
Applied Mixed Model Analysis

This practical book is designed for applied researchers who want to use mixed models with their data. It discusses the basic principles of mixed model analysis, including two-level and three-level structures, and covers continuous outcome variables, dichotomous outcome variables, and categorical and survival outcome variables. Emphasising interpretation of results, the book develops the most important applications of mixed models, such as the study of group differences, longitudinal data analysis, multivariate mixed model analysis, IPD meta-analysis and mixed model predictions. All examples are analysed with STATA, and an extensive overview and comparison of alternative software packages is provided. All datasets used in the book are available for download, so readers can reanalyse the examples to gain a strong understanding of the methods. Although most examples are taken from epidemiological and clinical studies, this book is also highly recommended for researchers working in other fields.

Jos W. R. Twisk specialises in the methodological field of longitudinal data analysis and multilevel/mixed model analysis, about which he has written three textbooks (all published by Cambridge University Press). He has also authored a textbook on applied biostatistics in Dutch. He is the director of the epidemiology masters program of the VU University Medical Center in Amsterdam and head of the Expertise Center for Applied Longitudinal Data Analysis. His main activities include applied methodological research, consulting and teaching courses on mixed model analysis, longitudinal data analysis, multilevel analysis, and applied basic statistics. He has authored or co-authored more than 700 peer-reviewed international papers.

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Applied Mixed Model Analysis

A Practical Guide

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To my parents

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Preface

This book is about applied mixed model analysis. The most important word in the title of this book is ‘applied’. Before reading this book, it is important to realise that the mathematical background of mixed model analysis will not be discussed in great detail. The emphasis here lies on the application of mixed model analysis. The book addresses questions like: ‘In what situations do we need to use mixed model analysis?’, ‘What kinds of choices do I have to make to perform a proper mixed model analysis?’ and ‘What do the results of a mixed model analysis actually mean?’

Many books have been written on mixed model analysis, but nearly all of them have been written by statisticians, and therefore they mainly focus on the mathematical background of mixed model analysis. The problem with that approach is that such books are very difficult to understand for non-mathematical researchers. And yet, these non-mathematical researchers are expected to use mixed model analysis to analyse their data. In fact, researchers are primarily interested not in the basic (mostly difficult) mathematical background of the statistical methods, but in finding correct answers to research questions. Furthermore, researchers want to know how to apply a statistical technique and how to interpret the results. Due to their different basic interests and different modes of thinking, communication problems between statisticians and applied researchers are quite common, and they often communicate on different levels. This, in addition to the growing interest in mixed model analysis, motivated the writing of this book. This book is written for non-statistical researchers, and it aims to provide practical guidance on when and how to use mixed model analysis. The purpose of this book is to build a bridge between the different

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communication levels that exist between statisticians and researchers when addressing the topic of mixed model analysis.

Although the book contains examples that are mostly taken from epidemiological and medical studies, all the methods discussed in this book can be applied to other research fields as well.