

Current Theses Topics

at the Department of Psychology with Focus on Quantitative Methods

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General information

Topics for final theses are regularly advertised at our department. In addition, you can also work on your own topics in the field of quantitative methods by prior arrangement.

A list of currently advertised topics can be found on the following pages. If you are interested in one of the topics, please send a short synopsis (max. 1 page) on the respective topic and a brief description of yourself to the supervisor named in the list. If you would like to work on your own topic, please contact the head of the department (simon.grund@uni-hamburg.de) with a specific topic proposal (incl. synopsis).

For general enquiries, please contact the secretary's office (sekretariat-grund.pb@uni-hamburg.de).

Notes on final theses

The master thesis should show the student's ability to work on and present a problem from an area of psychology according to scientific criteria. Master's theses in the field of "Quantitative Methods" mainly deal with the development and evaluation of statistical methods for psychological research, for example in the context of simulation studies or concrete case studies.

Theses in our research area are usually written in English. Exceptions are possible by prior agreement.

Topic	Effects of missing data on power and sample size calculations
Type	1-2 Bachelor theses
Supervisor	Prof. Dr. Simon Grund (simon.grund@uni-hamburg.de)
Description	<p>Missing data are a common problem in psychological research that can distort results and reduce statistical power, if it is not adequately handled. However, despite the well-known effects of missing data, they are rarely considered when researchers perform power and sample size computations, resulting in target sample sizes that may be too small. The aim of this thesis (or theses) is to conduct a simulation study to explore the impact of missing data on power and sample size calculations for a common type of statistical analysis in psychological research (e.g., t-tests, regression, ANOVA).</p>
Literature	<p>Newman, D. A. (2014). Missing data: Five practical guidelines. <i>Organizational Research Methods</i>, 17, 372–411. https://doi.org/10.1177/1094428114548590</p> <p>Davey, A., & Savla, J. (2009). Estimating statistical power with incomplete data. <i>Organizational Research Methods</i>, 12, 320–346. https://doi.org/10.1177/1094428107300366</p>

Topic	Alternatives to repeated-measures ANOVA: A re-analysis of data from within-subjects experimental designs
Type	1 Bachelor thesis
Supervisor	Prof. Dr. Simon Grund (simon.grund@uni-hamburg.de)
Description	<p>The repeated-measures ANOVA (RM-ANOVA) is one of the most common methods for analyzing data from within-subjects experimental designs. However, in recent years, there have been a number of recommendations for alternative methods, which include multilevel models (MLMs) with random effects and linear models with robust variance estimation (RVE) for clustered data. The aim of this thesis is to conduct a series of case studies that apply these methods to existing data from within-subjects designs and compare them with regards to their results and their conceptual and practical advantages and disadvantages.</p>
Literature	<p>Barr, D. J., Levy, R., Scheepers, C., & Tily, H. J. (2013). Random effects structure for confirmatory hypothesis testing: Keep it maximal. <i>Journal of Memory and Language</i>, 68, 255–278. https://doi.org/10.1016/j.jml.2012.11.001</p> <p>Lee, Y. R., & Pustejovsky, J. E. (2024). Comparing random effects models, ordinary least squares, or fixed effects with cluster robust standard errors for cross-classified data. <i>Psychological Methods</i>, 29, 1084–1099. https://doi.org/10.1037/met0000538</p>

Topic	Repeated-measures ANOVA with incomplete data
Type	1 Bachelor thesis
Supervisor	Prof. Dr. Simon Grund (simon.grund@uni-hamburg.de)
Description	<p>The repeated-measures ANOVA (RM-ANOVA) is often used to investigate mean changes over time. In studies with multiple measurements over time, there are often significant amounts of missing data that can distort the results of statistical analyses if they are not adequately handled. For this reason, it has been suggested that researchers should consider alternatives to RM-ANOVA, such as structural equation modeling (SEM) and multilevel modeling (MLM), which allow handling missing data through maximum likelihood estimation and similar methods. The aim of this thesis is to conduct a simulation study to evaluate how well these methods can deal with missing data in the context of the RM-ANOVA.</p>
Literature	<p>Barr, D. J., Levy, R., Scheepers, C., & Tily, H. J. (2013). Random effects structure for confirmatory hypothesis testing: Keep it maximal. <i>Journal of Memory and Language</i>, 68, 255–278. https://doi.org/10.1016/j.jml.2012.11.001</p> <p>Langenberg, B., Helm, J. L., Günther, T., & Mayer, A. (2023). Understanding, testing, and relaxing sphericity of repeated measures ANOVA with manifest and latent variables using SEM. <i>Methodology</i>, 19, 60–95. https://doi.org/10.5964/meth.8415</p>

