Understanding The New Statistics: Effect Sizes, Confidence Intervals, and Meta-Analysis (Multivariate Applications Series)

By Geoff Cumming

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This is the first book to introduce the *new statistics* - effect sizes, confidence intervals, and meta-analysis - in an accessible way. It is chock full of practical examples and tips on how to analyze and report research results using these techniques. The book is invaluable to readers interested in meeting the new APA *Publication Manual* guidelines by adopting the new statistics - which are more informative than null hypothesis significance testing, and becoming widely used in many disciplines.

Accompanying the book is the Exploratory Software for Confidence Intervals (ESCI) package, free software that runs under Excel and is accessible at www.thenewstatistics.com. The book's exercises use ESCI's simulations, which are highly visual and interactive, to engage users and encourage exploration. Working with the simulations strengthens understanding of key statistical ideas. There are also many examples, and detailed guidance to show readers how to analyze their own data using the new statistics, and practical strategies for interpreting the results. A particular strength of the book is its explanation of meta-analysis, using simple diagrams and examples. Understanding meta-analysis is increasingly important, even at undergraduate levels, because medicine, psychology and many other disciplines now use meta-analysis to assemble the evidence needed for evidence-based practice.

The book's pedagogical program, built on cognitive science principles, reinforces learning:

- Boxes provide "evidence-based" advice on the most effective statistical techniques.

- Numerous examples reinforce learning, and show that many disciplines are using the new statistics.
- Graphs are tied in with ESCI to make important concepts vividly clear and memorable.
- Opening overviews and end of chapter take-home messages summarize key points.
- Exercises encourage exploration, deep understanding, and practical applications.

This highly accessible book is intended as the core text for any course that emphasizes the new statistics, or as a supplementary text for graduate and/or advanced undergraduate courses in statistics and research methods in departments of psychology, education, human development , nursing, and natural, social, and life sciences. Researchers and practitioners interested in understanding the new statistics, and future published research, will also appreciate this book. A basic familiarity with introductory statistics is assumed.

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- Sales Rank: #206363 in eBooks
- Published on: 2013-06-19
- Released on: 2013-06-19
- Format: Kindle eBook

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Editorial Review

Review

"This book is so skilfully written and suitably illustrated with graphical displays and statistical formulae that, even individuals with only a basic knowledge of statistics, should be able to follow the author's message. ... [It is] *well designed as an introductory text to confidence intervals, effect sizes and meta-analyses for use by teachers and students of statistics. ... I would recommend this book to anyone interested in developing a better understanding and appreciation of these estimation techniques."* - **Patricia Wheaton, University of Adelaide, Australia, in the** *Australasian Physical & Engineering Sciences in Medicine*

"[Understanding The New Statistics] *provides a clear description of the difficulties people have in interpreting p- values, as well as an accessible description of how to combine evidence from multiple studies using meta-analysis. It will be valuable to researchers in the behavioural and social sciences, who wish to move beyond the superficial level in the statistical interpretation of their results."* - **David J. Hand, Imperial College, London, UK, in** *International Statistical Review*

"The exceptional value of this book is in the jargon-free and accessible way in which Cumming defines significance testing and its pitfalls and introduces the new statistics. ... The overall achievement of [Understanding The New Statistics] *is the convincing argument for why the new techniques should be preferred over traditional methods. A valuable contribution ? even the most novice of reader could not fail in understanding the new statistics."* - **Victoria R. Kroll, Nottingham Trent University, UK, in** *The Psychologist*

"This is a book intended to teach. There are exercises at the end of every chapter, exercise commentaries at the end of the book, boxed asides to expand on import points or exemplary articles, helpful rules of thumb for interpretation and excellent figures. ... If you are an undergraduate, postgraduate or researcher in the social sciences ... this book will enlighten you." - **Eoin O'Connell in** *Significance*

"In this book Cumming does exactly what's needed -- he clearly explains significance-testing and confidence-interval techniques, and in the process leaves no doubt as to which should be preferred. I hope that this book will be read by anyone who plans to do research of any kind." - **Geoffrey Loftus, University of Washington, Seattle, USA**

"It is about time that the "new statistics" get the place they deserve in statistics education, to further true understanding instead of following statistical rituals. Geoff Cumming's excellent book is a milestone towards reaching that goal." - **Peter Sedlmeier, Chemnitz University of Technology, Germany**

"Geoff Cumming is a preeminent author in statistics reform and his new book is an important work in this area. Written in a clear, accessible way, Cumming covers essential topics in data analysis, including effect size estimation, confidence intervals, and meta-analysis. Readers in the social and behavioral science will learn new ways to look at their own results and avoid common traps of traditional significance testing." - **Rex Kline, Concordia University, Canada**

"Cumming makes strong arguments for confidence intervals and meta-analysis as better ways of representing and thinking about research. His graphical, interactive approach makes the "new statistics" highly accessible and remarkably impactful on our statistical understanding." - **Robin K. Henson,**

University of North Texas, USA

"Cumming will be the 'breakthrough' text that finally shows how to analyze and interpret data for many common statistical designs without having to rely on significance testing. ... The material ... [is] easy even for undergraduates ... an unusual characteristic for a statistics text." - **Joseph Rossi, University of Rhode Island, USA**

"Currently, a paradigm shift from the flawed null hypothesis testing model to an effect size and confidence interval approach is taking place. Unfortunately, students taking lower level courses have not been exposed. This book repairs that omission. A very timely and important book!" - **Wayne F. Velicer, University of Rhode Island, USA**

"This is as clear a presentation of new approaches for evaluating hypotheses and presenting statistical evidence as one could want. Cumming brings researchers into the new age of statistical discourse." - **Patrick E. Shrout, New York University, USA**

"The writing style is breezy and informal. ... It is a unique book ... and it meets an important need. The quality of scholarship is excellent; the author is probably the top world expert on this subject. ...The [accompanying] software ... allows people to 'run their own studies' and see ... just how unstable research findings are across studies when sample size are in the typical small range." - **Frank Schmidt, University of Iowa, USA**

"I would recommend the Cumming book to students who want to be on the 'cutting edge' of how to write-up statistics. ... Strengths include the author's passion and long history of research into the most effective methods of teaching statistics. ... The quality of the scholarship is excellent. ... I would definitely purchase the book ... and recommend it to colleagues." - **Alan Reifman, Texas Tech University, USA**

"There is a real need for a statistics book that makes the 'new statistics' understandable and can be used as a teaching framework for undergraduates, or graduate students." - **Dennis Doverspike, University of Akron, USA**

"[This book will pave] the way for others to demonstrate further the potency of effect sizes and confidence intervals for both univariate and multivariate inferential procedures." - **Lisa Harlow, University of Rhode Island, USA**

About the Author

Geoff Cumming is an Emeritus Professor in the School of Psychological Science at La Trobe University in Melbourne, Australia. He has taught statistics for more than 40 years at every level from introductory to advanced, and at undergraduate and graduate levels. He has published numerous journal articles about teaching statistics. His research focuses on statistical cognition?the study of how students and researchers understand statistical concepts and how they interpret different ways to present results. He has also studied how statistical reform has been advocated and thwarted. He is frequently invited to give his highly successful workshop on the new statistics using his ESCI software at the American Psychological Association's Annual Convention. A Rhodes Scholar, he received his Doctorate degree in experimental psychology from Oxford University.

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Margaret Walker:

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