

This International Student Edition is for use outside of the U.S.

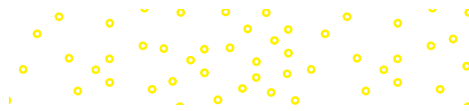
Fifteenth Edition

METHODS IN BEHAVIORAL RESEARCH

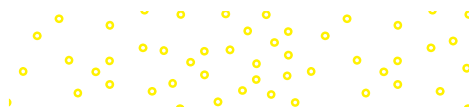
Mc
Graw
Hill

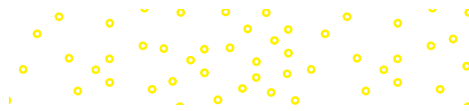
PAUL C. **COZBY**
SCOTT C. **BATES**

CEPIEC



Methods in Behavioral Research





Methods in Behavioral Research

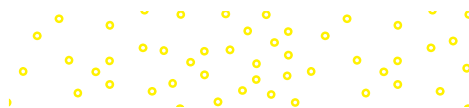
FIFTEENTH EDITION

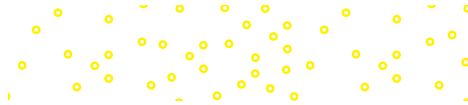
PAUL C. COZBY

California State University, Fullerton

SCOTT C. BATES

Utah State University





METHODS IN BEHAVIORAL RESEARCH

Published by McGraw Hill LLC, 1325 Avenue of the Americas, New York, NY 10019. Copyright ©2024 by McGraw Hill LLC. All rights reserved. Printed in the United States of America. No part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written consent of McGraw Hill LLC, including, but not limited to, in any network or other electronic storage or transmission, or broadcast for distance learning.

Some ancillaries, including electronic and print components, may not be available to customers outside the United States.

This book is printed on acid-free paper.

1 2 3 4 5 6 7 8 9 LCR 28 27 26 25 24 23

ISBN 978-1-266-17768-2

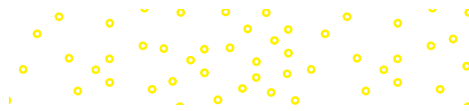
MHID 1-266-17768-X

Cover Image: *antonyspencer/E+/Getty Images*

All credits appearing on page or at the end of the book are considered to be an extension of the copyright page.

The Internet addresses listed in the text were accurate at the time of publication. The inclusion of a website does not indicate an endorsement by the authors or McGraw Hill LLC, and McGraw Hill LLC does not guarantee the accuracy of the information presented at these sites.



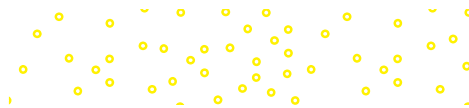


For Paul Rosenblatt

—PCC

For my grandmother, Marcile Lottie Yastrop, who had a teacher's heart.

—SCB





Guide to Diversity, Equity, and Inclusion

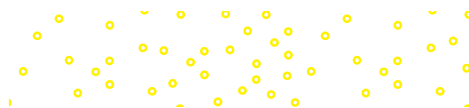
Since our first edition, *Methods in Behavioral Research* has helped students learn to think like behavioral scientists. Scientists rely on observations to uncover the truth. Historically, most of the scholarship in the behavioral sciences was conducted by White men with White male research participants; it is a discipline built on a single, segmented, incomplete view of humanity. While systemic inequality in society and science has held our collective understanding of humanity back, the persistence, talent, and hard work of many scholars have resulted in a more diverse, equitable, and inclusive science. Now behavioral research is being conducted worldwide, with diverse participants, by researchers with diverse backgrounds and experiences. We are a better science today than we were yesterday and must continue striving to be better. Because *Methods in Behavioral Research* is dedicated to helping students learn about the foundation of the behavioral sciences, it is our responsibility to shine a light on this history and help illuminate a more inclusive path forward.

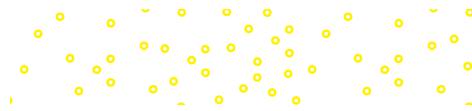
We use inclusive language, even if original texts do not. Language evolves and changes over time. In *Methods of Behavioral Research*, we describe some classic studies in the behavioral sciences. We will often modify the language used in those studies to reflect an inclusive sensibility. We are guided by the American Psychological Association’s Inclusive Language Guidelines because we agree that, “by embracing inclusive language... we firmly believe that we will not only communicate effectively with more people but also better adapt to a diversifying society and globe” (American Psychological Association, 2021b). We also laud the APA’s conceptualization of this living document and believe that language guidelines—like language itself—change over time.

We engage with diversity, equity, and inclusion. When discussing studies, we will describe their limitations regarding diversity, equity, and inclusion. One of the essential concepts in behavioral science—the idea that a study can be generalized beyond the population studied—will be emphasized when we talk about research. We will be careful about discussing a study conducted at a specific time and place with a particular group of research participants. When describing one of psychology’s most famous studies, the Milgram obedience studies, we note that Milgram’s sample mainly consisted of White people from New England. And we will draw attention to replications that expand those findings beyond their narrow origin.

We cite research conducted with diverse populations and researchers from diverse backgrounds. Research has not always represented diverse viewpoints (Roberts et al., 2020). We will not always succeed—behavioral science has a long way to go before it can represent the diversity of humanity—but we are trying (Buchanan, 2021). We foreground research conducted with diverse people by researchers who represent the diversity of humanity—such as Dr. Changwon Son and his colleagues, who studied the effects of COVID-19 on college students’ mental health in the United States; or Drs. Aurino, Wolf, and Tsinigo’s (2020) study of household food insecurity and early childhood development in Ghana, Africa; and Dr. Nada Goodrum and her colleagues’ longitudinal study of mothers’ disclosure of their HIV status to their children (Goodrum et al., 2021).

