USING R FOR STATISTICS AND ILLUSTRATIONS
PHD COURSE, FALL, 2021 (updated, v.4)

DEPARTMENT OF PSYCHOLOGY AND BEHAVIOURAL SCIENCES
AARHUS UNIVERSITY

Dates: **03/09-21, 15/10-21, 04/11-21, 25/11-21**

Time: **9.00-15.00**

Location: **Aarhus University – Building 1325, room 440**

Instructor: **Kaare Bro Wellnitz (KBW; kaare@psy.au.dk)**

Course description

Objective: The aim of this course is to provide participants with a broad, intermediate-level competence in using the statistics software R.

Content: The course begins with a thorough introduction into R-programming and how you work with data in R. Following this, it will be shown and discussed how basic/common as well as more advanced statistical analyses can be done in R. Basic/common analyses include correlation, multiple regression, ANOVA, and Chi-square (including non-parametric alternatives). Advanced analyses include exploratory factor analysis, structural equation modeling, and multilevel modeling. Lastly, it will be shown how advanced graphical illustrations of quantitative findings can be done using "ggplot2" (R-package).
Please note that this course assumes previous knowledge of mentioned methods of statistical analysis – focus of the course is R-programming, not the statistical analyses. No previous knowledge of programming is assumed.

It is recommended that if you need a brush-up on said statistical analyses, you review the relevant pages of statistical theory in e.g., Field, Miles & Field (2012).

Format and Evaluation: The course includes a combination of lectures, recorded video-instructions, and practical instructions using R. If COVID-19 allows, all teaching will be done in a physical classroom, but all content will furthermore be streamed and recorded using Zoom, allowing for full online participation.

Focus will be on giving participants hands-on experience with using R. Practical exercises will be assigned for each session; some of these exercises will be done collectively during the teaching day and others must be completed independently. Between each teaching day, a three-hour online R study-café is hosted – this study-café is meant for working on individual assignments, and attendance is voluntary. I will attend these study-cafés and be available for questions on R-programming.

In order to receive a certificate of completion and 3 ECTS points for the course, participants must attend all four days as well as passing the four assignments (one assignment pr course day).

Priority will be given to students who can attend all of the course. It is possible to attend specific modules if space is available but notice, that certification of attendance as well as ECTS is only awarded for full participation in the course.

Expected workload:
Preparation: 50-150 pages per course day (8 hours/day)
Classes: 6 hours/day
Homework assignments: 7 hours/assignment.

Sum: (8+6+7) * 4 = 84 hours (= 3,11 ECTS).

The due dates for the homework assignments are as follows (scheduled to allow for a few days after each voluntary online study-café):

Assignment 1: Monday, 27th of September at 23.59
Assignment 2: Tuesday, 2nd of November at 23.59
Assignment 3: Tuesday, 23rd of November at 23.59
Assignment 4: Tuesday, 7th of December at 23.59

Please upload assignment on Brightspace including R-code.

Important to do before course: Participants are expected to have a working installation of R and RStudio on their PC/Mac when we meet on the first course day. Both are available for free download at:

- R: https://cloud.r-project.org/
- RStudio: https://www.rstudio.com/products/rstudio/download/#download

If you experience problems, try using tutorials on Google/Youtube. If problems persist, send me an email on: kaare@psy.au.dk and I will try to help.

Getting in Contact with me
Open dialogue and co-operation is important to me, and I encourage you to use me to your best advantage. If you have questions about the class, special needs, or require clarification regarding the course requirements, please ask! Similarly, if you are having difficulty understanding something, don't stay quiet. I can't help you if you don't let me know that you're having trouble!

Readings and Resources: The core reading material is Field, Miles & Field (2012). *Discovering Statistics Using R, 1st Edition.* Sage Publications + small notes TBA.

A Brightspace webpage will be made for the course where I will upload R-code, Powerpoint slides, recordings, answers for the assignments, links to additional materials, etc. Announcements will also be posted on the course website throughout the semester, so please ensure you can receive emails from the system.

A detailed schedule and core reading lists for the course are provided on the following pages. As this is the first time this course is offered, minor modifications to the schedule may be required as the course progresses.

Detailed Course Schedule and Reading List

	Date	Content	Literature
1.	3/9-21	**Fundamentals** Working with R and RStudio Importing datasets Data-types and manipulating datasets. Simple simulation and plot (if time allows)	Field, Miles & Field (2012) chapter 3 Jensen (2017) (a nice short introduction to basic operations in R)
1*	17/9-21	**Study café for "Fundamentals"**	
2.	15/10-21	**Illustrations using ggplot2 and testing assumptions**	Field, Miles & Field (2012) chapter 4+5
2*	29/10-21	**Study café for "Illustrations…"**	
3.	04/11-21	**Tour de force in methods of statistical analysis in R (I)** Correlation Regression incl. logistic regression t-test ANOVA Chi-square	Field, Miles & Field (2012) (chapter 6-10 (pages describing implementation in R))
3*	19/11-21	**Study café for "Tour de force… (I)"**	
4.	25/11-21	**Tour de force in methods of statistical analysis in R (II)** Factor analysis Structural equation modeling (Lavaan) Multilevel modeling (nlme)	Field, Miles & Field (2012) (chapter 17+19 (pages describing implementation in R)) Rosseel (2021)
4*	03/12-21	**Study café for "Tour de force… (II)"**	

*: Voluntary, done online using Zoom from 12.30-15.30.

Core Readings:

Field, A., Miles, J. & Field, Z. (2012*). Discovering Statistics using R.* Sage Publications.

Jensen, J.L. (2017). *Introduktion til R (noter).* Institut for matematik.

Rosseel, Y. (2021). *The lavaan tutorial.* Available for free download at: https://www.lavaan.ugent.be/tutorial/tutorial.pdf

Additional Readings: