OXFORD

BEHAVIORAL METHODS IN CONSCIOUSNESS RESEARCH

EDITED BY

MORTEN OVERGAARD

Behavioral methods in consciousness research

Behavioral methods in consciousness research

Edited by

Morten Overgaard

OXFORD
UNIVERSITY PRESS

OXFORD
UNIVERSITY PRESS

Great Clarendon Street, Oxford, OX2 6DP,
United Kingdom

Oxford University Press is a department of the University of Oxford.
It furthers the University's objective of excellence in research, scholarship,
and education by publishing worldwide. Oxford is a registered trade mark of
Oxford University Press in the UK and in certain other countries

First Edition published in 2015

Impression: 1

Published in the United States of America by Oxford University Press
198 Madison Avenue, New York, NY 10016, United States of America

British Library Cataloguing in Publication Data

Data available

Library of Congress Control Number: 2014958222

ISBN 978–0–19–968889–0

Printed and bound by
CPI Group (UK) Ltd, Croydon, CR0 4YY

Contents

Contributors

Professor Talis Bachmann
University of Tartu,
Näituse 20
50409 Tartu, Estonia

Dr Adam B. Barrett
Sackler Centre for Consciousness Science and Department of Informatics, University of Sussex, Brighton, UK

Dr Julie Bertels
Consciousness, Cognition and Computation Group (**CO3**)
Center for Research in Cognition & Neurosciences (**CRCN**)
ULB Institute of Neurosciences (**UNI**)
Université Libre de Bruxelles
50 av. Franklin Roosevelt CP 191
1050 Brussels, Belgium

Dr Jan Brascamp
Utrecht University,
Willem C. Van Unnikgebouw,
Heidelberglaan 2, Room 16.22,
Utrecht, The Netherlands

Professor Axel Cleeremans
Consciousness, Cognition and Computation Group (**CO3**)
Center for Research in Cognition & Neurosciences (**CRCN**)
ULB Neuroscience Institute (**UNI**)
Université Libre de Bruxelles
50 av. Franklin Roosevelt CP 191
1050 Brussels, Belgium

Associate Professor Arnaud Destrebecqz
Consciousness, Cognition and Computation Group (**CO3**)
Center for Research in Cognition & Neurosciences (**CRCN**)
ULB Institute of Neurosciences (**UNI**)
Université Libre de Bruxelles
50 av. Franklin Roosevelt CP 191
1050 Brussels, Belgium

Professor Zoltan Dienes
Sackler Centre for Consciousness Science and School of Psychology,
University of Sussex,
Falmer, UK

Mr Steven Di Costa
Institute of Cognitive Neuroscience,
University College London
Alexandra House,
17 Queen Square,
London, UK

Dr Ana Franco
Unité de Recherche en Neurosciences Cognitives (**Unescog**)
Center for Research in Cognition & Neurosciences (**CRCN**)
ULB Institute of Neurosciences (**UNI**)
Université Libre de Bruxelles
50 av. Franklin Roosevelt CP 191
1050 Brussels, Belgium

Dr Vinciane Gaillard
Consciousness, Cognition
and Computation Group (**CO3**)
Center for Research in Cognition
& Neurosciences (**CRCN**)
ULB Institute of Neurosciences (**UNI**)
Université Libre de Bruxelles
50 av. Franklin Roosevelt CP 191
1050 Brussels, Belgium

Professor Patrick Haggard
Institute of Cognitive Neuroscience,
University College London
Alexandra House,
17 Queen Square,
London, UK

Professor Jakob Hohwy
Cognition & Philosophy Lab,
Monash University,
Melbourne, Australia

Mads Jensen
Cognitive Neuroscience Research
Unit (CNRU) CFIN, MindLab
Dept. of Clinical Medicine
Aarhus University
Aarhus, Denmark

Dr Ryota Kanai
Sackler Centre for Consciousness
Science and School of Psychology,
University of Sussex,
Brighton, UK

Dr Colin Klein
Department of Philosophy,
Macquarie University,
Sydney, Australia

Dr Ai Koizumi
Psychology Department,
Colombia University,
1190 Amsterdam Avenue,
New York, USA

University of Tokyo,
Tokyo, Japan

Professor Hakwan C. Lau
Psychology Department,
UCLA
11620 Mayfield Avenue,
Los Angeles, USA