This book is a product of its authors and their environment. We welcome feedback and hope you will reach out to us directly if you have a critique, suggestion, or thought.





Contents

Preface xv

About the Authors xxvii

1 SCIENTIFIC UNDERSTANDING OF BEHAVIOR 1

Consuming Research 2
Ways of Knowing 3
Being a Skilled Consumer of Research 8
Goals of Behavioral Science 9
Basic and Applied Research 13
Review Questions 20
Study Terms 21
Check Your Learning: Answers 21

2 WHERE TO START 22

Research Questions, Hypotheses, and Predictions 23
Sources of Ideas 25
Types of Journal Articles 30
Exploring Past Research 35
Review Questions 49
Study Terms 49
Check Your Learning: Answers 50

3 ETHICS IN BEHAVIORAL RESEARCH 51

Milgram's Obedience Experiments 52
Historical Context of Current Ethical Standards 53



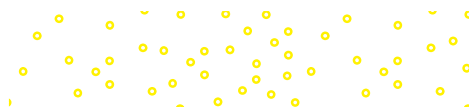
APA Ethics Code	55
Assessment of Risks and Benefits	57
Informed Consent	59
The Importance of Debriefing	64
Institutional Review Boards	66
Research with Nonhuman Animal Subjects	70
Being an Ethical Researcher: The Issue of Misrepresentation	71
Conclusion: Risks and Benefits Revisited	75
<i>Review Questions</i>	81
<i>Study Terms</i>	81
<i>Check Your Learning: Answers</i>	82

4 **FUNDAMENTAL RESEARCH ISSUES** 83

Validity: An Introduction	84
Variables	85
Operational Definitions of Variables	85
Relationships Between Variables	87
Nonexperimental Versus Experimental Methods	92
Experimental Methods: Additional Considerations	99
Evaluating Research: Summary of the Four Validities	104
<i>Review Questions</i>	109
<i>Study Terms</i>	110
<i>Check Your Learning: Answers</i>	110

5 **MEASUREMENT CONCEPTS** 111

Reliability of Measures	112
Construct Validity of Measures	117
Reactivity of Measures	121
Variables and Measurement Scales	122
<i>Review Questions</i>	129
<i>Study Terms</i>	130
<i>Check Your Learning: Answers</i>	130



6 **OBSERVATIONAL METHODS 131**

Quantitative and Qualitative Approaches 132

Naturalistic Observation 134

Systematic Observation 137

Case Studies 140

Archival Research 142

Review Questions 148

Study Terms 149

Check Your Learning: Answers 149

7 **ASKING PEOPLE ABOUT THEMSELVES: SURVEY RESEARCH 150**

Why Conduct Surveys? 151

Constructing Questions to Ask 153

Responses to Questions 156

Finalizing the Survey Instrument 160

Administering Surveys 161

Survey Designs to Study Changes Over Time 164

Sampling From a Population 165

Sampling Techniques 168

Evaluating Samples 173

Reasons for Using Convenience Samples 174

Review Questions 179

Study Terms 180

Check Your Learning: Answers 180

8 **EXPERIMENTAL DESIGN 181**

Confounding Variables and Internal Validity 182

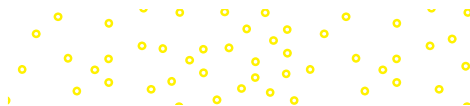
Basic Experiments 183

Assigning Participants to Experimental Conditions 188

Review Questions 198

Study Terms 198

Check Your Learning: Answers 198



9 CONDUCTING EXPERIMENTS 199

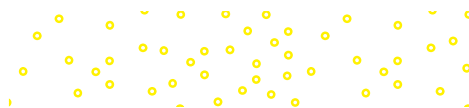
- Selecting Research Participants 200
- Manipulating the Independent Variable 201
- Measuring the Dependent Variable 207
- Additional Controls 211
- Final Planning Considerations 215
- Analyzing and Interpreting Results 218
- Communicating Research to Others 219
- Review Questions* 223
- Study Terms* 223
- Check Your Learning: Answers* 224

10 COMPLEX EXPERIMENTAL DESIGNS 225

- Increasing the Number of Levels of an Independent Variable 226
- Increasing the Number of Independent Variables:
 - Factorial Designs 228
 - Outcomes of a 2×2 Factorial Design 232
 - Assignment Procedures and Factorial Designs 236
 - From 2×2 to $N \times N$ Factorial Designs 238
 - Factorial Designs with Three or More Independent Variables 239
- Review Questions* 244
- Study Terms* 244
- Check Your Learning: Answers* 244

11 SINGLE-CASE, QUASI-EXPERIMENTAL, AND DEVELOPMENTAL RESEARCH 245

- Single-Case Experimental Designs 246
- Quasi-Experimental Designs 250
- Developmental Research Designs 259
- Review Questions* 267
- Study Terms* 268
- Check Your Learning: Answers* 268

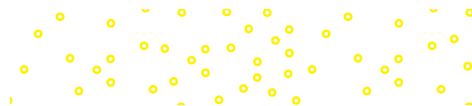


12 UNDERSTANDING RESEARCH RESULTS: DESCRIPTION AND CORRELATION 270

- Scales of Measurement: A Review 271
- Describing Results 272
- Frequency Distributions 274
- Descriptive Statistics 277
- Graphing Relationships 278
- Correlation Coefficients: Describing the Strength of Relationships 279
- Effect Size 285
- Regression Equations 286
- Multiple Correlation and Regression 287
- Mediating and Moderating Variables 289
- Advanced Statistical Analyses 292
- Review Questions* 296
- Study Terms* 296
- Check Your Learning: Answers* 297

