.000
## Median : 3.000   Median : 4.000   Median : 2.000   Median : 3.000
## Mean   : 2.656   Mean    : 3.282   Mean    : 2.349   Mean    : 2.763
## 3rd Qu.: 4.000   3rd Qu.: 4.000   3rd Qu.: 3.000   3rd Qu.: 4.000
## Max.   : 5.000   Max.    : 5.000   Max.    : 5.000   Max.    : 5.000
##      alterl5      alterl6      alterl7      alterl8
## Min.   :-2.00    Min.   :-2.000   Min.   :-2.000   Min.   :-2.000
## 1st Qu.: 2.00    1st Qu.: 2.000   1st Qu.: 2.000   1st Qu.: 1.000
## Median : 3.00    Median : 4.000   Median : 3.000   Median : 3.000
## Mean   : 2.99    Mean    : 3.405   Mean    : 3.237   Mean    : 2.712
## 3rd Qu.: 4.00    3rd Qu.: 5.000   3rd Qu.: 4.000   3rd Qu.: 4.000
## Max.   : 5.00    Max.    : 5.000   Max.    : 5.000   Max.    : 5.000
##      alterl9      alterl10
## Min.   :-2.000   Min.   :-2.000
## 1st Qu.: 2.000   1st Qu.: 1.000
## Median : 3.000   Median : 2.000
## Mean   : 2.969   Mean    : 2.305
## 3rd Qu.: 4.000   3rd Qu.: 3.000
## 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
##
## $alter12
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      36      4      196      245      379      648      355
##
## $alter13
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      20      3      500      577      403      244      116
##
## $alter14
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##     122      8      222      260      527      543      181
##
## $alter15
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##     101      4      199      211      452      680      216
##
## $alter16
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      19      3      149      324      358      537      473
##
## $alter17
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      20      2      145      362      471      525      338
##
## $alter18
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      20      3      516      350      325      340      309
##
## $alter19
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark Sehr stark
##      83     10      261      228      425      564      292
##
## $alter110
## .

```

## 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_alter1 |>
  map(~ proportions(table(.)))

## $alter1
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark
## 0.042941492 0.003220612 0.209339775 0.142780462 0.242082662 0.274288782
## Sehr stark
## 0.085346216
##
## $alter12
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark
## 0.019323671 0.002147075 0.105206656 0.131508320 0.203435319 0.347826087
## Sehr stark
## 0.190552872
##
## $alter13
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark
## 0.010735373 0.001610306 0.268384326 0.309715513 0.216317767 0.130971551
## Sehr stark
## 0.062265164
##
## $alter14
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark
## 0.065485776 0.004294149 0.119162641 0.139559850 0.282877080 0.291465378
## Sehr stark
## 0.097155126
##
## $alter15
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark
## 0.054213634 0.002147075 0.106816962 0.113258186 0.242619431 0.365002684
## Sehr stark
## 0.115942029
##
## $alter16
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark
```

```
## 0.010198604 0.001610306 0.079978529 0.173913043 0.192163178 0.288244767
## Sehr stark
## 0.253891573
##
## $alterl7
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark
## 0.010735373 0.001073537 0.077831455 0.194310252 0.252818035 0.281803543
## Sehr stark
## 0.181427805
##
## $alterl8
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark
## 0.010735373 0.001610306 0.276972625 0.187869028 0.174449812 0.182501342
## Sehr stark
## 0.165861514
##
## $alterl9
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark
## 0.044551798 0.005367687 0.140096618 0.122383253 0.228126677 0.302737520
## Sehr stark
## 0.156736447
##
## $alterl10
## .
## Weiß nicht Verweigert Gar nicht Ein wenig Mäßig Stark
## 0.023617821 0.003757381 0.288244767 0.232420827 0.260869565 0.134728932
## Sehr stark
## 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_alter1 |>
  map(~ tabyl(.))
```

```
## $alter11
##   .    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
##
## $alter12
##   .    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
##
## $alter13
##   .    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
##
## $alter14
##   .    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
##
## $alter15
##   .    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://strengeljacke.de/sjmisc-cheatsheet.pdf>. Also worth a reading is `browseVignettes("sjmisc")`.

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

```
df_alterl1 |>
  map(~ frq(. , show.na = T))
```

```
## $alterl1
## 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>
##
## $alterl2
## 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>
```

