Bayesian statistics for repeated measures

Their application and use in biomedical research

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Paper outline

Background/Introduction

* Paragraph 1: Definition of a longitudinal study. .Statistical advantages of repeated measures studies over cross sectional:power and number of subjects (references).
* Paragraph 2: Challenges presented by longitudinal studies. Missing observations, and correlation between measurements. Limitations that these items raise for the traditional ANOVA methods of analysis.
* Paragraph 3: Bayesian statistics as an alternative approach. Advantages over ANOVA and what inference can be made from it. Argue that while it is not commonly used in the biomedical arena, this paper aims at showing the implementation in an amenable manner to analyze non-linear trends in data.
* Recap on repeated measures ANOVA and the requisites that it needs to work properly -Sphericity -Variance-covariance matrix -Explain the *true* meaning of a *p-value* and why it is not what researchers commonly think it is
* Gentle introduction to Bayesian statistics -How it works -What advantages it has over ANOVA -What a confidence interval means probabilistically

# Background

The study of the temporal changes in a variable of interest is a question that has been analyzed extensively in biomedical research. Typically, measurements are taken across multiple timepoints on the same subject(s) within a group. Examples of this type of approach include clinical studies on cancer breast and neck cancer(Sio et al. [2016](#ref-sio2016); Kamstra et al. [2015](#ref-kamstra2015)), tumor response(Roblyer et al. [2011](#ref-roblyer2011); Tank et al. [2020](#ref-tank2020); Pavlov et al. [2018](#ref-pavlov2018); Demidov et al. [2018](#ref-demidov2018)), antibody expression(Ritter et al. [2001](#ref-ritter2001); Roth et al. [2017](#ref-roth2017)), and cell metabolism(Jones et al. [2018](#ref-jones2018); Skala et al. [2010](#ref-skala2010)). Whereas this type of study presents advantages over a cross-sectional study in the number of subjects required to achieve a certain statistical power, and in its ability (Chavalarias et al. [2016](#ref-chavalarias2016))

(Vishwanath et al. [2009](#ref-vishwanath2009)).

### Longitudinal vs

# References

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