Associate Professor Kim Mouridsen
Department of Clinical Medicine,
Center for Functionally Integrative
Neuroscience,
Nørrebrogade 44 NBG/10G,
Room 10G-5-36,
Aarhus, Denmark

Associate Professor Elisabeth Norman
Faculty of Psychology,
University of Bergen,
Christies gate 12,
5015 Bergen,
Norway

Professor Morten Overgaard
Cognitive Neuroscience Research
Unit (CNRU) CFIN, MindLab
Dept. of Clinical Medicine
Aarhus University
Aarhus, Denmark

Dept. of Communication and Psychology
Aalborg University
Aalborg, Denmark

Associate Professor Mark C. Price
Faculty of Psychology,
University of Bergen,
Christies gate 12,
5015 Bergen,
Norway

Dr Kristian Sandberg
Cognitive Neuroscience Research Unit
(CNRU), Hammel Neurorehabilitation
Centre and University Research Clinic
Aarhus University
Aarhus, Denmark

Maxine T. Sherman
Sackler Centre for Consciousness Science
and School of Psychology,
University of Sussex,
Brighton, UK

Amanda Song
Cognitive Science Department,
University of California, San Diego, US

Assistant Professor Bert Timmermans
School of Psychology,
University of Aberdeen,
William Guild Building,
King's College,
Aberdeen, UK

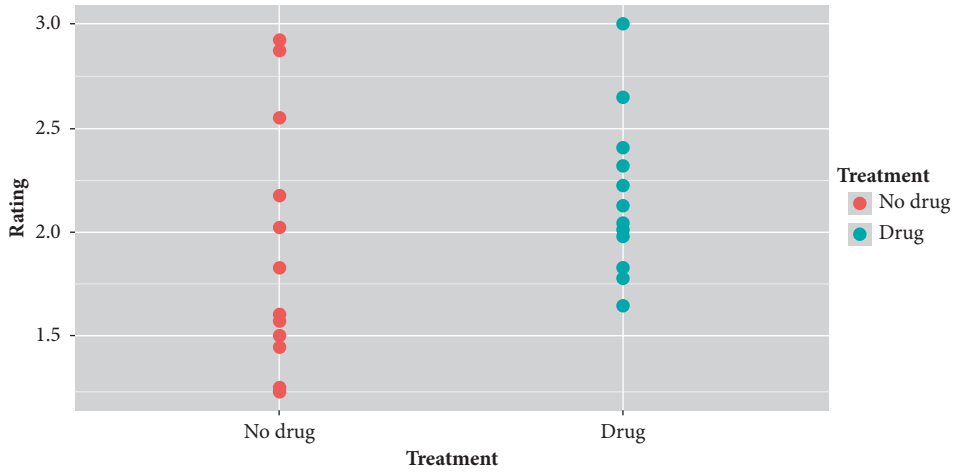

Plate 1 Average rating data (perceptual awareness scale) in the word presentation experiment with and without administration of a dopamine agonist. (See Fig. 13.1)

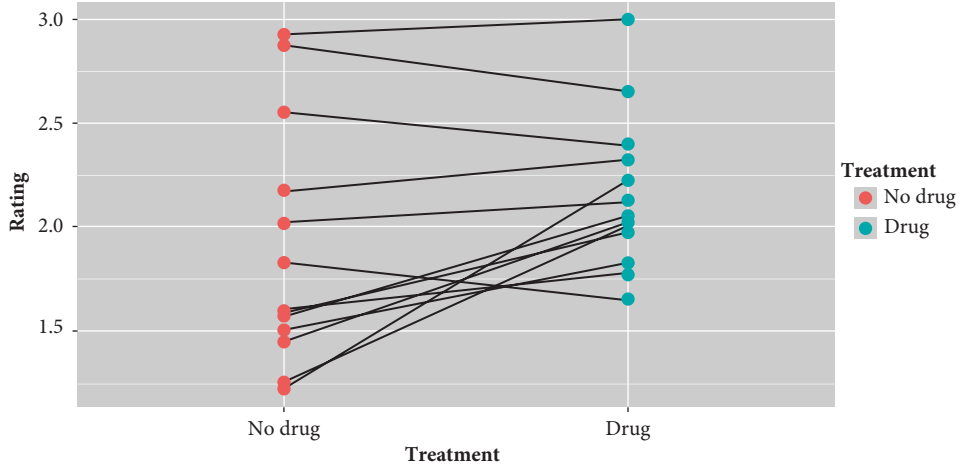

Plate 2 Data from Plate 1 with lines indicating that the same subjects were observed in the two groups. Compared to Plate 1 we see a clearer trend towards higher ratings with the dopamine agonist. (See Fig. 13.2)