```
##
```

```
## $alterl3
```

```
## 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>
```

```
##
```

```
## $alterl4
```

```
## 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>
```

```
##
```

```
## $alterl5
```

```
## 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>
##
## $alterl6
## 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 |      <NA> |  537 | 28.82 |  28.82 |  74.61
##    7 |      <NA> |  473 | 25.39 |  25.39 | 100.00
##   <NA> |      <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 |      <NA> | 525 | 28.18 | 28.18 | 81.86
##      7 |      <NA> | 338 | 18.14 | 18.14 | 100.00
## <NA> |      <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
## Min.   :-2.000 Min.   :-2.000 Min.   :-2.000 Min.   :-2.000
## 1st Qu.: 1.000 1st Qu.: 2.000 1st Qu.: 1.000 1st Qu.: 2.000
## Median : 3.000 Median : 4.000 Median : 2.000 Median : 3.000
## Mean   : 2.656 Mean   : 3.282 Mean   : 2.349 Mean   : 2.763
## 3rd Qu.: 4.000 3rd Qu.: 4.000 3rd Qu.: 3.000 3rd Qu.: 4.000
## Max.   : 5.000 Max.   : 5.000 Max.   : 5.000 Max.   : 5.000
##
##      alterl5      alterl6      alterl7      alterl8
## Min.   :-2.00 Min.   :-2.000 Min.   :-2.000 Min.   :-2.000
## 1st Qu.: 2.00  1st Qu.: 2.000 1st Qu.: 2.000 1st Qu.: 1.000
## Median : 3.00  Median : 4.000 Median : 3.000 Median : 3.000
## Mean   : 2.99  Mean   : 3.405 Mean   : 3.237 Mean   : 2.712
## 3rd Qu.: 4.00  3rd Qu.: 5.000 3rd Qu.: 4.000 3rd Qu.: 4.000
## Max.   : 5.00  Max.   : 5.000 Max.   : 5.000 Max.   : 5.000
##
##      alterl9      alterl10      alter_int      alter_cont
## Min.   :-2.000 Min.   :-2.000 Min.   : 80.00 Min.   : 80.11
## 1st Qu.: 2.000 1st Qu.: 1.000 1st Qu.: 82.00 1st Qu.: 82.99
## Median : 3.000 Median : 2.000 Median : 86.00 Median : 86.59
## Mean   : 2.969 Mean   : 2.305 Mean   : 86.48 Mean   : 86.98
## 3rd Qu.: 4.000 3rd Qu.: 3.000 3rd Qu.: 90.00 3rd Qu.: 90.56
## Max.   : 5.000 Max.   : 5.000 Max.   :102.00 Max.   :102.92
##                                     NA's :6      NA's :6
##      alterl_m1      alterl_m2      alterp      ALT_agegroup
## Min.   :1.000 Min.   :1.000 Min.   : -4.000 Min.   :1.000
## 1st Qu.:2.600 1st Qu.:2.200 1st Qu.: -4.000 1st Qu.:1.000
## Median :3.200 Median :2.800 Median : -4.000 Median :2.000
## Mean   :3.168 Mean   :2.877 Mean   :  2.632 Mean   :1.883
```

```
## 3rd Qu.:3.800 3rd Qu.:3.600 3rd Qu.: -4.000 3rd Qu.:3.000
## Max. :5.000 Max. :5.000 Max. :99.000 Max. :3.000
## NA's :16 NA's :14
## ALT_sex famst1 famst7 demtectcorr
## Min. :1.000 Min. : -1.000 Min. : -3.000 Min. : -11.000
## 1st Qu.:1.000 1st Qu.: 1.000 1st Qu.: -3.000 1st Qu.: -1.000
## Median :2.000 Median : 4.000 Median : 0.000 Median : 0.000
## Mean :1.502 Mean : 2.765 Mean : -1.179 Mean : -1.742
## 3rd Qu.:2.000 3rd Qu.: 4.000 3rd Qu.: 0.000 3rd Qu.: 0.000
## 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")
```

```
## Warning: attributes are not identical across measure variables; they will be
## dropped
```

```
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>
## 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)
```

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*':

```
)

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

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

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(alter1:alter10)) < 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_alter1` data and Figures 2 and 4 does so using the `df_alter1_balance` data whereby the latter to show the proportions stacked. Do you see any difference and can you explain the differences?

```
gglikert(df_alter1,
  exclude_fill_values = c("Weiß nicht", "Verweigert"),
  sort = "ascending"
)
```

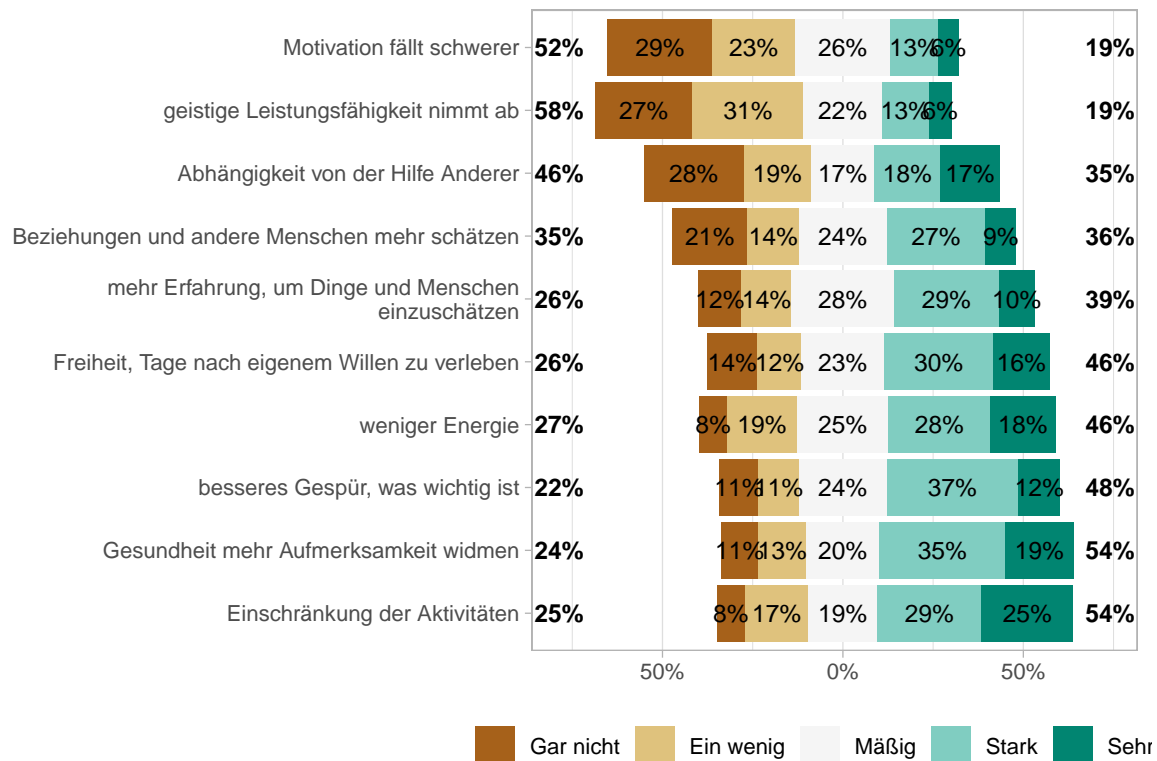


Figure 1. Experience of Ageing: Proportions of Answers (`df_alter1`)

```
gglikert(df_alter1_balance,
  sort = "ascending"
)
```

