

Brief Contents

List of Tables	xvii
List of Figures	xxi
Preface	xxiii
Acknowledgments	xxix
About the Authors	xxxii
PART I: INTRODUCTION TO META-ANALYSIS	1
1. Integrating Research Finding Across Studies	3
2. Study Artifacts and Their Impact on Study Outcomes	39
PART II: META-ANALYSIS OF CORRELATIONS	85
3. Meta-Analysis of Correlations Corrected Individually for Artifacts	87
4. Meta-Analysis of Correlations Using Artifact Distributions	165
5. Technical Questions in Meta-Analysis of Correlations	213
PART III: META-ANALYSIS OF EXPERIMENTAL EFFECTS AND OTHER DICHOTOMOUS COMPARISONS	243
6. Treatment Effects: Experimental Artifacts and Their Impact	245
7. Meta-Analysis Methods for <i>d</i> Values	279
8. Technical Questions in Meta-Analysis of <i>d</i> Values	343
PART IV: GENERAL ISSUES IN META-ANALYSIS	369
9. General Technical Issues in Meta-Analysis	371
10. Cumulation of Findings Within Studies	435
11. Different Methods of Meta-Analysis and Related Software	453

12. Locating, Evaluating, Selecting, and Coding Studies and Presentation of Meta-Analysis Results	483
13. Availability Bias, Source Bias, and Publication Bias in Meta-Analysis	513
14. Summary of Psychometric Meta-Analysis	553
Appendix	561
References	577
Author Index	611
Subject Index	619

Detailed Contents

List of Tables	xvii
List of Figures	xxi
Preface	xxiii
Acknowledgments	xxix
About the Authors	xxxii
PART I: INTRODUCTION TO META-ANALYSIS	1
1. Integrating Research Findings Across Studies	3
General Problem and an Example	3
A Typical Interpretation of the Example Data	4
Conclusions of the Review	6
Critique of the Sample Review	6
Problems With Statistical Significance Tests	7
Is Statistical Power the Solution?	10
Confidence Intervals	12
Meta-Analysis	15
Role of Meta-Analysis in the Behavioral and Social Sciences	17
The Myth of the Perfect Study	18
Some Relevant History	19
Role of Meta-Analysis in Theory Development	23
Meta-Analysis in Industrial-Organizational Psychology	26
Wider Impact of Meta-Analysis on Psychology	28
Impact of Meta-Analysis Outside Psychology	31
Impact in Biomedical Research	31
Impact in Other Disciplines	32
Meta-Analysis and Social Policy	33
Meta-Analysis and Theories of Data and Theories of Knowledge	34
Conclusion	36
2. Study Artifacts and Their Impact on Study Outcomes	39
Study Artifacts	40
Sampling Error	40
Error of Measurement	42

Dichotomization	43
Range Variation in the Independent Variable	44
Range Variation in the Dependent Variable	47
Imperfect Construct Validity in the Independent Variable	50
Imperfect Construct Validity in the Dependent Variable	61
Computational and Other Errors in the Data	63
Extraneous Factors Introduced by the Study Procedure	64
Bias in the Sample Correlation	66
Sampling Error, Statistical Power, and the Interpretation of Research Findings	67
An Illustration of Statistical Power	67
A More Detailed Examination of Statistical Power	70
When and How to Cumulate	78
Undercorrection for Artifacts in the Corrected Standard Deviation (SD_p)	78
Coding Studies Characteristics and Capitalization on Sampling Error in Moderator Analysis	80
A Look Ahead in the Book	84

PART II: META-ANALYSIS OF CORRELATIONS **85**

3. Meta-Analysis of Correlations Corrected Individually for Artifacts	87
Introduction and Overview	87
Bare-Bones Meta-Analysis: Correcting for Sampling Error Only	94
Estimation of Sampling Error	95
Correcting the Variance for Sampling Error and a Worked Example	96
Moderator Variables Analyzed by Grouping the Data and a Worked Example	104
Correcting Feature Correlations for Sampling Error and a Worked Example	107
Artifacts Other Than Sampling Error	111
Error of Measurement and Correction for Attenuation	111
Using the Appropriate Reliability Coefficient	115
Methods of Estimating Reliability Coefficients	117
Implications of Measurement Error for Meta-Analysis	121
Restriction or Enhancement of Range	123
Dichotomization of Independent and Dependent Variable Measures	133
Imperfect Construct Validity in Independent and Dependent Variable Measures	137
Attrition Artifacts	139
Extraneous Factors	139
Bias in the Correlation	140