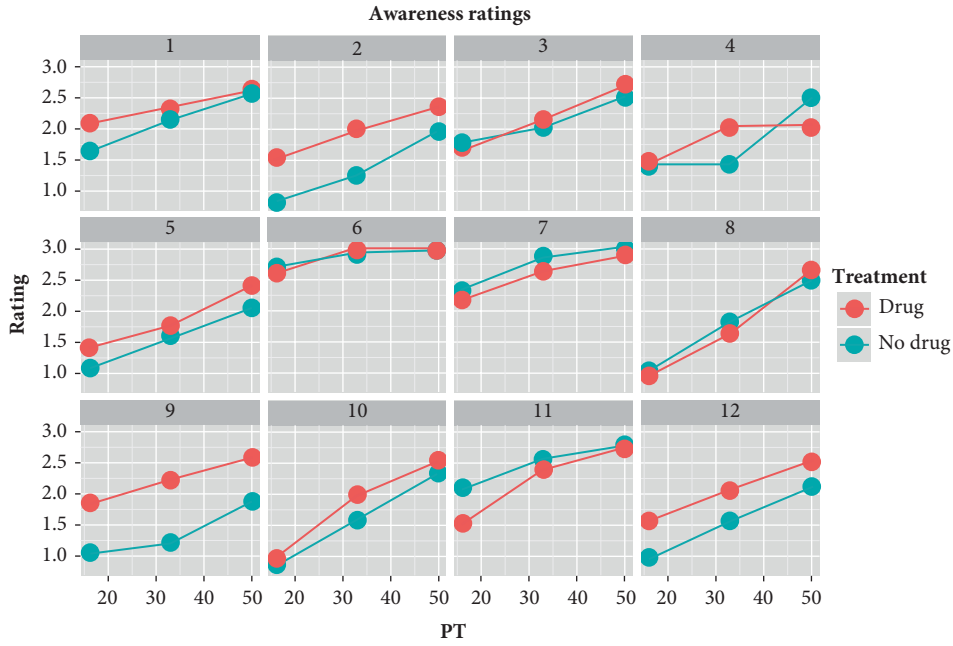

Plate 3 Average PAS ratings at three different stimulus durations for each subject with and without the dopamine agonist. (See Fig. 13.3)