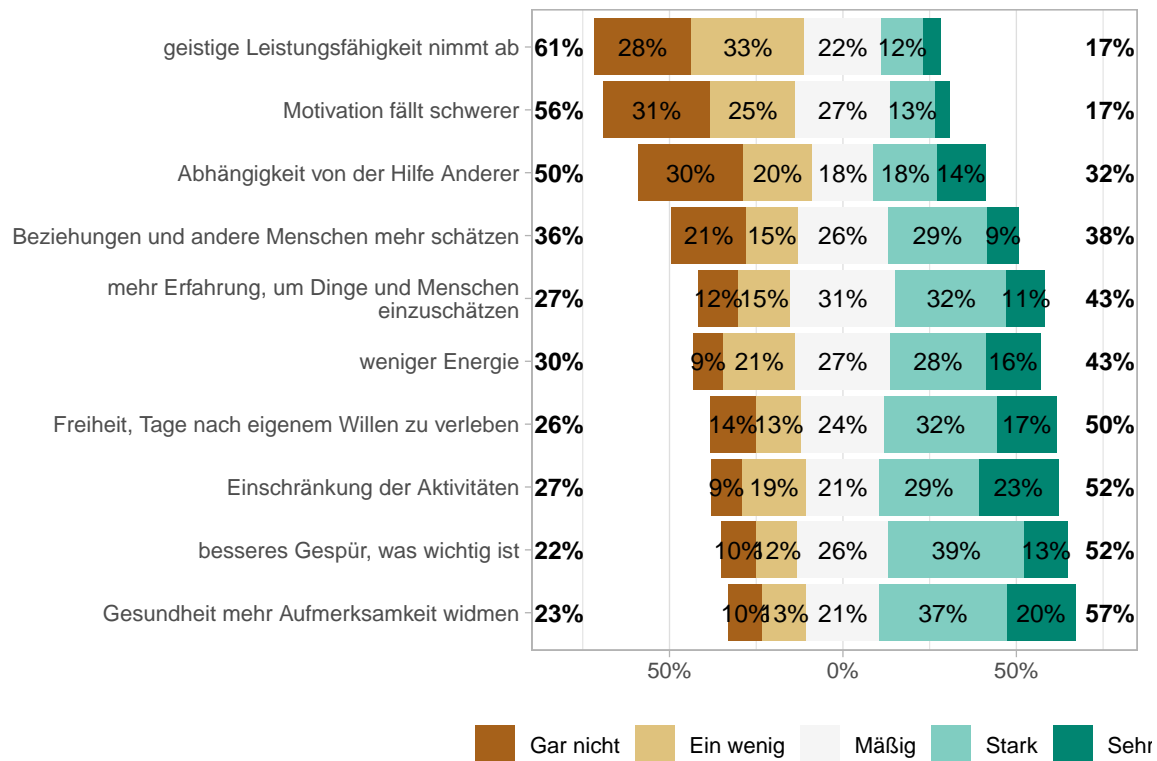


Figure 2. Experience of Ageing: Proportions of Answers (df_alterl_balance)

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

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

As we are interested in the differences of the two samples, it makes sense to look at the summary statistics for the df_alter_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)"
)
```

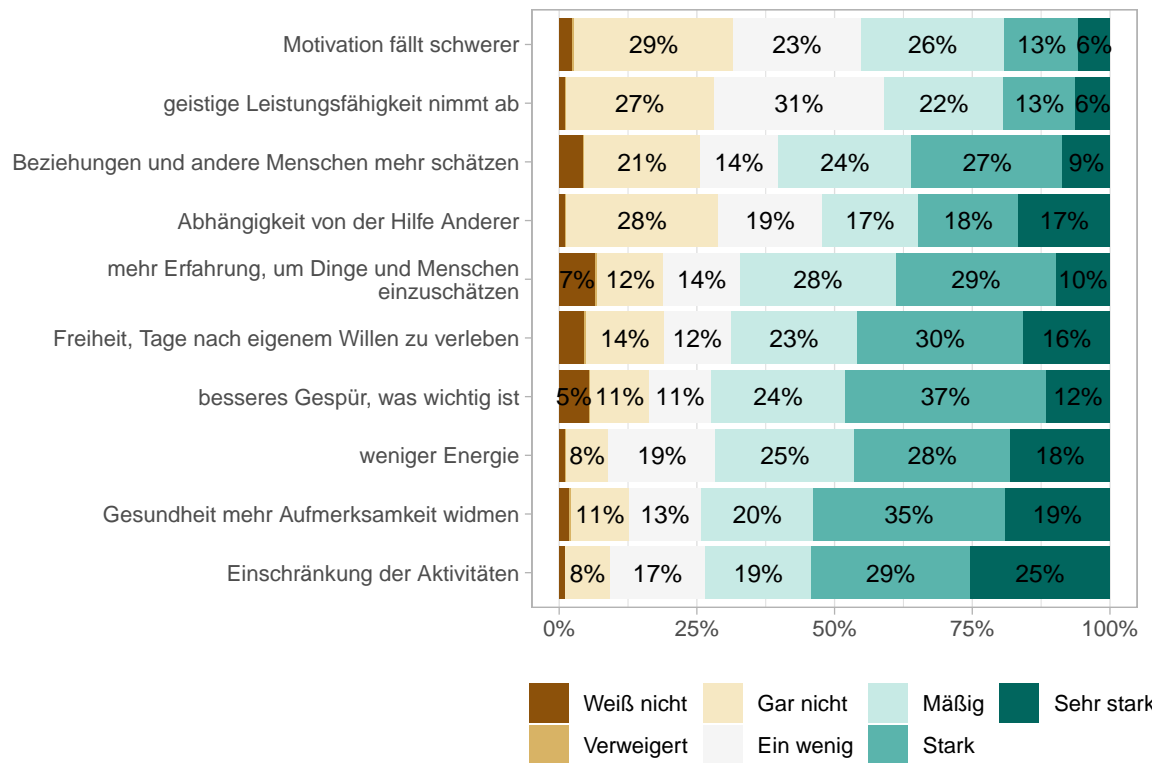


Figure 3. Experience of Ageing: Proportions of Answers - Stacked (df_alter)

