Contents

Preface to the Seventh Edition, x

Preface to the First Edition, xv

Chapter 1 AN OVERVIEW OF EXPERIMENTATION, 1

The Nature of Science, 1

Nature of Science, 1

Definitions of Science, 1

Scientific and Nonscientific Disciplines, 2

Psychology as a Science, 4

Psychology as a Science, 4
Psychological Experimentation: An Application of the Scientific Method, 5

Impossibility of Collecting Relevant Data; 35

Stating the Problem, 5

Formulating a Hypothesis, 6

Selecting Participants, 6 participants of the selecting Participant Participants of the selecting Participant Participants of the selecting Participant Participants of the selecting Participants of the selecting Participant Participants of the selecting Participants of the selecting Participant Part

Assigning Participants to Groups and Treatments (Conditions), 6

Stimulus-Response Laws, 7

Stimulus-Response Laws, 7
Determining the Influence of an Independent Variable, 8

Controlling Extraneous Variables, 10

Punctions of Apparatus, 10 suppossant to a suppossant and a suppossant to a su

Conducting Statistical Tests, 11

Generalizing the Hypothesis, 12

Making Predictions, 13

Explaining Findings, 13

Dissemination of Findings, 13

Overview of the Scientific Method, 14

An Example of a Psychological Experiment, 14

Chapter Summary, 16

Critical Review for the Student, 19

Chapter 2 THE PROBLEM, 21

What Is a Problem? 21

Ways in Which a Problem Is Manifested, 22

A Gap in Our Knowledge, 22

Contradictory Results, 23

Explaining a Fact, 24

Defining a Solvable Problem, 26

The Proposed Solution Is Testable, 26

The Proposed Solution Is Relevant to the Problem, 27

Contents

Degree of Probability Instead of True and False, 28

Kinds of Possibilities, 28

Presently Attainable, 29

Potentially Attainable, 29

Classes of Testability, 29

Presently Testable, 29

Potentially Testable, 29

A Working Principle for the Experimenter, 30

Unsolvable Problems, 31

The Unstructured Problem, 31

Inadequately Defined Terms and the Operational Definition, 32

Impossibility of Collecting Relevant Data, 35

Vicious Circularity, 37

Some Additional Considerations of Problems, 39

A Problem Should Have Value, 39

Avoid the Impasse Problem, 39

Psychological Reactions to Problems, 40

Chapter Summary, 41

Critical Review for the Student, 42

Chapter 3 THE HYPOTHESIS, 43

The Nature of a Hypothesis, 43

Analytic, Contradictory, and Synthetic Statements, 45

The Manner of Stating Hypotheses, 46

Hypotheses Are "If . . . , Then . . . " Relationships, 47

Mathematical Statements of Hypotheses, 48

Controlling Extraneous Variab The General Implication Is an Approximation to a Probability Statement, 49 Causal Connections Between Antecedent and Consequent Conditions, 49

Types of Hypotheses, 50

Universal and Existential Hypotheses, 50

Arriving at a Hypothesis, 52

Abstracting Similarities, 52

Forming Analogies, 53

Extrapolating From Previous Research, 53

How Are Good Hypotheses Formulated? 53

Criteria of Hypotheses, 54

The Guidance Function of Hypotheses, 55

On Accident, Serendipity, and Hypotheses, 56

Chapter Summary, 59

Critical Review for the Student, 60

Chapter 4 THE EXPERIMENTAL VARIABLES AND HOW TO CONTROL THEM, 61 Independent Variables, 62 Stimulus Variables, 62 Organismic Variables, 62 Dependent Variables, 62 Response Measures, 62 Selecting a Dependent Variable, 64 Validity of Dependent Variables, 65 Reliability of Dependent Variables, 67 Multiple Dependent-Variable Measures, 69 Delayed Measures, 71 Types of Empirical Relationships in Psychology, 71 Types of Empirical Relationships in Psychology, 71 Stimulus-Response Laws, 71 Organismic-Behavioral Laws, 72 Stimulus-Response Laws, 72 Mathematical Statement of Laws, 72 The Nature of Experimental Control, 72 Independent-Variable Control, 73 Extraneous-Variable Control, 73 Two Kinds of Control of the Independent Variable, 76 Steps in Testing an Empirical Hypothesis, 143 Extraneous Variables, 79 Specifying Extraneous Variables to Be Controlled, 79 Specifying Extraneous Variables That Cannot Reasonably Be Controlled, 79 Student, 2841, atast Isanahu 2 to sall out anivirabnil anotignuss A When to Abandon an Experiment, 80 Techniques of Control, 80 An Example of Exercising Extraneous-Variable Control, 91 The Experimenter as an Extraneous Variable, 92 Chapter Summary, 95 Critical Review for the Student—Some Control Problems, 97 Chapter 5 THE RESEARCH PLAN, 100 The Evidence Report, 100 Multiplication of Old in the Property of the Prope Methods of Obtaining an Evidence Report, 100 Nonexperimental Methods, 100 10 12 AD 3 HT (AD 12 HT (AD Experimental Methods, 103 Contrasting Experimental and Nonexperimental Methods, 104 Types of Experiments, 106 Exploratory Versus Confirmatory Experiments, 106 Crucial Experiments, 107 Pilot Studies, 107 Field Studies, 108