Multiple Simultaneous Artifacts	141
Meta-Analysis of Individually Corrected Correlations	142
Individual Study Computations	143
Combining Across Studies	145
Final Meta-Analysis Estimation	149
An Example: Validity Generalization With Indirect Range Restriction	150
A Worked Example: Indirect Range Restriction	151
Summary of Meta-Analysis Correcting Each Correlation Individually	158
Exercise 3.1: Bare Bones Meta-Analysis: Correcting for Sampling Error Only	161
Exercise 3.2: Meta-Analysis Correcting Each Correlation Individually	163
4. Meta-Analysis of Correlations Using Artifact Distributions	165
Introduction and Basic Concepts	165
Full Artifact Distribution Meta-Analysis	167
Earlier Procedures for Artifact Distribution Meta-Analysis	169
The Interactive Method	170
A Simplified Example of Application of the Interactive Method	173
A Worked Example: Error of Measurement	175
A Worked Example: Unreliability and Direct Range Restriction	179
A Worked Example: Personnel Selection With Fixed Test (Direct Range Restriction)	181
Personnel Selection With Varying Tests	186
Personnel Selection: Meta-Analytic Findings in the Literature	187
A Worked Example: Indirect Range Restriction	189
Refinements to Increase Accuracy of the SD_p Estimate	193
Accuracy of Corrections for Artifacts	195
Mixed Meta-Analysis: Partial Artifact Information in Individual Studies	199
An Example: Dichotomization of Both Variables and a Moderator	200
The Moderator Evaluated	206
Summary of Artifact Distribution Meta-Analysis of Correlations	207
Exercise 4.1: Artifact Distribution Meta-Analysis	208
5. Technical Questions in Meta-Analysis of Correlations	213
r Versus r^2 : Which Should be Used?	213
r Versus Regression Slopes and Intercepts in Meta-Analysis	216
Range Restriction	216
Measurement Error	217
Comparability of Units Across Studies	218

Comparability of Findings Across Meta-Analyses	219
Intrinsic Interpretability	219
Use of Fisher's z in Meta-Analysis of Correlations	220
Fixed Effects and Random Effects Models in Meta-Analysis	222
Accuracy of Different Random Effects Models	224
Credibility Intervals, Confidence Intervals, and Prediction Intervals in Meta-Analysis	228
Computing Confidence Intervals in Meta-Analysis of Correlations	229
Technical Issues in Using Meta-Analysis Results in Causal Modeling and Regression	231
Path Analysis or SEM?	232
What Sample Size to Use and What Software?	232
Is There a Mixture of Populations in the Correlation Matrix?	233
What About Heterogeneity Within Meta-Analyses?	234
Technical Factors That Cause Overestimation of SD_p	234
Presence of Non-Pearson r s	235
Presence of Outliers and Other Data Errors and Problems in Removing Outliers	235
Use of r Instead of \bar{r} in the Sampling Error Formula	237
Undercorrection for Sampling Error Variance in the Presence of Range Restriction	238
Nonlinearity in the Range Correction	239
Setting Negative Variance Estimates to Zero	241
Other Factors Causing Overestimation of SD_p	241

PART III: META-ANALYSIS OF EXPERIMENTAL EFFECTS AND OTHER DICHOTOMOUS COMPARISONS 243

6. Treatment Effects: Experimental Artifacts and Their Impact	245
Quantification of the Treatment Effect:	
The d Statistic and the Point Biserial Correlation	246
Sampling Error in d Values: Illustrations	250
Case 1: $N = 30$	250
Case 2: $N = 68$	253
Case 3: $N = 400$	254
Error of Measurement in the Dependent Variable Measure	255
Error of Measurement in the Treatment Variable	261
Variation Across Studies in Treatment Strength	265
Range Variation on the Dependent Variable	266
Dichotomization of the Dependent Variable Measure	268
Imperfect Construct Validity in the Dependent Variable Measure	269
Imperfect Construct Validity in the Treatment Variable	272
Bias in the Effect Size (d Statistic)	273
Recording, Computational, and Transcriptional Errors	275
Multiple Artifacts and Corrections	275