Topic	How many syntheses should be used when generating and analyzing synthetic data?
Type	1 Master thesis
Supervisor	Prof. Dr. Simon Grund (simon.grund@uni-hamburg.de)
Description	<p>Research in psychology has faced a credibility crisis, and “open data” is often considered an important step towards a more reproducible and credible psychological science. Unfortunately, data sharing is very rare. For this reason, it has been suggested that statistical methods such as synthetic data could be used to improve data sharing practices. Using this method, researchers can replace sensitive information with simulated values, resulting in copies of the data that can be shared more liberally and still allow other researchers to reproduce the findings of the original study. However, there are still many open questions about how synthetic data should best be generated and analyzed. The aim of this thesis is to conduct a simulation study that focuses on how the number of synthetic data sets affects the utility of the results obtained from synthetic data.</p>
Literature	<p>Quintana, D. S. (2020). A synthetic dataset primer for the biobehavioural sciences to promote reproducibility and hypothesis generation. <i>eLife</i>, 9(e53275), 1–12. https://doi.org/10.7554/eLife.53275</p> <p>Grund, S., Lüdtke, O., & Robitzsch, A. (2024). Using synthetic data to improve the reproducibility of statistical results in psychological research. <i>Psychological Methods</i>, 29, 789–806. https://doi.org/10.1037/met0000526</p>

Topic	Testing indirect effects in mediation analyses with incomplete data
Type	1 Master thesis
Supervisor	Prof. Dr. Simon Grund (simon.grund@uni-hamburg.de)
Description	<p>Mediation analyses are often used to investigate indirect effects, which are based on the idea that one variables' effect on a second variable is due, in part, to a third, intermittent variable. In practice, mediation analyses are often complicated by missing data, and many researchers address this problem with multiple imputation (MI) or similar methods. However, best-practice recommendations for estimating and testing indirect effects (e.g., the bootstrap) are difficult to apply in MI, and there are multiple strategies for combining them. The aim of this thesis is to conduct a simulation study to evaluate some of these strategies for testing indirect effects in MI.</p>
Literature	<p>MacKinnon, D. P., Lockwood, C. M., & Williams, J. (2004). Confidence limits for the indirect effect: Distribution of the product and resampling methods. <i>Multivariate Behavioral Research</i>, 39, 99–128. https://doi.org/10.1207/s15327906mbr3901_4</p> <p>Newman, D. A. (2014). Missing data: Five practical guidelines. <i>Organizational Research Methods</i>, 17, 372–411. https://doi.org/10.1177/1094428114548590</p>

Topic	Small-sample corrections in multilevel modeling with multiply imputed data
Type	1 Master thesis
Supervisor	Prof. Dr. Simon Grund (simon.grund@uni-hamburg.de)
Description	<p>Psychological researchers often use multilevel modeling to analyze multilevel data, which are characterized by a hierarchical (e.g., with persons nested in groups). In these types of data, sample sizes are often small, and missing data are a common nuisance. For this reason, it is recommended that researchers handle the missing data with modern methods such as multiple imputation (MI) and use multilevel modeling with small-sample corrections. However, there are different strategies for combining these methods, and little is known about which strategy works best. The aim of this thesis is to conduct a simulation study to evaluate some of the possible strategies for conducting multilevel modeling in small samples with missing data.</p>
Literature	<p>McNeish, D. (2017). Small sample methods for multilevel modeling: A colloquial elucidation of REML and the Kenward-Roger correction. <i>Multivariate Behavioral Research</i>, 52, 661–670. https://doi.org/10.1080/00273171.2017.1344538</p> <p>McNeish, D. M. (2017). Missing data methods for arbitrary missingness with small samples. <i>Journal of Applied Statistics</i>, 44, 24–39. https://doi.org/10.1080/02664763.2016.1158246</p>