

University of Groningen

Bayes factor tests for intervention effects

de Vries, Rivka

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version

Publisher's PDF, also known as Version of record

Publication date:

2015

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

de Vries, R. (2015). Bayes factor tests for intervention effects. [S.l.]: [S.n.].

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Bayes Factor Tests for Intervention Effects

Rivka Marianne de Vries

©2015 Bayes Factor Tests for Intervention Effects
Rivka M. de Vries, University of Groningen

ISBN: 978-90-367-7546-5

ISBN electronic version: 978-90-367-7545-8

Cover design: Rivka de Vries & J.B. Matto

Printed by: Off Page



rijksuniversiteit
 groningen

Bayes Factor Tests for Intervention Effects

Proefschrift

ter verkrijging van de graad van doctor aan de
 Rijksuniversiteit Groningen
 op gezag van de
 rector magnificus prof. dr. E. Sterken,
 en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op
 donderdag 5 februari 2015 om 16.15 uur

door

Rivka Marianne de Vries

geboren op 12 januari 1985
 te Groningen

Promotor

Prof. dr. R.R. Meijer

Copromotor

Dr. R.D. Morey

Beoordelingscommissie

Prof. dr. M.D. Lee

Prof. dr. T.A.B. Snijders

Prof. dr. E-J. Wagenmakers

Contents

1	Introduction	1
2	Bayesian Hypothesis Testing for Single-Subject Designs	5
2.1	Introduction	6
2.2	Introduction to inference for single-subject data	8
2.2.1	Likelihood ratios	9
2.3	Bayes factors for single-subject data	14
2.3.1	Rouder et al.'s Bayes factor t test	14
2.3.2	Rouder et al.'s Bayes factor t test extended for time-series data	19
2.3.3	Bayes factors for trend and intercept differences	25
2.3.4	Estimation of effect sizes and credible intervals	32
2.3.5	Extension of Bayes factor to clinical significance	34
2.4	Discussion	34
2.4.1	Bayesian methods versus null hypothesis significance testing	36
2.4.2	Required number of data points	38
2.4.3	Conclusions	40
2.5	Appendix A	41
2.6	Appendix B	42
2.6.1	Simulations for JZS+AR model	42
2.6.2	Simulations for the TAR model	43
2.7	Online Supplement	44
2.7.1	Tutorial for computing de Vries and Morey's Bayes factors	44
2.7.2	Technical details for estimation	50
3	A tutorial on computing Bayes factors for single-subject designs	63
3.1	Introduction	64
3.2	Getting Started	65
3.3	De Vries and Morey's (2013) JZS+AR Model for Mean Difference .	68
3.3.1	Estimation of Effect Sizes	71
3.3.2	Testing Intervention Effects	76
3.4	De Vries and Morey's (2013) Model for Trend Difference	79
3.4.1	Estimation of Effect Sizes	81

3.4.2	Testing Intervention Effects	84
3.5	Discussion	86
3.5.1	Setting the prior scale	87
4	Bayesian Hypothesis Testing for Routine Outcome Measurement Data	89
4.1	Introduction	90
4.2	Intercept Model	93
4.2.1	Prior Distributions	95
4.2.2	Posterior Distributions	100
4.2.3	Bayes Factors	102
4.2.4	Simulations	108
4.3	Trend Model	112
4.3.1	Prior Distributions	112
4.3.2	Posteriors Distributions	114
4.3.3	Bayes Factors	115
4.3.4	Simulations	118
4.4	Discussion	119
4.5	Appendix A	128
4.5.1	Conditional Posterior Distributions Intercept Model	128
4.5.2	Conditional Posterior Distributions Trend Model	131
4.6	Appendix B	136
4.6.1	Simulation Details Intercept Model	136
4.6.2	Simulations Details Trend Model	137
5	Improving the Analysis of Routine Outcome Measurement Data: What A Bayesian Approach Can Do for You	139
5.1	Introduction	140
5.2	Testing intervention effects	141
5.2.1	Logical problems of using p values as evidence	142
5.2.2	Relative Evidence and Bayes Factor	143
5.2.3	Clinical and Statistical Change in One Measure	146
5.3	Empirical Example	147
5.4	Discussion	149
	Summary/Conclusion	153
	Samenvatting/Conclusie	155
	Bibliography	157
	Curriculum Vitae	165
	Dankwoord	167