Multilevel Analysis of Group and (Intensive) Longitudinal Data

# General Information

**Objectives**: Participants learn about the basic principles of multilevel analysis and how to perform this analysis (with a special focus on multilevel analysis of experience sampling data).

**Type of instruction**: Lectures and practical

**Course load**: 3 full days

**Lecturers**: Dr. Joran Jongerling (<https://www.tilburguniversity.edu/staff/j-jongerling>) and Dr. Leonie Vogelsmeier (<https://www.tilburguniversity.edu/staff/l-v-d-e-vogelsmeier>)

**Contents**: Aim of the workshop is to provide an introduction to multilevel analysis on data of units at different levels (e.g., pupils nested within schools, employees nested within teams or organizations, patients nested within doctors, or observations nested in individuals [repeated measures]). Multilevel analysis will be amply illustrated using R, and participants get the opportunity to apply R to assignments and their own data as well.

**Instruction language**: English

**Compulsory reading**: We will use open-source material throughout the course, including publicly available e-books.

**Required prerequisites**: Sound knowledge of regression analysis

**Other remarks**: -Bring your own laptop. -Before each day, you are asked to do some recommended/mandatory readings required to finish the assignment in the practicals in time. For details, see Section “**Reading Material**”.

# Course Schedule

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| **Day 1** (02-06-2022): Room M020 | |
| 09:00 - 09:30 | Introduction / Logistics |
| 09:30 - 11:00 | Lecture 1: Modeling and Visualization |
| 11:00 - 12:30 | Exercise 1 |
| 12:30 - 13:30 | Lunch |
| 13:30 - 15:30 | Lecture 2: Dependent Data |
| 15:30 - 17:00 | Exercise 2 |
| 17:15 - | Drinks @ Esplanade |
| **Day 2** (08-06-2022): Room M020 | |
| 09:00 - 10:00 | Lecture 3: Steps of a Multilevel Analysis |
| 10:00 - 11:00 | Exercise 3 |
| 11:00 - 12:00 | Lecture 4: Common Issues and Three-level Models |
| 12:00 - 13:00 | Lunch |
| 13:00 - 14:00 | Exercise 4 |
| 14:00 - 15:30 | Lecture 5: Cross-Nested Data and Non-Normal Data |
| 15:30 - 17:00 | Exercise 5 |
| **Day 3** (09-06-2022): Room M020 | |
| 09:00 - 11:00 | Lecture 6: Longitudinal Data |
| 11:00 - 12:30 | Exercise 6 |
| 12:30 - 13:30 | Lunch |
| 13:30 - 15:30 | Lecture 7: Residual Structures and Intensive Longitudinal Data |
| 15:30 - 16:30 | Exercise 7 |
| 16:30 - 17:00 | Lecture 8: Open Issues and Closing |

Note: Given the dynamics of a live and interactive course, this schedule is tentative. Also, while the starting time for each day is definite, the ending times can vary a bit (by ±30 minutes). Also, shorter breaks are not indicated in the schedule, but we will take them as needed.

# Reading Material

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| Day | Type | Chapters |
| 1 | Suggested Preparation (to refresh regression knowledge) | * **Learning Statistical Models Through Simulation in R:**    + Chapter 1: <https://psyteachr.github.io/stat-models-v1/introduction.html>   + Chapter 2: <https://psyteachr.github.io/stat-models-v1/correlation-and-regression.html>   + Chapter 3: <https://psyteachr.github.io/stat-models-v1/multiple-regression.html> * **Beyond Multiple Linear Regression:**    + Chapter 1 (excluding sections 1.7 and 1.8) : <https://bookdown.org/roback/bookdown-BeyondMLR/ch-MLRreview.html#learning-objectives> |
| Mandatory Prepatation | * **Beyond Multiple Linear Regression:**   + Chapter 7 (excluding sections 7.8, 7.9, and 7.10): <https://bookdown.org/roback/bookdown-BeyondMLR/ch-corrdata.html> |
| 2 | Suggested Preparation (to recap day 1) | * **Learning Statistical Models Through Simulation in R:**    + Chapter 5: <https://psyteachr.github.io/stat-models-v1/introducing-linear-mixed-effects-models.html>   + Chapter 6: <https://psyteachr.github.io/stat-models-v1/linear-mixed-effects-models-with-one-random-factor.html> * **Beyond Multiple Linear Regression:**   + Chapter 8 (excluding the optional sections and section 8.7.2): <https://bookdown.org/roback/bookdown-BeyondMLR/ch-multilevelintro.html> |
| Mandatory Prepatation | * **Learning Statistical Models Through Simulation in R:**    + Chapter 8: <https://psyteachr.github.io/stat-models-v1/generalized-linear-mixed-effects-models.html> |
| 3 | Suggested Preparation (introducing multilevel analysis on longitudinal data) | * **Beyond Multiple Linear Regression:**    + Chapter 9: https://bookdown.org/roback/bookdown-BeyondMLR/ch-lon.html |
| Mandatory Prepatation | X |

In addition, we suggest the following readings to recap the day-2 material after the course:

* **Learning Statistical Models Through Simulation in R:** 
  + Chapter 7: <https://psyteachr.github.io/stat-models-v1/linear-mixed-effects-models-with-crossed-random-factors.html>
* **Beyond Multiple Linear Regression:** 
  + Chapter 11 (excluding sections 11.5 and 11.6): <https://bookdown.org/roback/bookdown-BeyondMLR/ch-GLMM.html>