```
, note = "This table contains all variables of `alterl*` and only observations where all
, escape = TRUE
)
```

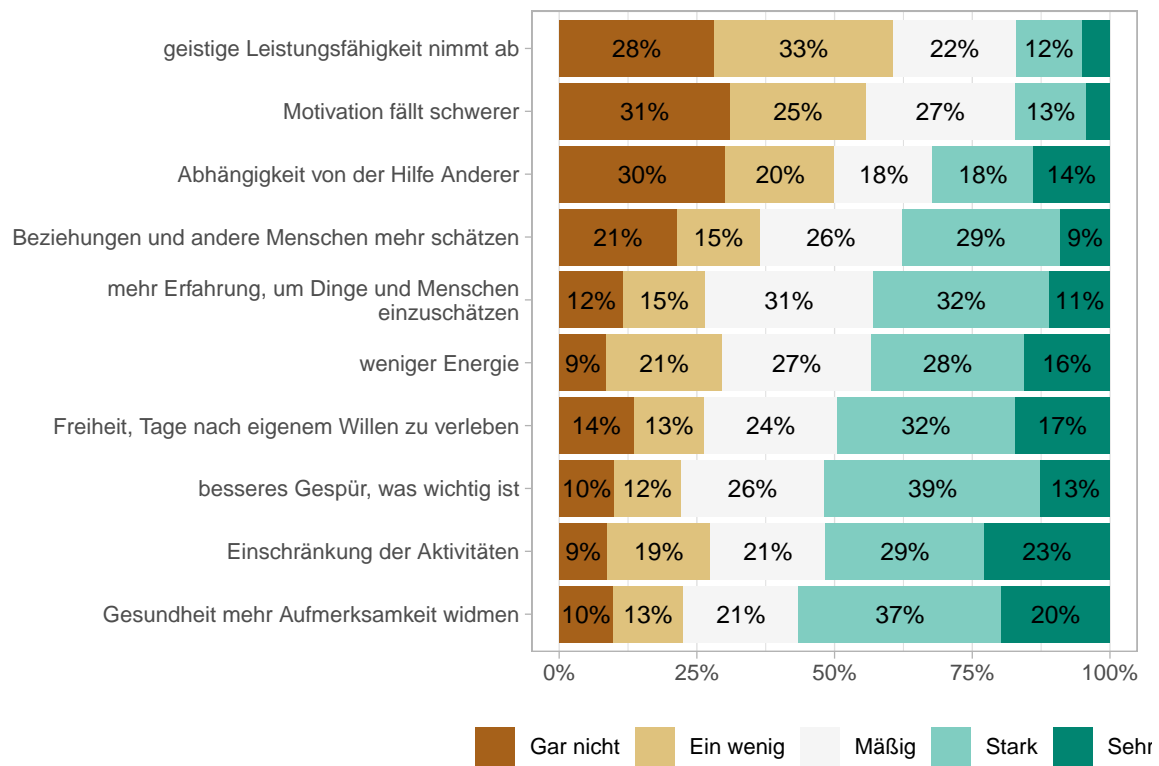


Figure 4. Experience of Ageing: Proportions of Answers - Stacked (df_alterl_balance)

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.

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>
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