13 UNDERSTANDING RESEARCH RESULTS: STATISTICAL INFERENCE 298

- Samples and Populations 299
- Inferential Statistics 300
- Null and Research Hypotheses 301
- Probability and Sampling Distributions 301
- Group Differences: The t and F Tests 304
- Type I and Type II Errors 311
- Choosing a Significance Level 314
- Interpreting Nonsignificant Results 315
- Choosing a Sample Size: Power Analysis 316
- The Importance of Replications 317
- Significance of a Pearson r Correlation Coefficient 318
- Statistical Analysis Software 318
- Selecting the Appropriate Statistical Test 320
- Review Questions* 324
- Study Terms* 324
- Check Your Learning: Answers* 324



14 GENERALIZATION 326

- Generalizing Across People 327
- Generalizing Across Situations 334
- Replications 336
- Assessing External Validity Via Literature Reviews and Meta-Analyses 340
- Using Research to Improve Lives 342
- Review Questions* 345
- Study Terms* 346
- Check Your Learning: Answers* 346

APPENDIX A: REPORTING RESEARCH 347

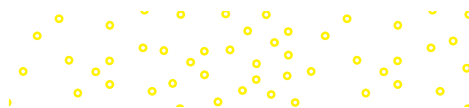
- Introduction 347
- Writing Your Report 348
- Formatting Your Report 355
- Organization of the Report 357
- The Use of Headings 374
- Citing Sources and Creating a Reference List 375
- Abbreviations 384
- Reporting Numbers and Statistics 386
- Paper and Poster Presentations 387
- APA Style Resources: Sample Paper 390
- APA Style Resources: Citations 411
- APA Style Resources: Title Page 413
- APA Style Resources: Page and Section Format 416
- APA Style Resources: Reference List 419

APPENDIX B: STATISTICAL TESTS 422

- Descriptive Statistics 422
- Statistical Significance and Effect Size 425

Engaging with Research

- Chapter 1: Introduction
- Chapter 2: Laptops in Class
- Chapter 3: Replication of Milgram
- Chapter 4: Studying Discrimination

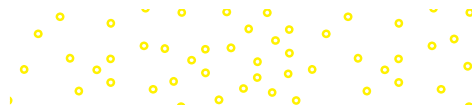


Chapter 5: Measurement Concepts
Chapter 6: Observational Methods
Chapter 7: Survey Research
Chapter 8: Experimental Design
Chapter 9: Conducting Experiments
Chapter 10: Complex Experimental Designs
Chapter 11: Developmental Research
Chapter 14: Generalizing Results

Glossary 443

References 452

Index 472



Preface

Methods in Behavioral Research guides students toward success by helping them study smarter and more efficiently. Supported by SmartBook[®], McGraw Hill's adaptive and personalized reading experience, this Fifteenth Edition provides helpful pedagogy, rich examples, and a clear voice in its approach to methodological decision making.

In this Fifteenth Edition, we strive for an accessible presentation and continue looking for opportunities to drive home foundational concepts and reinforce students' understanding of the material. We have reimagined end-of-chapter content. We chose concepts that students have traditionally found most challenging and designed exercises that ask them to reflect, recall, and organize the material. We have also aligned with the *Publication Manual of the American Psychological Association* (7th ed.). Focused organization combined with clear and direct writing remains a hallmark of *Methods in Behavioral Research*. Chapters follow the arc of a research investigation, from planning through conducting and presenting.

ORGANIZATION

Methods in Behavioral Research moves carefully through the major concepts in behavioral research, from the foundations of scientific study through practical issues in research design and implementation.

“Scientific Understanding of Behavior” grounds students in the scientific approach, emphasizing the distinction between basic and applied research. “Where to Start” discusses sources of ideas for research and the importance of library research. “Ethics in Behavioral Research” focuses on research ethics; ethical issues are covered in depth here and emphasized throughout the book. “Fundamental Research Issues” introduces validity and examines psychological variables and the distinction between experimental and nonexperimental approaches to studying relationships among variables. “Measurement Concepts” focuses on measurement issues, including reliability and validity. Nonexperimental research approaches—including naturalistic observation, case studies, and content analysis—are described in “Observational Methods.” “Asking People About Themselves: Survey Research” covers sampling as well as the design of questionnaires and interviews. “Experimental Design” and “Conducting Experiments” present the basics of designing and conducting experiments. Factorial designs are emphasized in “Complex Experimental Designs.” “Single-Case, Quasi-Experimental, and

Developmental Research” discusses the designs for special applications: single-case experimental designs, developmental research designs, and quasi-experimental designs. “Understanding Research Results: Description and Correlation” and “Understanding Research Results: Statistical Inference” focus on the use of statistics to help students understand research results. These chapters include material on effect size and confidence intervals. Finally, “Generalization” discusses external validity, meta-analyses, open science, and the importance of replications.

FEATURES

Methods in Behavioral Research includes the following features to enhance learning:

NEW! APA Style Resources. New, easy-to-use guides on APA style formatting for the title page, page and section format, citations, and the reference page. The title page guide includes both professional and student versions. The citations guide includes how-to guides for many common in-text and parenthetical citations as well as formats for commonly used sources. The page and section guide guides students through APA headers, font choices, margins, and running heads. The reference page guide includes global formatting as well as source-level formatting.

NEW! Sample Paper. A new, fully annotated sample paper—written by an undergraduate researcher—provides an accessible example of good APA style. Annotation points to common questions and common misperceptions and connects students back to the APA Style Resources sections for additional information. The new sample paper and annotations were designed to be easy to use in both e-book and print formats.

Engaging with Research. This feature has been refined to include authors from diverse backgrounds and topic-of-study that reflect the diversity of the behavioral sciences. These boxes include published journal articles with questions and exercises designed to focus on chapter-related material. In addition, the articles help students become familiar with the structure and language of journal articles in psychology. Most important, we have provided links to online copies of the articles whenever possible.

Being a Skilled Consumer of Research. These exercises are designed to get students out of the textbook and out of their classrooms and into the broader world in which we all move. These exercises ask students to look at examples of research—such as studies on the predictors of happiness and the causes and effects of sitting in the front of the classroom—to compare what they’ve learned in class or the text with what they see. Applying the concepts they have learned will help them expand their understanding of the content.

Fully updated according to the Publication Manual of the American Psychological Association (7th ed.): This edition includes and supports new guidelines on ethical and bias-free writing, adopts the new standard for in-text citations, updates rules for manuscript formatting, and adopts the APA's final resolution to the eternal question: One space or two after a period? (Answer: One!)

Check Your Learning: Practice Exercises. In previous editions, these Check Your Learning boxes were placed within the body of the chapter. We learned that students often found this placement distracting and preferred to be able to control when to complete the exercises. Feature includes an in-text callout to place the content; the actual exercises and answers are at the end of the chapter.

Solid pedagogy. Each chapter opens with a set of learning objectives that serve as reading guides and ends with a review of major concepts and key terms.

Practical examples. Thought-provoking examples help students interpret challenging concepts and complex research designs. For instance, the concept of diversity of ideas is examined through the lens of biases regarding rap music, and theory article formats are introduced by discussion of a recent study on suicide.

Emphasis on decision-making. Distinguishing among a variety of research designs helps students understand when to use one type of design over another.

FLEXIBLE

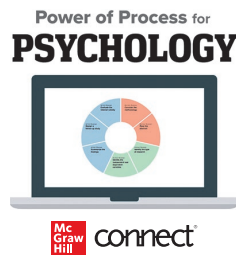
Chapters are designed to work independently, so that they can be adapted to any curriculum or syllabus. Sections are clearly defined, and relevant practice exercises are called out within each, making it easy to reorder or skip topics.

In addition, two appendices related to communicating research findings and conducting statistical analyses can be used at any time throughout the course. Appendix A includes an annotated version of a published paper and provides firm instructions for organizing research. Appendix B includes a bank of statistical tests that can be applied to a variety of research designs.



Methods in Behavioral Research is available to instructors and students in traditional print format as well as online within McGraw Hill Connect, a digital assignment and assessment platform. Connect includes assignable and assessable videos, quizzes, exercises, and interactive activities, all associated with learning objectives for *Methods in Behavioral Research*. These online tools make managing assignments easier for instructors, and learning and studying more motivating and efficient for students.

Power of Process, available in Connect for Research Methods, guides students through the process of critical reading, analysis, and writing. Faculty can select or upload their own content, such as journal articles, and assign analysis strategies to gain insight into students' application of the scientific method. For students, Power of Process offers a guided visual approach to exercising critical thinking strategies to apply before, during, and after reading published research.



A PERSONALIZED EXPERIENCE THAT LEADS TO IMPROVED LEARNING AND RESULTS

Students study more effectively with Connect and SmartBook. How many students think they know everything about introductory psychology, but struggle on the first exam?

With more than a decade of collecting data from billions of questions answered across 90+ disciplines, we've learned a lot about adaptive learning's impact on student performance. We've created a secure space for learning that balances intentional rigor with the freedom to make mistakes. This is an environment that develops self-awareness through meaningful, immediate feedback that improves student success. SmartBook builds on our market-leading technology with enhanced capabilities that deliver a more personalized, productive, and accessible learning experience for students and instructors.

SmartBook helps students study more efficiently by highlighting what to focus on in the chapter, asking review questions, and directing them to resources until they understand. SmartBook creates a personalized study path customized to individual student needs, continually adapting to pinpoint knowledge gaps and focus learning on concepts requiring additional study. By taking the guesswork out of what to study, SmartBook fosters more productive learning and helps students better prepare for class. With SmartBook, instructors have the flexibility to tailor assignments to their courses. Pick the topics, depth of coverage, or even the length of time students spend on an assignment. SmartBook assignments can help students build foundational knowledge, while review assignments can focus on multiple chapters or previously assigned concepts to help students prepare for exams.

With McGraw Hill's free ReadAnywhere app, students can read or study when it's convenient for them—anytime, anywhere. Available for iOS or Android

smartphones or tablets, ReadAnywhere gives users access to McGraw Hill tools, including the eBook and SmartBook in Connect. Students can take notes, highlight, and complete assignments offline, and their work will sync when they open the app with WiFi access. SmartBook also provides a more accessible student experience with improved color contrast, descriptions for images, increased keyboard navigation, and enhanced screen reader support. Work is ongoing to improve the user experience for all.

POWERFUL REPORTING

Whether a class is face-to-face, hybrid, or entirely online, McGraw Hill Connect provides the tools needed to reduce the amount of time and energy instructors spend administering their courses. Easy-to-use course management tools allow instructors to spend less time administering and more time teaching, while reports allow students to monitor their progress and optimize their study time.

- The **At-Risk Student Report** provides instructors with one-click access to a dashboard that identifies students who are at risk of dropping out of the course due to low engagement levels.
- The **Category Analysis Report** details student performance relative to specific learning objectives and goals, including APA learning goals and outcomes and levels of Bloom's taxonomy.
- **The SmartBook Reports** allow instructors and students to easily monitor progress and pinpoint areas of weakness, giving each student a personalized study plan to achieve success.

ADDITIONAL RESOURCES



Achieve simplicity in assigning and engaging your students with course materials. Craft your teaching resources to match the way you teach! With McGraw Hill Create, you can easily rearrange chapters, combine material from other content sources, and quickly upload content you have written, such as your course syllabus or teaching notes. Find the content you need in Create by searching through thousands of leading McGraw Hill textbooks. Arrange your book to fit your teaching style. Create even allows you to personalize your book's appearance by selecting the cover and adding your name, school, and course information. Order a Create book and you'll receive a complimentary electronic review copy (eComp) via email in about an hour. Experience how McGraw Hill Create empowers you to teach your students *your* way: <http://create.mheducation.com>

CONTENT CHANGES IN THE FIFTEENTH EDITION

The Fifteenth Edition of *Methods in Behavioral Research* reflects global and specific chapter level changes.

Global changes

- We've adopted APA's inclusive language guidelines.
- We engage with diversity, equity, and inclusion in examples.
- We cite research conducted with diverse populations and researchers from diverse backgrounds.
- Engaging with Research was refined to include authors from diverse backgrounds and topics of study that reflect the diversity of the behavioral sciences.
- Appendix A was significantly revised to focus on usability for students: new sections related to APA style (7th edition) were created, and a new sample paper was designed to connect students to APA style guidelines and help them learn effective APA style writing.
- Being a Skilled Consumer of Research was refined to specifically enhance critical thinking skills.

Chapter 1

- “Being a Skilled Consumer of Research” has been revised to include eight key questions to help students evaluate “any research study that will reveal a lot about how much the study should be trusted.”
- Repositioned “Engaging with Research” chapter-ending features are explained in chapter 1 and align with the eight questions to ask of a study to be a Being a Skilled Consumer of Research.
- The new “Engaging with Research” chapter feature is a study of ethnic variation in gratitude and well-being, and asks students to evaluate this study using the eight questions that lead to being a skilled consumer of research.

Chapter 2

- Analysis of the impact of the pandemic on research and academic conferences.
- A new key example related to Latina identity safety in STEM environments anchors the chapter.

Chapter 3

- Discussion on how exploitation of minority groups in research has contributed to COVID-19 vaccine resistance.

- Explanation of the informed consent procedure used in the Milgram study, which allowed for participants to withdraw at any time without penalty.
- Description of the Greenspan and Loftus (2021) study on misinformation and “enhanced debriefing.”
- Examination of “debriefing” as a researcher’s obligation to treat participants with dignity and respect.
- Significantly revised section on Research with Nonhuman Animal Subjects.

Chapter 4

- Several new examples, including Schreer’s 2009 study of how Black customers were subject to suspicion in a customer scenario, Weijers and de Koning’s 2021 study of how subjects reacted to varying reminders to sanitize hands. Guntzviller et al. 2020 found that stress is related to poor mental health among young adult Hispanics and that social support can help mitigate the effects of stress.
- Expanded discussion of predictive validity, with the construct of “grit” as an example.
- New Engaging with Research study examining workplace discrimination using a “lost email” experiment (Agerström et al., 2021).

Chapter 5

- A new section, *Measurement Validity: For Whom*, focuses on measurement validity across populations in an effort to draw attention to measurement biases that intersect with the diversity of study populations.

Chapter 6

- A significantly revised section introducing qualitative and quantitative approaches.
- Discussion of the Goodrum et al. 2021 study using mixed-methods research design to study what happens after mothers diagnosed with HIV disclose their HIV status to their children.
- A new section on Sampling Behaviors and Experiences describes the Experience Sampling Method (ESM) and Day Reconstruction Method (DRM).
- Description of the Halstead et al. 2021 study on PTSD resulting from racial discrimination and sexual abuse during childhood.
- Definition of *psychobiography* as a case study in which the researcher applies psychological theory to explain the life of a historical figure.
- Discussion of Stout et al. 2020 study that tried two different mentors for recruiting Black and non-Hispanic White older adults for research investigation on Alzheimer’s disease.

- Explanation of the National Longitudinal Mortality Study as a database for studying the effects of demographic and socioeconomic characteristics on mortality rates.
- New examples of archival research studies using written, audio, and video records: Kruspe et al. (2020), who analyzed Twitter messages during the first months of the COVID-19 pandemic; Corbett and Savarimuthu (2022), who analyzed 6,528 tweets about sustainable energy; Trivedi et al. (2021), who examined suicide prevention using Google-search trends; and Lewis et al. (2020), who analyzed the content of books for young children to detect and quantify gender biases.
- The new Engaging with Research study examines meal service and feeding practices among Mexican American fathers and mothers (Penilla et al., 2022).

Chapter 7

- Updated section on using pictorial scales in behavioral research.
- New information on conducting surveys in large randomly selected samples, especially online, and the Pew Research Center's *American Trends Panel*.
- Discussion of the McBride et al. (2021) study on the impact of concerns about climate change on psychological well-being.
- Explanation of convenience samples through online participant recruitment services such as Amazon Mechanical Turk and Prolific.
- The new "Engaging with Research" study examines the effects of COVID-19 on U.S. college students' mental health (Son et al., 2020).

Chapter 8

- Discussion of education reform, especially emphasis on STEM and the Educational Robotics approach and its impact on cognitive development.
- A new example of the Solomon four-group design studied the effect of an intervention to promote responsible substance use, safe sex, and other positive behaviors in a diverse sample of 18- to 24-year-olds experiencing homelessness (Rew et al. 2022).
- Debate on the manipulation check as a potential demand characteristic that alerts subjects to the study's purpose.
- The new Engaging with Research study examines executive functions in 5- and 6-year-old typically developing children through educational robotics in a randomized control trial study (Di Lieto et al., 2020).

Chapter 9

- Examination of the methods used to study memory and cognition, including the Cushing and Bodner 2022 study on improving proofreading accuracy.