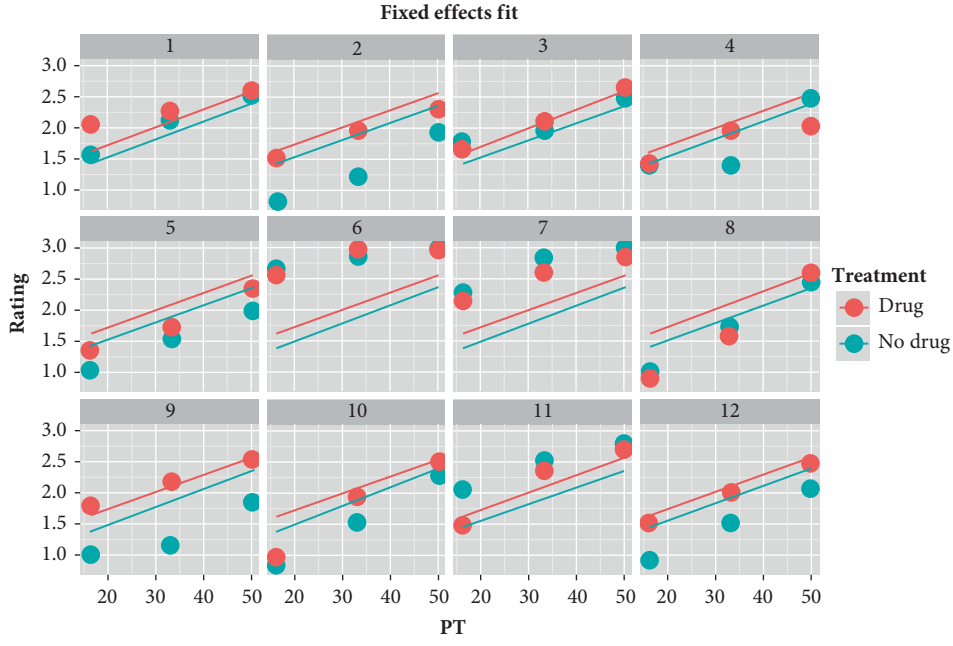

Plate 4 Fixed effects analysis suggests an increase in PAS rating with dopamine agonist, but the model provides a poor fit in most subjects. It estimates the same effect across all subjects. (See Fig. 13.4)

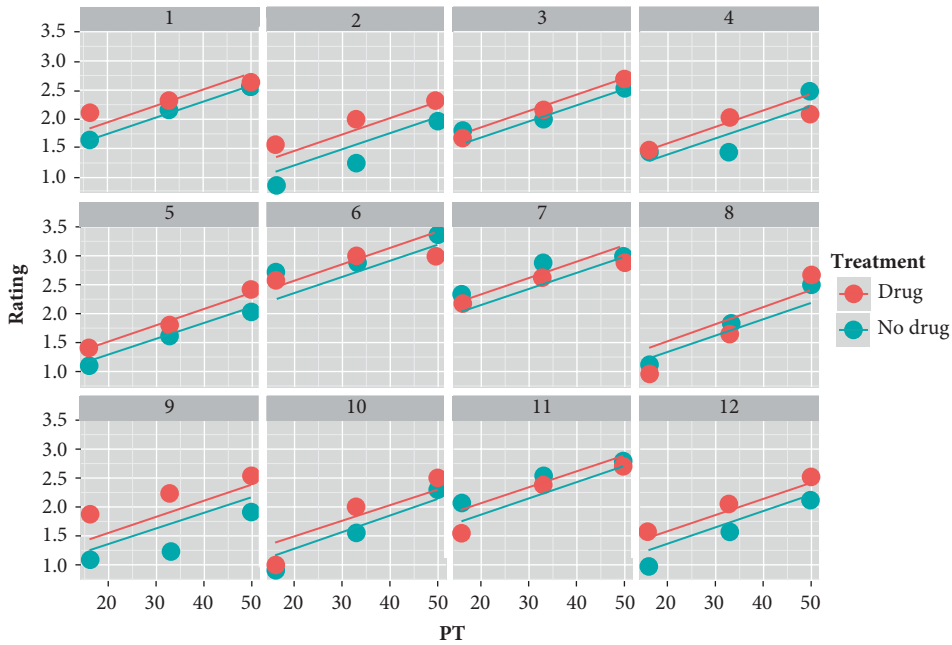

Plate 5 The random effects or mixed model produces an individual fit to each subject and provides a more accurate fit to the individuals than the fixed effects model. Note that this comes at the cost of only one additional parameter in the model (the variance component corresponding to subject variation). (See Fig. 13.5)

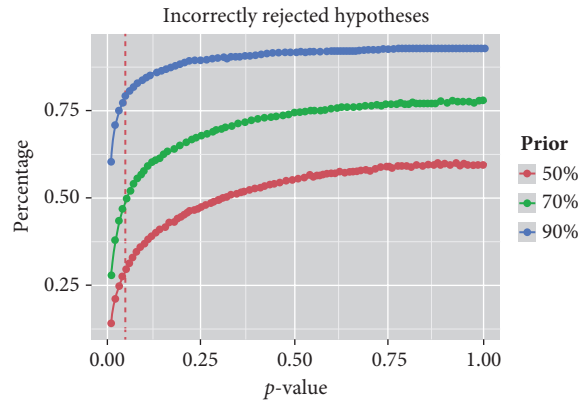

Plate 6 Fraction of incorrectly rejected null hypotheses when the prior probability that the null is true is 50, 70, or 90%. The dashed vertical line illustrates the fraction of incorrect rejections that occurs if the alpha level is fixed at the typical 5%. (See Fig. 13.6)

