



Childhood and Adolescence  
Psychopathology:  
unravelling the complex etiology  
by a large Interdisciplinary  
Collaboration in Europe

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## 1. Overview of the workshop

In preparation of the workshop, ESRs were asked to prepare themselves so as to be up to speed with basic applied statistical concepts such as the linear model and statistical inference. ESRs were given a copy of the textbook<sup>1</sup> used at the University of Twente. In addition they were asked to get some introduction to the statistical package R and JAGS. This was needed to have some common ground during the workshop.

The workshop was held in Hotel Drienerburgh, located on the campus of the University of Twente. The first morning was spent on a short introductory lecture and an assignment that was intended to get a feel of the level of knowledge and the differences in the level of knowledge across ESRs. The rest of the day was spent on longitudinal modelling in R, particularly the simplex model (autoregressive model) and the linear growth model. Short lectures were followed by practical exercises.

The next day was spent on introducing factor models (morning) and item response models (afternoon). These were introduced together with Bayesian statistical inference using Markov chain Monte Carlo estimation using the JAGS software. Again this was practised extensively.

The third and last day delved deeper into practical applications of item response theory, namely to solve for the problem of attenuation due to unreliable measurement (morning) and harmonization of measurements (afternoon). Again, short lectures were followed by practical assignments.

Overall, days started at 9am, with an opportunity to ask questions. The first lecture started at 9.30. The days finished around 5pm. All lectures were given by Dr Stephanie van den Berg.

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<sup>1</sup> Van den Berg, S.M. (2018, 2<sup>nd</sup> Ed.). Analyzing Data using Linear Models. Enschede: University of Twente.

## 2. Overview of participants

Table 1 shows an overview of the participants of the workshop. One ESR fell ill and could not make it to Enschede. All participants were active and present at all meetings.

<b>Beneficiary</b>	<b>ESR</b>
VU University	Wonu Akingbuwa
VU University	Eshim Shahid
King's College	Andra Allegrini
University of Bristol	Elis Haan
University of Bristol	Laura Schellhas
Erasmus University	Elizabeth Diemer
Karolinska Institutet	Ashley Thompson
University of Twente	Kratika Agarwal
University of Cagliari	Hema Sekhar Reddy Rajula
Imperial College	Ville Karhunen
Janssen	Marica Leone

*Table 1 – List of attendees*

### 3. Useful links and references relevant for the workshop

The JAGS manual:

[https://netcologne.dl.sourceforge.net/project/mcmcjags/Manuals/4.x/jags\\_user\\_manual.pdf](https://netcologne.dl.sourceforge.net/project/mcmcjags/Manuals/4.x/jags_user_manual.pdf)

Some JAGS examples: <http://www.johnmyleswhite.com/notebook/2010/08/20/using-jags-in-r-with-the-rjags-package/>

The tidyverse coding scheme in R: <https://www.tidyverse.org/>

Free R book online: <https://r4ds.had.co.nz/>

Book on linear models, linear mixed models and generalized linear models, freely distributed: Van den Berg, S.M. (2018, 2<sup>nd</sup> Ed.). *Analyzing Data using Linear Models*. Enschede: University of Twente.

Books on Bayesian inference:

Gelman, Carlin, Stern & Rubin (Bayesian data analysis)

D'Agostini (Bayesian reasoning in data analysis: a critical introduction)

Box & Tiao (Bayesian inference in statistical analysis)

Robert & Casella (Monte Carlo Statistical Methods)

Krushke (Doing Bayesian Analysis)

Papers on IRT as applied in genetics:

Van den Berg, S.M., Glas, C.A.W., Boomsma, D.I. (2007). Variance decomposition using an IRT measurement model. *Behavior Genetics*, 37, 604-616.

Van den Berg et al. (2014). Harmonization of neuroticism and extraversion phenotypes across inventories and cohorts in the genetics of personality consortium: an application of item response theory. *Behavior Genetics*, 44, 295-313.

Van Leeuwen, M., van den Berg, S.M. & Boomsma, D.I. (2008). A twin-family study of general IQ. *Learning and Individual Differences*, 18, 76-88.

Eaves et al. (2005). Application of Bayesian inference using Gibbs sampling to item-response theory modeling of multi-symptom genetic data. *Behav Genet.* 2005 Nov;35(6):765-80.

Van der Sluis et al (2010). Phenotypic complexity, measurement bias, and poor phenotypic resolution contribute to the missing heritability problem in genetic association studies. *PLoS One.* 2010 Nov 10;5(11):e13929.