

Cambridge University Press

978-0-521-58046-5 - Startle Modification: Implications for Neuroscience, Cognitive Science, and Clinical Science

Edited by Michael E. Dawson, Anne M. Schell and Andreas H. Böhmelt

Frontmatter

[More information](#)

Startle Modification

The startle response (response to a loud noise, for instance) is a reflex that is wired into the brain at a very basic level. Although everyone has such a reflex, the strength and quickness of the startle response is modified by a subject's underlying psychoneurological state. The nature of this modification, therefore, is now seen as an accurate, objective measure of very deep neurological processes.

This book is the first comprehensive volume devoted to startle modification and offers a unique overview of the methods, measurement, physiology, and psychology of the phenomenon, particularly modification of the human startle eye-blink. Chapters are written by many of the world's leading investigators in the field and include coverage of elicitation and recording of the startle blink; issues in measurement and quantification; the neurophysiological basis of the basic startle response and its modification by attentional and affective processes; psychological processes underlying short and long lead interval modification (including prepulse inhibition); applications of startle modification to the study of psychopathology, including schizophrenia, affective disorders, and psychopathy; developmental processes; and relationships with event-related potentials and behavioral measures of information processing.

This book will be an invaluable reference for graduate students and researchers in cognitive science, clinical science, and neuroscience, including experimental psychologists, psychophysicologists, neuroscientists, biological psychiatrists, and clinical psychologists with research interests in psychopathology.

Michael E. Dawson is Professor of Psychology at the University of Southern California, Los Angeles.

Anne M. Schell is Professor of Psychology at Occidental College, Los Angeles, California.

Andreas H. Böhmelt is Assistant Professor at the Center for Psychobiological and Psychosomatic Research at the University of Trier, Germany.

Cambridge University Press

978-0-521-58046-5 - Startle Modification: Implications for Neuroscience, Cognitive Science, and Clinical Science

Edited by Michael E. Dawson, Anne M. Schell and Andreas H. Böhmelt

Frontmatter

[More information](#)

Startle Modification

Implications for
Neuroscience,
Cognitive Science, and
Clinical Science

Edited by

Michael E. Dawson

Anne M. Schell

Andreas H. Böhmelt



Cambridge University Press

978-0-521-58046-5 - Startle Modification: Implications for Neuroscience, Cognitive Science, and Clinical Science

Edited by Michael E. Dawson, Anne M. Schell and Andreas H. Bohmelt

Frontmatter

[More information](#)

CAMBRIDGE UNIVERSITY PRESS

Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore,
São Paulo, Delhi, Dubai, Tokyo

Cambridge University Press

The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org

Information on this title: www.cambridge.org/9780521580465

© Cambridge University Press 1999

This publication is in copyright. Subject to statutory exception
and to the provisions of relevant collective licensing agreements,
no reproduction of any part may take place without the written
permission of Cambridge University Press.

First published 1999

A catalogue record for this publication is available from the British Library

Library of Congress Cataloguing in Publication data

Startle modification: implications for neuroscience, cognitive science, and clinical science/edited
by Michael E. Dawson, Anne M. Schell, Andreas H. Bohmelt.

p. cm.

Includes bibliographical references and index.

ISBN 0-521-58046-3 (hb)

1. Startle reaction. 2. Cognitive neuroscience – Methodology.

I. Dawson, Michael E. II. Schell, Anne M. (Anne McCall), 1942–

III. Bohmelt, Andreas H., 1963– .

[DNLM: 1. Startle Reaction. 2. Blinking. WL 106S796 1999]

QP372.6.S73 1999

152.3'22 – dc21

DNLM/DLC

for Library of Congress 98-39368

CIP

ISBN 978-0-521-58046-5 Hardback

ISBN 978-0-521-08789-6 Paperback

Transferred to digital printing 2009

Cambridge University Press has no responsibility for the persistence or
accuracy of URLs for external or third-party Internet websites referred to in
this publication, and does not guarantee that any content on such websites is,
or will remain, accurate or appropriate. Information regarding prices, travel
timetables and other factual information given in this work are correct at
the time of first printing but Cambridge University Press does not guarantee
the accuracy of such information thereafter.