- Hies and Lewis (2022) used a face database to obtain stimuli for a study on perceptions of people wearing masks during the COVID pandemic.
- Forrin et al. (2021) studied whether and how the behavior of one student in a learning situation might affect the behavior of another. They proposed that inattention (or attention) to learning could spread, a phenomenon called “attention contagion.”
- Randall et al. (2017) investigated weight discrimination in a field experiment conducted on a college campus.
- Wang et al. (2021) used a technology called the Contain Intelligent Facial Expression Recognition System (CIFERS) to explore real-time emotions (joy and anxiety) of college students.
- De Vita et al. (2021) conducted research to examine the pain-reducing effects of cannabidiol (CBD) and determine the degree to which observed pain reduction is due to the effects of CBD as opposed to the psychological expectancies associated with this substance.
- Introduction of the “examiner” expectancy effect using the Sodos et al. 2018 study in which examiners first rated whether or not they believed an examinee was a cannabis user.
- Discussion of the debate about the use of manipulation checks (Ejelöv and Luke, 2020; Hauser et al., 2018). One concern is that the manipulation check might serve as a demand characteristic, alerting subjects to the purpose of the study.
- A new section on Open Science and Preregistration.
- The new Engaging with Research study examines Instagram influencer posts using eye-tracking technology to see how specific tags on posts (#ad versus #sponsored) would impact people’s visual attention to those ads (Klein et al., 2020).

Chapter 10

- A new example of a mixed factorial design. Pan et al. (2020), for example, were interested in identifying factors that might help college students pay attention to the material presented in a recorded lecture.
- A new Engaging with Research study reported on an experiment with Instagram users in the United States to test whether hiding “likes” would affect the users’ mood and loneliness (Wallace and Buil, 2020).

Chapter 11

- Enhanced discussion of the ex post facto design and selection differences that can arise.
- Discussion of the Rathje et al. (2021) study on empathy

- The new Engaging with Research Study (Aurino et al., 2020) reported on a longitudinal study of children in Ghana, in sub-Saharan Africa.

Chapter 12

- Significantly revised section on multiple correlation and regression.
- A new section on mediating and moderating variables.
- A revised section on advanced statistics that creates a gentle introduction to the more sophisticated statistical approaches that students see in recently published work.

Chapter 14

- A deeply revised section on Generalizing Across People that focuses on identities (including sex, gender, sexual orientation, race, and ethnicity) and culture, threats to external validity.
- A deeply revised section on Generalizing Across Situations focuses on research conducted in a laboratory setting and researcher expectancy effects.
- A new example of meta-analysis that examined the effectiveness of psychotherapy delivered remotely for children and adolescents (Venturo-Conerly et al., 2022).
- A new book-ending section, Using Research to Improve Lives, frames the behavioral sciences in terms of “There is a lot of work left to do” and our hope that students “feel more prepared to do it.”
- The new Engaging with Research study investigated the experiences of economically disadvantaged mothers during the COVID-19 pandemic (Haskett et al., 2022).

Appendix A

- Updated and aligned with the *Publication Manual of the American Psychological Association* (7th ed.).
- An enhanced organization designed to provide useful and accessible resources for students as they learn to write in APA style.
- The section Avoiding Biased Language now refers to the *APA Inclusive Language Guidelines* (APA, 2021b).
- A new annotated sample paper—written by an undergraduate—provides an accessible example of good APA style.
- New APA Style Resources pages provide students will easy-to-use guidance on the title page, page and section format, citations, and the reference page.

INSTRUCTOR RESOURCES

Methods in Behavioral Research also includes the following instructor resources:

Instructor's Manual: Designed to provide a wide variety of resources for presenting the course, the instructor's manual includes learning objectives, ideas for lectures and discussions, laboratory demonstrations, and activities aligned specifically to facilitate a clearer knowledge of research methods.

Test Bank: By increasing the rigor of the test bank development process, McGraw Hill has raised the bar for student assessment. A coordinated team of subject-matter experts methodically vetted each question and each set of possible answers for accuracy, clarity, and effectiveness. Each question is further annotated for level of page difficulty, Bloom's taxonomy, APA learning outcomes, and corresponding coverage in the text. Structured by chapter, the questions are designed to test students' conceptual, applied, and factual understanding.

Test Builder: New to this edition and available within Connect, Test Builder is a cloud-based tool that enables instructors to format tests that can be printed or administered within a Learning Management System. Test Builder offers a modern, streamlined interface for easy content configuration that matches course needs, without requiring a download.

Test Builder enables instructors to:

- Access all test bank content from a particular title
- Easily pinpoint the most relevant content through robust filtering options
- Manipulate the order of questions or scramble questions and / or answers
- Pin questions to a specific location within a test
- Determine your preferred treatment of algorithmic questions
- Choose the layout and spacing
- Add instructions and configure default settings

Lecture Presentation: Accessibility compliant, PowerPoint slides are provided that present key points of the chapter, along with supporting visuals. All of the slides can be modified to meet individual needs.

Image Gallery: The complete set of figures and tables from the text are available for download and can be easily embedded into PowerPoint slides.

Remote proctoring and browser-locking capabilities: Hosted by Proctorio within Connect, remote proctoring provides control of the assessment environment by enabling security options and verifying the identity of the student. Seamlessly integrated within Connect, these services allow instructors to control students' assessment experience by restricting browser activity, recording students' activity, and verifying students are doing their own work. Instant and detailed reporting gives instructors an at-a-glance view

of potential academic integrity concerns, thereby avoiding personal bias and supporting evidence-based claims.