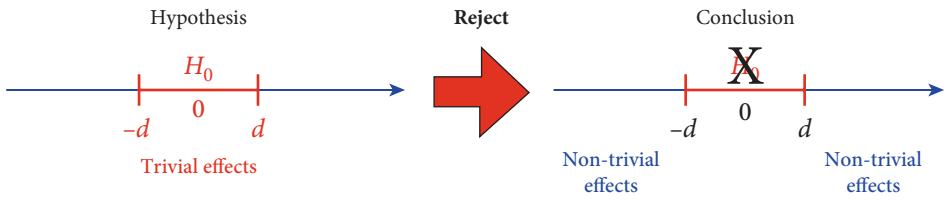

Plate 7 By extending the usual null hypothesis of zero effect to the hypothesis that the effect is numerically less than d we avoid declaring the significance when magnitude of the effect is scientifically negligible but p-value for the point null hypothesis nevertheless is below 5%. (See Fig. 13.7)

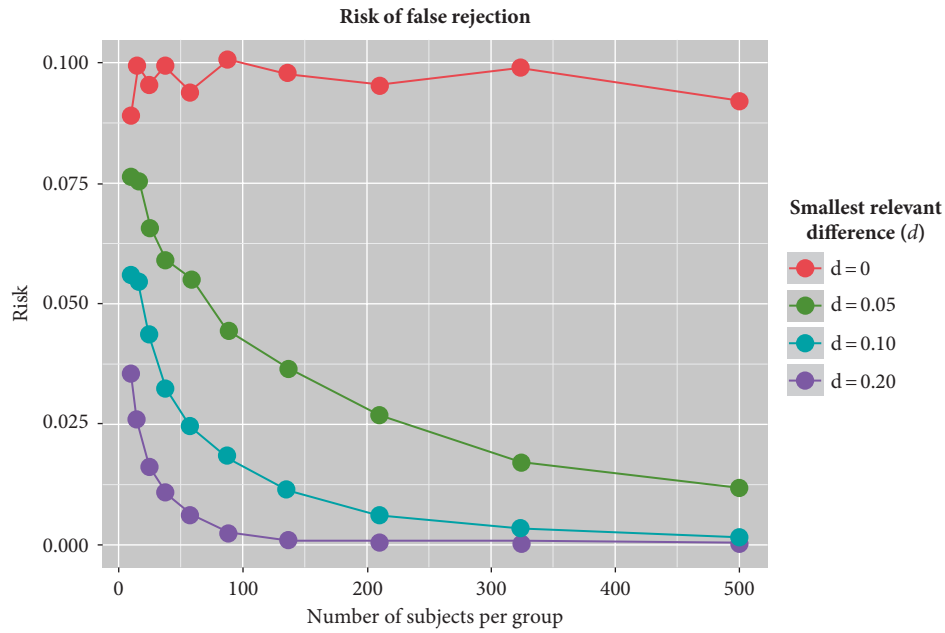

Plate 8 Risk of falsely rejecting different null hypotheses in a simulated experiment with zero effect. The usual point null is rejected in just under 10% of cases, which is about double the alpha-level (5%), demonstrating that the risk of a false positive is not the usual 5% when the researcher has the possibility to choose between two outcomes (and does not correct for multiple comparisons). Testing the presence of non-zero effects leads to lower risks (however, the appropriate strategy is to correct *p*-values for multiple comparisons). (See Fig. 13.8)

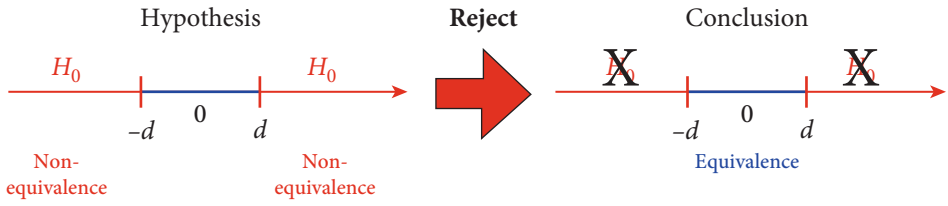

Plate 9 Equivalence tests assume that an effect is numerically larger than some *d*, then rejects this assumption if *p*-value is low. Hence equivalence can be concluded and the risk of a false rejection is bounded by the alpha-level (which may be the usual 5%). (See Fig. 13.9)