Cambridge University Press

978-0-521-58046-5 - Startle Modification: Implications for Neuroscience, Cognitive Science, and Clinical Science

Edited by Michael E. Dawson, Anne M. Schell and Andreas H. Bohmelt

Frontmatter

[More information](#)

*To the people who fill our lives with love and make our work
worthwhile*

Lavina Dawson, Michael Dawson, and Christopher Dawson

Allen Chroman, Lauren Chroman, and Michael Schell

Julian Häger, Svenja Häger, Herman Böhmelt, and Inge Böhmelt

Cambridge University Press
978-0-521-58046-5 - Startle Modification: Implications for Neuroscience, Cognitive
Science, and Clinical Science
Edited by Michael E. Dawson, Anne M. Schell and Andreas H. Bohmelt
Frontmatter
[More information](#)

Contents

<i>Contributors</i>	<i>page ix</i>
<i>Preface</i>	xiii
<i>Prologue: A Historical Note on the “Discovery” of Startle Modification</i>	1
HOWARD S. HOFFMAN	
1. Startle Modification: Introduction and Overview	6
MICHAEL E. DAWSON, ANNE M. SCHELL, AND ANDREAS H. BÖHMELT	
PART I: BASIC PARADIGMS, METHODS, AND PHENOMENA	
2. Startle Elicitation: Stimulus Parameters, Recording Techniques, and Quantification	21
W. KEITH BERG AND MARIE T. BALABAN	
3. Short Lead Interval Startle Modification	51
TERRY D. BLUMENTHAL	
4. Long Lead Interval Startle Modification	72
LOIS E. PUTNAM AND ERIC J. VANMAN	
PART II: PHYSIOLOGICAL MEDIATION OF STARTLE MODIFICATION	
5. Neurophysiology and Neuropharmacology of Startle and Its Affective Modification	95
MICHAEL DAVIS, DAVID L. WALKER, AND YOUNGLIM LEE	
6. Neurophysiology and Neuropharmacology of Short Lead Interval Startle Modification	114
NEAL R. SWERDLOW AND MARK A. GEYER	

Cambridge University Press
978-0-521-58046-5 - Startle Modification: Implications for Neuroscience, Cognitive
Science, and Clinical Science
Edited by Michael E. Dawson, Anne M. Schell and Andreas H. Bohmelt
Frontmatter
[More information](#)

viii	Contents
PART III: PSYCHOLOGICAL MEDIATION OF STARTLE MODIFICATION	
7. Implications of Blink Reflex Research for Theories of Attention and Consciousness	137
STEVE A. HACKLEY	
8. Affect and the Startle Reflex	157
MARGARET M. BRADLEY, BRUCE N. CUTHBERT, AND PETER J. LANG	
PART IV: INDIVIDUAL DIFFERENCES AND STARTLE MODIFICATION	
9. Affective Individual Differences, Psychopathology, and Startle Reflex Modification	187
EDWIN W. COOK III	
10. Psychopathic Traits and Intoxicated States: Affective Concomitants and Conceptual Links	209
CHRISTOPHER J. PATRICK AND ALAN R. LANG	
11. Schizophrenia Spectrum Disorders	231
KRISTIN S. CADENHEAD AND DAVID L. BRAFF	
12. Startle Modification in Children and Developmental Effects	245
EDWARD M. ORNITZ	
PART V: RELATIONSHIPS WITH OTHER PARADIGMS AND MEASURES	
13. Behavioral Analogies of Short Lead Interval Startle Inhibition	269
DIANE L. FILION, KIMBERLE A. KELLY, AND ERIN A. HAZLETT	
14. Event-Related Potential Components and Startle	284
JUDITH M. FORD AND WALTON T. ROTH	
15. Startle Modification during Orienting and Pavlovian Conditioning	300
OTTMAR V. LIPP AND DAVID A. T. SIDDLE	
References	315
Author Index	365
Subject Index	379