Writing Assignment: The Writing Assignment tool delivers a learning experience to help students improve their written communication skills and conceptual understanding. As an instructor you can assign, monitor, grade, and provide feedback on writing more efficiently and effectively

ACKNOWLEDGMENTS

Many individuals helped to produce this and previous editions of this book. The portfolio manager at McGraw Hill was Jason Seitz; we are also indebted to the editors of previous editions, Franklin Graham, Ken King, Mike Sugarman, and Krista Bettino, for their guidance. We are extremely grateful for the input from numerous students and instructors:

Marina Bornovalova <i>University of South Florida</i>	Suzanne Helfer <i>Adrian College</i>
Kristy Boyce <i>The Ohio State University</i>	Charles M. Huffman <i>Georgia Southwestern State University</i>
Blaine Browne <i>Valdosta State University</i>	Christopher Howard <i>Husson University</i>
Robert Christman <i>Mohawk Valley Community College</i>	Ashley Jordan <i>University of Arizona</i>
Emily Cohen-Shikora <i>Washington University at St. Louis</i>	Ruthellen Josselson <i>Society for Qualitative Inquiry in Psychology The Fielding Graduate University</i>
Paul Curran <i>Grand Valley State University</i>	Jeff Kibler <i>Nova Southeastern University</i>
Robert O. Deaner <i>Grand Valley State University</i>	Cecile Lardon <i>University of Alaska Fairbanks</i>
Christopher Dickinson <i>Appalachian State University</i>	Mindy Ma <i>Nova Southeastern University</i>
Melanie Domenech Rodríguez <i>Utah State University</i>	Hajime Otani <i>Central Michigan University</i>
Dana S. Dunn <i>Moravian College</i>	Mary K. Radeke <i>Central Washington University</i>
Mario Fific <i>Grand Valley State University</i>	Theodore M. Singelis <i>California State University, Chico</i>
Stephen Gabbard <i>Wright State University, Dayton</i>	Lynda Villaneuva <i>University of Houston</i>
Leslie A. Gill <i>Eastern New Mexico University</i>	

About the Authors

Paul C. Cozby is Emeritus Professor of Psychology at California State University, Fullerton. Dr. Cozby was an undergraduate at the University of California, Riverside, and received his PhD in psychology from the University of Minnesota. He is a fellow of the American Psychological Association and a member of the Association for Psychological Science. He served as an officer of the Society for Computers in Psychology and as Executive Officer of the Western Psychological Association. He is the author of *Using Computers in the Behavioral Sciences* and co-editor with Daniel Perlman of *Social Psychology*.

Scott C. Bates is a Professor and Department Head of the Psychology Department at Utah State University in Logan, Utah. He earned a BS in Psychology from Whitman College, an MS in Psychology from Western Washington University, and a PhD in social psychology from Colorado State University. His research interests and experiences are varied. He has conducted research in areas as wide-ranging as adolescent problem behavior and problem-behavior prevention, teaching and learning in higher education, and the psychological consequences of growing and tending plants in outer space.

We are always interested in receiving comments and suggestions from students and instructors. Please email us at scott.bates@usu.edu or cozby@fullerton.edu.



fizkes/Shutterstock

Scientific Understanding of Behavior

LEARNING OBJECTIVES

- Describe why it is essential to understand research methods.
- Explain the scientific approach to learning about behavior and be able to compare and contrast it with other ways of knowing.
- Identify and explain key features of the scientific approach to understanding behavior, and be able to compare and contrast it with a pseudoscientific approach.
- Describe and give examples of the four goals of scientific research: description, prediction, determination of cause, and explanation of behavior.
- Summarize the three elements for inferring causation: temporal order, covariation of cause and effect, and elimination of alternative explanations. Be able to generate an example.
- Determine if a study is basic or applied research.

DOES INSTAGRAM IMPACT HOW WE FEEL ABOUT OURSELVES? Why do we help some people in need and not others? How do our early childhood experiences affect our later lives? What causes depression? Why do some people experience anxiety so intense that it disrupts their lives? What is the impact of racism? How is gender identity formed? What can we do to promote human flourishing?

Students often cite a curiosity about questions like these as their motivation for taking courses in the behavioral sciences. Science is the best way to explore and answer these sorts of questions. In this book, we examine scientific research methods in the behavioral sciences. This introductory chapter will focus on how knowledge of research methods can help us understand the world around us. We will also review the characteristics of a scientific approach to studying behavior and some general types of research studies that behavioral scientists conduct.

CONSUMING RESEARCH

Newspapers, television, and websites are daily sources of information about the latest research on human and even animal behavior. You might have seen these articles in the New York Times: “Does Instagram Harm Girls? No One Actually Knows,” or “An Overlooked Cure for Loneliness.” A headline in theweek.com is intriguing: “Your Dog Yawns When You Yawn Because He Loves You.” Cable news CNN shows us “How to become more resilient, according to the research.” Frequent reports of survey results describe people’s views on various topics ranging from politics to the economy, health, education, and the environment. And you might wonder if your grandfather might benefit from a “brain training” app advertised to improve cognitive functioning.

The critical question is: How do you evaluate such reports? Do you accept the information because they are supposed to be scientific? A background in research methods will help you read these reports critically, evaluate the methods employed, and decide whether the conclusions are reasonable. Learning about research methods will help you think critically; learning about research methods will help you be a skilled consumer of research.

Why Learn about Research Methods?

Learning about research methods is essential for many reasons. First, many professions use research findings. For example, mental health professionals must make decisions about treatment methods, medications, and testing procedures. Such decisions are made using research findings; to make good decisions, mental health professionals must be able to read the research literature in the field and apply it to their professional lives. Similarly, people working in business environments frequently rely on research to make decisions about marketing strategies, ways of improving employee productivity and morale, and methods of selecting and training new employees. Educators must keep up with research on topics such as the effectiveness of various teaching strategies or programs to deal with special

student problems. It is useful to know research methods and the ability to evaluate research reports in many fields.

It is also important to recognize that scientific research has become increasingly prominent in public policy decisions. Legislators and political leaders at all levels of government frequently take political positions and propose legislation based on research findings. Research may also influence judicial decisions: A classic example is the *Social Science Brief* prepared by psychologists and accepted as evidence in the landmark 1954 case *Brown v. Board of Education*, in which the U.S. Supreme Court banned school segregation in the United States. One of the studies cited in the brief was conducted by Clark and Clark (1947), who found that when allowed to choose between light-skinned and dark-skinned dolls, both Black and White children preferred to play with the light-skinned dolls (see Stephan, 1983, for a further discussion of the implications of this classic study).

