Contrasts and Effect Sizes in Behavioral Research

A CORRELATIONAL APPROACH

Contrasts are statistical procedures for asking focused questions of data. Compared to diffuse or omnibus questions, focused questions are characterized by greater conceptual clarity and greater statistical power when examining those focused questions. If an effect truly exists, we are more likely to discover it and to believe it to be real when asking focused questions rather than omnibus ones. Researchers, teachers of research methods, and graduate students will be familiar with the principles and procedures of contrast analysis but will also be introduced to a series of newly developed concepts, measures, and indices that permit a wider and more useful application of contrast analysis. This volume takes on this new approach by introducing a family of correlational effect size estimates. By returning to these correlations throughout the book, the authors demonstrate special adaptations in a variety of contexts from two-group comparison to one-way analysis of variance contexts, to factorial designs, to repeated measures designs, and to the case of multiple contrasts.

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CAMBRIDGE UNIVERSITY PRESS

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9780521652582

First published 2000

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

Library of Congress Cataloguing in Publication data
Rosenthal, Robert, 1933 – Contrasts and effect sizes in behavioral research : a correlational approach / Robert Rosenthal, Ralph L. Rosnow, Donald B. Rubin.
p. cm.
Includes bibliographical references and index.
ISBN 0-521-65258-8 (hc). – ISBN 0-521-65980-9 (pb)
1. Psychometrics. 2. Analysis of variance. 3. Psychology – Statistical methods. 4. Social sciences – Statistical methods.
I. Rosnow, Ralph L. II. Rubin, Donald B. III. Title.
BF39.2.A52R67 1999
150′.7′27 – dc21 99-24199 CIP

ISBN 978-0-521-65258-2 Hardback
ISBN 978-0-521-65980-2 Paperback

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Preface

There is a dual purpose to this book. First, we want to make available in a single volume an exposition of the principles and procedures of contrast analysis that have applications in a wide range of fields in the behavioral and social sciences. Second, we want to introduce to the community of researchers, teachers of research methods, and graduate students in these fields a series of newly developed concepts, measures, and indices that permit a wider and more useful application of contrast analysis. In short, this book is intended as both a text and a contribution to new knowledge in the area of contrast analysis.

Although one of us might be viewed as a mathematical statistician (DBR), our approach in this book is intuitive, concrete, and arithmetic rather than rigorously or formally mathematical. The statistical examples we employ are in all cases hypothetical, constructed specifically to illustrate the logical bases of the computational procedures. The numbers are neater than real-life examples tend to be, and there are fewer numbers in any single example than we would find in an actual data set. All of this material has been pretested in our own courses, with the objective of showing how practical, convenient, and inviting it is to use this approach to contrast analysis.

So why is contrast analysis not used all the time? As Robert Abelson noted in an unpublished paper prepared in 1962, the answer is not that the "method of contrasts" is brand-new:

> This method dates back virtually to the invention of the analysis of variance itself. . . . It is well-known to most statisticians and to some psychologists, but it has received only the most cursory and off-hand treatment in standard statistical reference works . . . and presentations by psychologists of some of its uses have tended toward very specialized applications. . . . Actually the method of contrasts is extraordinary for its wide range of varied uses. That the method has not heretofore received a comprehensive, unified treatment is a matter of some mystery. One compelling line of explanation is that the statisticians do not regard the idea as mathematically very interesting (it is based on quite elementary statistical concepts) and that quantitative psychologists have never quite appreciated its generality of application.

Indeed, the fact of the matter is that tradition in the behavioral and social sciences has pretty much ignored contrast analysis, often in favor of omnibus

significance tests and more complex techniques of data analysis. The problem is that omnibus tests, although they provide protection for some investigators from the danger of "data mining" when multiple tests are performed as if each were the only one considered, do not usually tell us anything we really want to know. As for more complex techniques (such as canonical correlation or multivariate analysis of variance), they have useful exploratory data-analytic applications, but the danger is that they are commonly used to test null hypotheses that are typically of doubtful scientific value (cf. Huberty & Morris, 1989). Thus it is our hope that the present volume will help foster that appreciation of the value of contrast analysis that Bob Abelson found missing all those years ago.

Although the basic idea of contrasts is quite old, as Abelson pointed out long ago, the approach taken in the present volume is almost entirely new. What makes our approach new is the introduction of a family of correlational effect size estimates including $r_{alerting}$, $r_{contrast}$, $r_{effect\ size}$, r_{BESD}, and $r_{counternull}$. We return to the application of these five correlations throughout the book, showing their special adaptations in a variety of contexts from two-group comparisons to one-way analysis of variance contexts, to factorial designs, to repeated measures designs, to the case of multiple contrasts.

Since the publication of an earlier book on contrasts (Rosenthal & Rosnow, 1985), we have been thinking, teaching, and writing about the ideas elaborated more fully in this book. We are very much indebted to the many colleagues and graduate students who provided critical commentary at various stages in the evolution of these ideas. In particular, we thank Professors Larry Hedges and Miron Zuckerman for their recent suggestions. We are also grateful for the support provided by a number of institutions, including the James McKeen Cattell Fund, Temple University, and the National Science Foundation. We are grateful to Blair Boudreau for her superb keyboarding of our oft-revised and sharpened manuscript, and to Julia Hough of Cambridge University Press for her patience as our additions and improvements pushed the date of publication further and further away. We thank the following for generously granting permission to adapt the statistical tables that appear in this volume: the American Statistical Association, Lawrence Erlbaum Associates, Houghton Mifflin, and McGraw-Hill. And finally, we thank MaryLu Rosenthal, Mimi Rosnow, and Kathryn Rubin for their forbearance and support of their abstracted and overcommitted friends Bob, Ralph, and Don.