7. Meta-Analysis Methods for d Values	279
Effect Size Indexes: d and r	281
Maximum Value of the Point Biserial r	282
The Effect Size (d Statistic)	284
Correction of the Point Biserial r for Unequal Sample Sizes	287
Examples of the Convertability of r and d	288
Problems of Artificial Dichotomization	290
An Alternative to d : Glass's d	290
Sampling Error in the d Statistic	292
The Standard Error for d	292
The Confidence Interval for δ	295
Cumulation and Correction of the Variance for Sampling Error	295
Bare-Bones Meta-Analysis	296
Confidence Intervals for \bar{d}	298
A Worked Example	298
Another Example: Leadership Training by Experts	301
Analysis of Moderator Variables	303
Using Study Domain Subsets	304
Using Study Characteristic Correlations	304
A Worked Example: Training by Experts Versus Training by Managers	306
Another Worked Example: Amount of Training	310
The Correlational Moderator Analysis	313
Correcting d Value Statistics for Measurement Error in the Dependent Variable	314
Meta-Analysis of d Values Corrected Individually and a Worked Example	318
Artifact Distribution Meta-Analysis and a Worked Example	321
Measurement Error in the Independent Variable in Experiments	328
Other Artifacts and Their Effects	331
Correcting Individual d Values for Multiple Artifacts	332
Attenuation Effect of Multiple Artifacts and Correction for the Same	332
Meta-Analysis of d Values With Multiple Artifacts Using the Correlation Metric	335
Summary of Meta-Analysis of d Values	337
Exercise 7.1: Meta-Analysis of d Values	340
8. Technical Questions in Meta-Analysis of d Values	343
Alternative Experimental Designs: General Considerations	343
Analysis of Covariance (ANCOVA) Designs	346
Factorial Independent Groups ANOVA Designs	348
Repeated Measures Designs	349
Repeated Measures Designs Without Control Group and Matched Groups Designs	350

Repeated Measures Designs With a Control Group	352
Empirical Comparison of the Two Repeated Measures Designs	353
Threats to Validity in Repeated Measures Designs With No Control Group	355
History	357
Maturation	357
Testing Effects	358
Instrumentation	358
Regression Toward the Mean	359
Reactive Situations	360
Interaction Between Selection and the Treatment	361
Bias in Observed d Values	362
Credibility Intervals, Confidence Intervals, and Prediction Intervals in Meta-Analysis of d Values	362
Computing Confidence Intervals in Meta-Analysis of d Values	364
Fixed Effects and Random Effects Models in Meta-Analysis of d Values	365

PART IV: GENERAL ISSUES IN META-ANALYSIS **369**

9. General Technical Issues in Meta-Analysis	371
Large- N Studies Versus Meta-Analysis	372
Detecting Moderator Variables in Meta-Analysis	374
Detecting Moderator Variables Not Hypothesized a Priori	374
Hierarchical Analysis of Moderator Variables via Study Subgrouping	381
Use of Multiple Regression in Moderator Analysis and Mixed Meta-Analysis Models	384
Meta-Regression: Advantages and Disadvantages	384
Multilevel Models in Meta-Analysis and HLM	389
Mixed Effects Models in Meta-Analysis	390
Second-Order Sampling Error: General Principles	391
Second-Order Meta-Analysis Across Different Independent Variables	394
Second-Order Meta-Analysis With a Constant Independent Variable	396
Second-Order Meta-Analysis of Bare-Bones Meta-Analyses	397
Second-Order Meta-Analysis When Correlations Have Been Individually Corrected	399
Second-Order Meta-Analysis With Artifact Distribution Meta-Analyses	402
Mixed Second-Order Meta-Analysis	404
Considerations in Second-Order Meta-Analysis	405