Planning an Experiment, 108

Outline for an Experimental Plan, 109

Cel Vision Control of Control o

Conducting an Experiment: An Example, 121 Chapter Summary, 124

Some Review Questions for the Student, 125 Problem 27 St. apidairs V automit?

Organismic Variables, 62 ... 82 , sala? but to bastant vti Chapter 6 EXPERIMENTAL DESIGN: THE CASE OF TWO INDEPENDENT GROUPS, 126

A General Orientation, 127

Establishing "Equality" of Groups Through Randomization, 128

"Unequal" Groups Are Unlikely, 128

"Unequal" Groups Are Possible, 128

Compare Group Means on Relevant Variables, 129 dans V-monage Capital Means V-monage Capital Means V-monage Capital Means

Analysis of Covariance, 129 Science Is Self-Correcting, 130

Statistical Analysis of the Two-Independent-Groups Design, 130 Computing a Mean, 131

Testing the Difference Between Means, 132

The Null Hypothesis, 136
How Large Is Large? 138

How Large Is Large? 138

Testing the Null Hypothesis, 140

Specifying the Criterion for the Test, 141

Creative Transport of the Test, 141

One- Versus Two-Tailed Tests, 142

Steps in Testing an Empirical Hypothesis, 143

"Borderline" (Marginal) Reliability, 144 mmo) and of saldans V automatical anivirous?

The Standard Deviation and Variance, 145 and saldard appointment and privilege

Assumptions Underlying the Use of Statistical Tests, 148

Your Data Analysis Must Be Accurate, 151 08 dnaminaged as nobasida of nadW

Number of Participants per Group, 153

Error Variance, 155 ... Hyperferror Variable Workship and Market Variance of Exercising Extraneous-Variable Workship and Market Variable Ways to Reduce Error Variance, 156

Replication, 159 at Statements of Hypotheses, 48 Summary of the Computation of t for a Two-Independent-Groups Design, 160 Chapter Summary, 161 Retween Antecedent and Consequent Condition 189

Critical Review for the Student, 163

Chapter S THE RESEARCH PLAN, 100 Appendix: The Meaning of Degrees of Freedom, 166

Methods of Obtaining an Evidence Report, 100 Chapter 7 EXPERIMENTAL DESIGN: THE CASE OF MORE THAN TWO INDEPENDENT **GROUPS**, 168 The Value of More Than Two Groups, 168

Limitations of a Two-Group Design, 174

Statistical Analysis of a Design With More Than Two Independent Groups, 177 Exployer Reperiments, 107

Limited Pairwise Comparisons, 178

All Possible Pairwise Comparisons, 181

Overall (Omnibus) F-Tests and the Analysis of Variance, 182

Chapter Summary, 194

Statistical Summary, 195

Limited Pairwise Comparisons, 195

All Possible Pairwise Comparisons, 195

Summary of the Computation of Analysis of Variance and the F-Test for an Independent-Groups Design With More Than Two Groups, 196

Critical Review for the Student, 198

Chapter 8 EXPERIMENTAL DESIGN: THE FACTORIAL DESIGN, 200

Overview, 200

Assessing the Two Independent Variables, 202

The Concept of Interaction, 204
Statistical Analysis of Factorial Designs, 209

Analysis of Variance for a 2 × 2 Factorial Design, 209

F-Tests and the Null Hypotheses, 215

A Briefer Example, 216 A TOTAL MARKET BANKS AND ASSESSED AS A MARKET BANKS AND ASSESSED AS A

Selecting an Error Term, 221

The Importance of Interactions, 221

The Importance of Interactions, 221

Interactions, Extraneous Variables, and Conflicting Results, 223

Value of the Factorial Design, 225

Types of Factorial Designs, 227

Factorial Designs With Two Independent Variables, 227

Factorial Designs With More Than Two Independent Variables, 228

Chapter Summary, 230

Summary of an Analysis of Variance and the Computation of an F-Test for a 2×2 Factorial Design, 231
Critical Review for the Student, 233
Critical Review for the Student, 233
Critical Review for the Student, 233

Chapter 9 CORRELATIONS AND EXPERIMENTAL DESIGNS, 236 Behavior Therapy, 301

Correlational Research, 236

The Meaning of Correlation, 236
Scattergrams, 239

Curvilinear Relationships, 242

The Computation of Correlation Coefficients, 243

The Pearson Product Moment Coefficient of Correlation, 243

Dichotomized Variables, 245

Statistical Reliability of Correlation Coefficients, 246

Correlation and Causation, 246

The Two-Matched-Groups Experimental Design, 249

Statistical Analysis of a Two-Matched-Groups Design, 250

Selecting the Matching Variable, 252

Which Design to Use: Randomized Groups or Matched Groups? 254

Error Variance and the Matched-Groups Design, 256

Experimental Designs for Repeated Treatments Using Groups, 258

Between- Versus Within-Groups Designs, 258

The Two-Repeated-Treatments Design, 258

Several-Repeated-Treatments Designs, 261

Statistical Analysis for More Than Two Repeated Treatments, 262

Statistical Assumptions, 265 Statistical Assu

Order of Participants in Repeated-Treatments Designs, 265

Evaluation of Repeated-Treatments Designs, 266

Overview of Experimental Designs and Their Statistical Tests, 270

Chapter Summary, 270

Summary of Statistical Computations, 273

Correlations, 273 Croups Through Randomization, 128 000, weivrew

Computation of t for a Two-Matched-Groups Design, 275

Two-Repeated-Treatments Design, 276

More Than Two Repeated Treatments, 277

Critical Review for the Student, 279 Tales Clampas I C X C and something the elayland

Chapter 10 EXPERIMENTAL DESIGN: SINGLE-SUBJECT (N = 1) RESEARCH, 283

Two Research Strategies, 283

Two Research Strategies, 283

The Experimental Analysis of Behavior, 285

The Basic Experiment: Operant Conditioning, 286

Contingencies of Responding, 287

The Cumulative Record, 287

Graphic Analysis for Assessing Response Changes, 289

Paradigms for N = 1 Experimental Designs, 291

Overview, 291
Withdrawal Designs, 291

The Reversal Design, 297

Changing-Criterion Designs, 298

Maintaining Behavior That Is Acquired, 301

Fields of Application, 301

Behavior Therapy, 301

Behavior Therapy, 301
Drug Evaluations, 302
Drug Evaluations, 302
Drug Evaluations, 302

Difficulties Encountered With Single-Subject Methodology, 304

Comments on Group Designs, 307

Conclusion, 307 y 161 EAC estadon Coefficients, 243

Chapter Summary, 308 (Manning Strong) to training of the month of the board of the strong of the str

Critical Review for the Student, 309

Appendix A: Statistical Analysis of Time-Series Designs, 310

Appendix B: Multiple-Baseline Designs, 313

The Two-Matched-Groups Experimental Design, 249 851 Chapter 11 QUASI-EXPERIMENTAL DESIGNS: SEEKING SOLUTIONS TO SOCIETY'S Selecting the Matching Variable, 252 aldshow grinds Med gnitosis.

Applied Versus? Pure Science, 318

Applying Psychological Principles to Improve Society, 318

Quasi-Experimental Designs, 320

Notational System for Quasi-Experimental Designs, 321

The One-Group Pretest-Posttest Design, 322

Nonequivalent Comparison-Group Designs, 323

Interrupted Time-Series Designs, 327 Mowil made grown to leave and leaders and leaves an

Conclusion, 335

Chapter Summary, 335

Critical Review for the Student, 337

Appendix: Possible Effects of Treatments, 338

Chapter 12 GENERALIZATION, EXPLANATION, AND PREDICTION IN PSYCHOLOGY, 340

The Inductive Schema, 341

Inductive and Deductive Inferences, 344

Concatenation, 346

Generalization, 347

Explanation, 348

Prediction, 351

Forming the Evidence Report, 354

Direct Versus Indirect Statements, 355

Confirmation Versus Verification, 356

Inferences From the Evidence Report to the Hypothesis, 357

Universal Hypotheses, 357

Existential Hypotheses, 358

The Mechanics of Generalization, 361

Representative Samples, 361

Representative Experimenters, 362

Representative Tasks, 362

Representative Stimuli, 362

Applying Factorial Designs, 363

Models and the Choice of a Correct Error Term, 365

The Limitation of Generalizations, 367

Ascertaining the Reason for Conflicting Results, 367

A Look to the Future, 376

Chapter Summary, 376

Critical Review for the Student, 378

Appendix A STATISTICAL TABLES, 381

Appendix B WRITING UP YOUR EXPERIMENT, 389

Getting Yourself Prepared, 389

Overview of the Components of a Manuscript, 391

Pages of a Manuscript: Title Page, 391

Author's Name and Institutional Affiliation, 392

Abstract Page, 392

Text Pages, 392

Introduction, 392

Method, 393

Results, 394