University of Hamburg

Master Thesis

Masterthesis_doc

Author:
Lona Frießner

Supervisor:
Prof. Dr. Simon Grund

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for the degree of Master of Science

in the

Institute of Psychology
Department of Psychology with focus on Quantitative Methods

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UNIVERSITY OF HAMBURG

Abstract

Institute of Psychology

Department of Psychology with focus on Quantitative Methods

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by Lona Frießner

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3.1 Data generation

A simulation study was conducted to compare the methods of missing data handling. (erklären, was eine Simulationsstudie ist)

Data was generated from a parametric model with known parameters.

3.2 Data-generating model

The data-generating model was a two-level random intercept model:

$$Y_{ij} = \gamma_{10} (X_{ij} - \bar{X}_{\cdot j}) + \gamma_{01} \bar{X}_{\cdot j} + \gamma_{02} W_j + u_{0j} + e_{ij} \tag{3.1}$$

The random effects are normally distributed with $u_{0j} \sim N(0, \psi^2)$ and $e_{ij} \sim N(0, \sigma^2)$ and independent of each other. Y_{ij}, X_{ij} and W_j are created as z-standardized variables, which means that they have a mean of zero and a variance of 1. First,

3.3 Missing data generation

3.4 Factors and simulation conditions

3.4.1 Constants

3.4.2 Level-2 sample size

As the small-sample performance of the methods is of interest, three different group sizes are used: - N2 = 15 - N2 = 30 - N2 = 60 These sizes are chosen to reflect McNeish´s (2017) summary that group sizes below 25 almost certainly face issues and below 50 there is a susceptibility to small sample biases. These sample sizes should therefore cover problematic, likely problematic and not problematic magnitudes. ### Effect size of the group-level effect { 01} The effect size of the group-level effect of X is varied between 0.0 and 0.30. This is to investigate the performance both with a null effect of the parameter of interest as well as a substantive effect.

3.4.3 ICC of X and residual Y

3.4.4 Missing data mechanism

Missing data mechanism is set to either MCAR or MAR. For MAR, the strength of relationship between W and missing of X is set to 0.4, which corresponds to 0.4^2 % 100% explanation of variance in missingness through W.

3.5 Methods of missing data handling

3.5.1 Estimands

3.5.2 Performance measures

3.6 Execution of simulation

Chapter 4

Results

options(kableExtra.latex.load_packages = FALSE)

```
here() starts at C:/Users/lonaf/Documents/masterthesis

Attache Paket: 'dplyr'

Die folgenden Objekte sind maskiert von 'package:stats':

    filter, lag

Die folgenden Objekte sind maskiert von 'package:base':

    intersect, setdiff, setequal, union

Attache Paket: 'kableExtra'

Das folgende Objekt ist maskiert 'package:dplyr':

    group_rows
```

TABLE 4.1: Simulation results (N2 = 15, $\gamma_{01} = 0.0$)

	CD			LD			MI-R			MI-a			Bayes		
	Bias	Cov	SD	Bias	Cov	SD	Bias	Cov	SD	Bias	Cov	SD	Bias	Cov	SD
ICC = 0.1															
MCAR															
γ_{01}	0.002	0.942	0.284	0.037	0.941	0.300	0.005	0.966	0.252	0.005	0.986	0.252	0.003	0.980	0.291
γ_{10}	-0.106	0.771	0.084	-0.106	0.831	0.104	-0.108	0.825	0.103	-0.108	0.831	0.103	-0.110	0.823	0.100
MAR															
γ_{01}	0.000	0.960	0.272	0.012	0.953	0.280	-0.001	0.942	0.278	-0.001	0.972	0.278	-0.003	0.980	0.288
γ_{10}	-0.099	0.776	0.089	-0.100	0.818	0.111	-0.105	0.822	0.108	-0.105	0.827	0.108	-0.106	0.816	0.108
ICC = 0.3															
MCAR															
γ_{01}	-0.002	0.949	0.283	0.031	0.947	0.284	0.007	0.970	0.247	0.007	0.985	0.247	0.001	0.987	0.289
γ_{10}	-0.100	0.782	0.087	-0.102	0.835	0.106	-0.107	0.820	0.104	-0.107	0.828	0.104	-0.107	0.806	0.102
MAR															
γ_{01}	-0.016	0.943	0.279	0.007	0.949	0.279	-0.014	0.943	0.275	-0.014	0.968	0.275	-0.016	0.975	0.291
γ_{10}	-0.099	0.800	0.087	-0.101	0.837	0.105	-0.104	0.841	0.102	-0.104	0.846	0.102	-0.105	0.842	0.101

Chapter 5

Discussion

References

McNeish, D. (2017). Small Sample Methods for Multilevel Modeling: A Colloquial Elucidation of REML and the Kenward-Roger Correction. *Multivariate Behavioral Research*, *52*(5), 661–670. https://doi.org/10.1080/00273171.2017.1344538