Cambridge University Press

978-0-521-58046-5 - Startle Modification: Implications for Neuroscience, Cognitive Science, and Clinical Science

Edited by Michael E. Dawson, Anne M. Schell and Andreas H. Bohmelt

Frontmatter

[More information](#)

Contributors

MARIE T. BALABAN

Department of Psychology
Eastern Oregon University
La Grande, Oregon 97850-2899

W. KEITH BERG

Department of Psychology
University of Florida
Gainesville, Florida 32611

TERRY D. BLUMENTHAL

Department of Psychology
Wake Forest University
Winston-Salem, North Carolina
27109

ANDREAS H. BÖHMELT

Center for Research in Psychobiology and Psychosomatics
University of Trier
D-54290 Trier, Germany

MARGARET M. BRADLEY

Center for Research in Psychophysiology
University of Florida
Gainesville, Florida 32610-0165

DAVID L. BRAFF

Department of Psychiatry
University of California–San Diego
Medical Center
San Diego, California 92103

KRISTIN S. CADENHEAD

Department of Psychiatry
University of California–San Diego
La Jolla, California 92093-0603

EDWIN W. COOK III

Department of Psychology
University of Alabama–Birmingham
Birmingham, Alabama 35294

BRUCE N. CUTHBERT

Behavioral Science Research Branch
Division of Mental Disorders, Behavioral Research, and AIDS
National Institute of Mental Health
Bethesda, Maryland 20892-8030

MICHAEL DAVIS

Department of Psychiatry
Emory University
Atlanta, Georgia 30322

Cambridge University Press
978-0-521-58046-5 - Startle Modification: Implications for Neuroscience, Cognitive
Science, and Clinical Science
Edited by Michael E. Dawson, Anne M. Schell and Andreas H. Bohmelt
Frontmatter
[More information](#)

x

Contributors

MICHAEL E. DAWSON
Department of Psychology
University of Southern California
Los Angeles, California 90089-1061

DIANE L. FILION
Occupational Therapy Education
Kansas University Medical Center
Kansas City, Kansas 66160

JUDITH M. FORD
Department of Psychiatry
Stanford University
School of Medicine
Stanford, California 94305

MARK A. GEYER
Department of Psychiatry
University of California–San Diego
La Jolla, California 92093-0804

STEVEN A. HACKLEY
Department of Psychology
University of Missouri
Columbia, Missouri 65211

ERIN A. HAZLETT
Department of Psychiatry
Mount Sinai School of Medicine
New York, New York 10029-6574

HOWARD S. HOFFMAN
Department of Psychology
Bryn Mawr College
Bryn Mawr, Pennsylvania 19010-
2899

KIMBERLE A. KELLY
Aftercare Clinic
University of California–Los Angeles
Los Angeles, California 90024-6968

ALAN R. LANG
Department of Psychology
Florida State University
Tallahassee, Florida 32306-1051

PETER J. LANG
Center for Research in Psychophysi-
ology
University of Florida
Gainesville, Florida 32610-0165

YOUNGLIM LEE
Department of Psychiatry
Yale University
Connecticut Mental Health Center
New Haven, Connecticut 06508

OTTMAR V. LIPP
Department of Psychology
University of Queensland
Brisbane, Queensland 4072
Australia

EDWARD M. ORNITZ
Department of Psychiatry and Biobe-
havioral Sciences
University of California–Los Ange-
les
Los Angeles, California 90024

CHRISTOPHER J. PATRICK
Department of Psychology
Florida State University
Tallahassee, Florida 32306-1051

LOIS E. PUTNAM
Department of Psychology
Columbia University
New York, New York 10027

Cambridge University Press
978-0-521-58046-5 - Startle Modification: Implications for Neuroscience, Cognitive
Science, and Clinical Science
Edited by Michael E. Dawson, Anne M. Schell and Andreas H. Bohmelt
Frontmatter
[More information](#)

Contributors xi

WALTON T. ROTH
Department of Psychiatry and
Behavioral Sciences
Veterans Administration Medical
Center
Stanford University
Palo Alto, California 94304