Second-Order Sampling Error: Technical Treatment	407
The Homogeneous Case	412
The Heterogeneous Case	414
A Numerical Example	416
Another Example: Leadership Training by Experts	418
Moderator Example: Skills Training	419
Confidence Intervals in Random Effects Models:	
Hunter-Schmidt and Hedges-Olkin	420
Updating a Meta-Analysis When a New Study Becomes Available	423
What Are Optimal Study Weights in Random Effect Meta-Analyses?	423
The Meaning of Percent Variance Accounted for in Meta-Analysis	425
The Odds Ratio (OR) in Behavioral Meta-Analyses	427
Exercise 9.1: Second-Order Meta-Analysis Across Different Independent Variables With the Same Dependent Variable	429
Exercise 9.2: Second-Order Meta-Analysis With Constant Independent and Dependent Variables	430
Exercise 9.3: Second-Order Meta-Analysis With Constant Independent and Dependent Variables	432
10. Cumulation of Findings Within Studies	435
Fully Replicated Designs: Statistical Independence	435
Conceptual Replication and Lack of Statistical Independence	436
Research on Effects of Violations of Statistical Independence	439
Conceptual Replication and Composite Scores	441
Conceptual Replication: A Fourth Approach and Summary and Conclusions	447
Replication by Analysis of Subgroups	449
Subgroups and Loss of Power	449
Subgroups and Capitalization on Chance	450
Subgroups and the Bias of Disaggregation	450
Conclusion: Use Total Group Correlations	451
Summary	452
11. Different Methods of Meta-Analysis and Related Software	453
The Traditional Narrative Review	453
The Traditional Voting Method	454
Cumulation of p Values Across Studies	455
Statistically Correct Vote-Counting Procedures	457
Vote-Counting Methods Yielding Only Significance Levels	457
Vote-Counting Methods Yielding Estimates of Effect Sizes	459
Meta-Analysis of Research Studies	462
Purely Descriptive Meta-Analysis Methods: Glassian and Related Methods	464
Meta-Analysis Methods Focusing Only on Sampling Error	469

Unresolved Problems in Meta-Analysis	476
Summary of Methods of Integrating Studies	477
Computer Programs for Meta-Analysis	478
Programs for Glassian Meta-Analysis	478
Programs for Homogeneity-Based Meta-Analysis	479
Programs for Psychometric Meta-Analysis	480
12. Locating, Evaluating, Selecting, and Coding	
Studies and Presentation of Meta-Analysis Results	483
Conducting a Thorough Literature Search	483
What to Do About Studies With Methodological Weaknesses	484
Coding Studies in Meta-Analysis	488
Reporting the Results of a Meta-Analysis: Standards and Practices	489
Information Needed in Reports of Primary Studies	493
Correlational Studies	493
Experimental Studies	494
Studies Using Multiple Regression	495
Studies Using Factor Analysis	496
Studies Using Canonical Correlation	497
Studies Using Multivariate Analysis of Variance (MANOVA)	498
General Comments on Reporting in Primary Studies	498
Appendix	500
13. Availability Bias, Source Bias, and Publication	
Bias in Meta-Analysis	513
Some Literatures May Have Little or No Publication Bias	515
Effects of Methodological Quality on Mean Effect Sizes From Different Sources	518
Multiple Hypotheses and Other Considerations in Availability Bias	519
Is There a Crisis of Confidence in Scientific Research Today?	521
Scientific Fraud	521
Data Manipulation Short of Scientific Fraud	523
Evidence for Publication Bias (Traditionally Defined)	526
Methods for Dealing With Availability Bias	531
File Drawer Analysis Based on p Values	531
File Drawer Analysis Based on Effect Size	533
Subgrouping of Published and Unpublished Studies	534
The Funnel Plot	535
The Trim-and-Fill Method	538
Cumulative Meta-Analysis	540
Correlation- and Regression-Based Methods	541
The Statistical Power Method and the p -Hacking Method	542
Selection Models	543
Study Artifacts and Publication Bias Analysis	549
Software for Publication Bias Analysis	550

Attempts to Prevent Publication Bias Before It Happens	550
Summary of Methods for Correcting Availability Bias	551
14. Summary of Psychometric Meta-Analysis	553
Meta-Analysis Methods and Theories of Data and Theories of Knowledge	553
What Is the Ultimate Purpose of Meta-Analysis?	555
Psychometric Meta-Analysis: Summary Overview	556
Appendix: Windows-Based Meta-Analysis Software Package Version 2.0	561
References	577
Author Index	611
Subject Index	619