Evaluation Randomisiert-Kontrollierter Studien und Experimente mit R

Missing Data

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Missing Data-Mechanismen

"Obviously the best way to treat missing data is not to have them."
Orchard & Woodbury (1972)

Fehlende Werte sind, insbesondere in der medizinischen und psychologischen Forschung, häufig unvermeidbar!

Der Umgang mit fehlenden Werten in der (medizinisch-psychologischen) Forschung ist oftmals mangelhaft:

- Verteilung fehlender Werte nicht transparent berichtet
- Unpassendes missing data handling (z.B. listwise deletion)
- Adäquate Imputationsmethoden (z.B. MI, FIML) häufig nicht benutzt, inadäquat angewendet, oder unzureichend berichtet

R **macht es nicht (automatisch) "richtig"**

```
y <- 1:10
x <- c(1, NA, NA, NA, 3, 5, 8, 10, -1, 10)
summary(lm(y ~ x))

## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.9403     1.7738    2.785   0.0387 *
## x             0.3172     0.2709    1.171   0.2945
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.904 on 5 degrees of freedom
##    (3 observations deleted due to missingness)
```

Taxonomie: Gründe für fehlende Werte in klinischen Studien

- **Instrumente**: Response Burden, zu langes Assessment.

- **Teilnehmende**: Überforderung, Privatsphäre-Bedenken, Movationsprobleme (Dropout)

- **Center**: Inadäquate Umsetzung des Studienmethodik, Personalmangel

- **Personal**: Falsche Datenerfassung, Datenverlust, falsche Dateneingabe

- **Studie**: Technische Fehler, Zeitverzögerungen bei Follow-Ups

Palmer et al. (2018)

Second Section

Bulleted Lists

- Element A
- Element B
  - B.1
  - B.2
- Element C

Elements

```
The theme provides sensible defaults to
\emph{emphasize} text, \alert{accent} parts
or show \textbf{bold} results.

In Markdown, you can also use _emphasize_ and **bold**.
```

becomes

The theme provides sensible defaults to *emphasize* text, accent parts or show **bold** results (Arendt, 1989; Bandersson & Cuijpers, 2009; Smit et al., 2006)
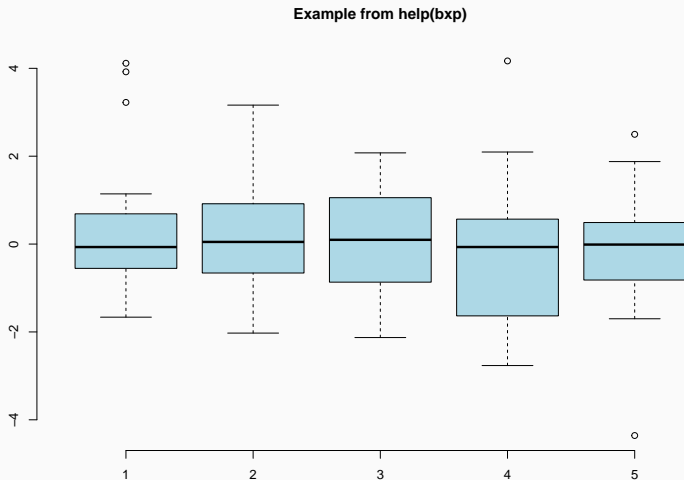
.

In Markdown, you can also use *emphasize* and **bold**.

$$e = \lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^n$$

The following code generates the plot on the next slide (taken from `help(bxp)` and modified slightly):

```r
library(stats)
set.seed(753)
bx.p <- boxplot(split(rt(100, 4),
                      gl(5, 20)), plot=FALSE)
bxp(bx.p, notch = FALSE, boxfill = "lightblue",
    frame = FALSE, outl = TRUE,
    main = "Example from help(bxp)")
```

Example from help(bxp)

A simple `knitr::kable` example:

```r
knitr::kable(mtcars[1:5, 1:8],
             caption="(Parts of) the mtcars dataset")
```

Table 1: (Parts of) the mtcars dataset

	mpg	cyl	disp	hp	drat	wt	qsec	vs
Mazda RX4	21.0	6	160	110	3.90	2.620	16.46	0
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875	17.02	0
Datsun 710	22.8	4	108	93	3.85	2.320	18.61	1
Hornet 4 Drive	21.4	6	258	110	3.08	3.215	19.44	1
Hornet Sportabout	18.7	8	360	175	3.15	3.440	17.02	0

As one example of falling back into LaTeX, consider the example of three different block environments are pre-defined and may be styled with an optional background color.

Default

Block content.

Alert

Block content.

Example

Block content.

For more information:

- See the Metropolis repository for more on Metropolis
- See the RMarkdown repository for more on RMarkdown
- See the binb repository for more on binb
- See the binb vignettes for more examples.

Arendt, H. (1989). *Vom leben des geistes, band 2, das wollen. Aus dem amerikanischen von hermann vetter*. Piper.

Bandersson, G., & Cuijpers, P. (2009). Internet-based and other computerized psychological treatments for adult depression: A meta-analysis. *Cognitive Behaviour Therapy*, *38*(4), 196–205.

Orchard, T., & Woodbury, M. A. (1972). A missing information principle: Theory and applications. In *Theory of statistics* (pp. 697–716). University of California Press.

Palmer, M. J., Mercieca-Bebber, R., King, M., Calvert, M., Richardson, H., & Brundage, M. (2018). A systematic review and development of a classification framework for factors associated with missing patient-reported outcome data. *Clinical Trials*, *15*(1), 95–106.

Smit, H., Cuijpers, P., Oostenbrink, J., Batelaan, N., Graaf, R. de, & Beekman, A. (2006). Costs of nine common mental disorders: Implications for curative and preventive psychiatry. *The Journal of Mental Health Policy and Economics*, *9*(4), 193–200.