ANNE M. SCHELL
Department of Psychology
Occidental College
Los Angeles, California 90041

DAVID A. T. SIDDLE
Office of Pro-Vice-Chancellor
(Research)
The University of Sydney
New South Wales, 2006
Australia

NEAL R. SWERDLOW
Department of Psychiatry
University of California–San Diego
School of Medicine
La Jolla, California 92093-6270

ERIC J. VANMAN
Department of Psychology
Emory University
Atlanta, Georgia 30332

DAVID L. WALKER
Department of Psychiatry
Yale University
Connecticut Mental Health Center
New Haven, Connecticut 06508

Cambridge University Press

978-0-521-58046-5 - Startle Modification: Implications for Neuroscience, Cognitive Science, and Clinical Science

Edited by Michael E. Dawson, Anne M. Schell and Andreas H. Bohmelt

Frontmatter

[More information](#)

Preface

This book is the first comprehensive volume devoted to startle modification, particularly modification of the human startle eyeblink reflex. As such, it offers a unique overview of the paradigms used to study startle modification, the methods used to measure and quantify startle modification, and the physiological and psychological processes mediating and moderating the phenomena of startle modification.

Why devote an entire book to a seemingly esoteric and narrow topic such as the modification of the startle reflex? The answer is that the study of startle modification is deceptive in its appearance of being narrow and esoteric. In fact, the study of startle modification offers the potential to expose and clarify a number of important issues across diverse areas of psychology, psychiatry, and neuroscience. The startle reflex and its modification are rich with implications for neuroscience, cognitive science, and clinical science; hence, the subtitle of this book.

Beyond having implications *for* several subareas of scientific inquiry, the study of startle modification has implications for the integration *across* these areas. Startle modification in its various forms may provide a powerful integrative research tool. It is a paradigm that can bridge the methods and concepts of neuroscience, cognitive science, and clinical science. The growing interest in this paradigm attests to the emerging sense of the important integrative nature of the study of startle modification.

For cross-disciplinary integration to occur, however, researchers in different disciplines with their different terminologies and different concepts need to communicate. That is one of the primary reasons for this book. We invited distinguished investigators doing research with startle modification in different disciplines to write about how startle modification can enlighten us in their specific disciplines. In this way we can begin to see what the study of startle modification has to offer within each discipline and how this information can lead to greater integration across disciplines.

Another reason for this book is to introduce the startle modification para-

Cambridge University Press

978-0-521-58046-5 - Startle Modification: Implications for Neuroscience, Cognitive Science, and Clinical Science

Edited by Michael E. Dawson, Anne M. Schell and Andreas H. Bohmelt

Frontmatter

[More information](#)

digms and their immense possibilities to investigators of different disciplines who may be only vaguely familiar with them. This book will hopefully provide an introduction to those who want to learn more about the startle modification phenomena and who may be interested in adding it to their own investigation, as well as providing a thorough review for those already familiar with this versatile measure.

It is important to remember that this book is not about the startle reflex; rather, it is about *modification* of the startle reflex. That is, the focus of this book is on psychological and physiological processes initiated by nonstartling “lead stimuli” that influence subsequently elicited startle reactions. These processes include protective inhibition, sensorimotor gating, alertness and activation, attention and orienting, information processing, and affect processing in both normal and abnormal guises. The startle modification paradigms allow investigators to study the excitatory and inhibitory mechanisms underlying these processes, and to uncover their time courses, in both humans and lower animals. The startle modification paradigms permit the study of these processes and mechanisms with different lead stimuli at different times in different people. Thus, the “startle stimulus” is a convenient, nonverbal, involuntary, culture-free, and quantifiable probe of psychophysiological processes occurring at specified intervals following the “lead stimuli.”

Finally, we express our great appreciation to Jonathan Wynn for his invaluable assistance with the many details necessary to put this book in its final form. Jonathan’s considerable skills and good nature were put to the test with the compiling of the extensive integrated list of references, the organization of the final text and figures, and many other matters.