Behavioral research on human development has influenced U.S. Supreme Court decisions related to juvenile crime. In 2005, for instance, the Supreme Court decided that juveniles could not face the death penalty (*Roper v. Simmons*), and the decision was informed by neurological and behavioral research showing that in juveniles, the level of development of their brains, social relationships, and character make juveniles less culpable than adults for the same crimes. Similarly, in 2010, in *Graham v. Florida*, the U.S. Supreme Court decided that juvenile offenders could not be sentenced to life without parole for nonhomicide offenses. This decision was influenced by research in developmental psychology and neuroscience. The Court majority pointed to this research in their conclusion that assessment of blame and standards for sentencing should be different for juveniles and adults because juveniles lack adults' maturity, ability to resist pressures from peers and others, and personal sense of responsibility (Clay, 2010).

Research is also important when developing and assessing the effectiveness of programs designed to achieve specific goals—for example, improving high school graduation rates in a community, influencing people to be vaccinated, teaching employees how to reduce the effects of stress, or making a workplace welcoming and productive for everybody. We need to determine whether these sorts of programs are successfully meeting their goals.

Finally, research methods are important because they can provide us with the best way to find answers to questions like those we posed at the outset of this chapter. Research methods can be the way to satisfy our native curiosity about ourselves, our world, and those around us.

WAYS OF KNOWING

We opened this chapter with several questions about human behavior and suggested that scientific research is a valuable means of answering them. There are, of course, other ways of knowing. People have always observed the world around them and sought explanations for what they see and experience. So, the question must be asked: How does the scientific approach differ from other ways of learning about behavior?

Intuition

People planning to adopt after unsuccessful attempts to become pregnant often report that friends and co-workers say that the adoption will soon be followed by a pregnancy. Pregnancy does sometimes follow adoption, and can lead to the belief that adoption increases the likelihood of pregnancy for people who are having difficulties conceiving a child. People who hold this belief usually go one step further and offer an explanation for this effect—such as, that the adoption reduces a major source of stress, and the stress reduction, in turn, increases the chances of conception (see Gilovich, 1991).

This example illustrates the use of **intuition** and anecdotal evidence to draw general conclusions about the world around us. When you rely on intuition, you accept unquestioningly what your own personal judgment or a single story (anecdote) about one person's experience tells you. The intuitive approach takes many forms. Often it involves finding an explanation for our own behaviors or the behaviors of others. For example, you might develop an explanation for why you keep having conflicts with your roommate, such as “My roommate hates me” or “Having to share a bathroom creates conflict.” Other times, intuition is used to explain events that you observe, as in the case of concluding that adoption increases the chances of conception for people who are having difficulty conceiving a child.

A problem with intuition is that numerous cognitive and motivational biases affect our perceptions, and so we may draw erroneous conclusions about cause and effect (cf. Fiske & Taylor, 2021; Gilovich, 1991). Gilovich points out that there is in fact no relationship between adoption and subsequent pregnancy, according to scientific research investigations. So why do we hold this belief? Most likely it is because of a cognitive bias called *illusory correlation* that occurs when we focus on two events that stand out and occur together. When an adoption is closely followed by a pregnancy, our attention is drawn to the situation, and we are biased to conclude that there must be a causal connection. Such illusory correlations are also likely to occur when we are highly motivated to believe in the causal relationship. Although this is a natural thing for us to do, it is not scientific. A scientific approach requires much more evidence before conclusions can be drawn.

Authority

Humans are often persuaded by those in **authority**. The philosopher Aristotle said: “We believe good men more fully and readily than others.” The obvious exclusion of more than half of humanity aside, Aristotle would argue that we are more likely to be persuaded by a speaker who seems prestigious, trustworthy, and respectable than by one who appears to lack such qualities.

Many of us might accept Aristotle's arguments simply because *he* is considered a prestigious authority—a convincing and influential source—and his writings remain important. Similarly, many people are all too ready to accept anything they learn from the internet, news media, books, government officials, celebrities,

religious figures, or even a professor because they believe that statements made by such authorities must be true.

The problem, of course, is that the statements might not be true. The scientific approach rejects the notion that one can accept *on faith* the statements of any authority; again, more evidence is needed before we can draw scientific conclusions.

Empiricism

The scientific approach to acquiring knowledge recognizes that intuition, anecdote, and authority can be sources of ideas about behavior. However, scientists do not unquestioningly accept anyone's intuitions—including their own. Scientists recognize that *their* ideas are just as likely to be wrong as anyone else's. Also, scientists do not accept on faith anyone's pronouncements, regardless of that person's prestige or authority. Thus, scientists are very skeptical about what they see and hear. Scientific skepticism means that ideas must be evaluated on the basis of careful logic and results from well-executed scientific investigations.

If scientists reject intuition and blind acceptance of authority as ways of knowing about the world, how do they go about gaining knowledge? How does the scientist know anything?

The fundamental characteristic of the scientific approach is **empiricism**—the idea that knowledge comes from observations. Data are collected and analyzed, and the data form the basis of conclusions about the nature of the world. The scientific method embodies a number of rules for collecting and evaluating data; these rules will be explored throughout this book.

The Scientific Approach

The power of the scientific approach can be seen all around us. Whether you look at biology, chemistry, medicine, physics, anthropology, or psychology, you will see amazing advances over the past 5, 25, 50, or 100 years. We have a greater understanding of the world around us, and the applications of that understanding have kept pace. Goodstein (2000) describes an “evolved theory of science” that defines the characteristics of scientific inquiry. These characteristics are summarized below.

- **Data play a central role.** For scientists, knowledge is primarily based on observations. Scientists enthusiastically search for observations that will verify or reject their ideas about the world. They develop theories, argue that existing data support their theories, and conduct research that can increase our confidence that the theories are correct. Observations can be criticized, alternatives can be suggested, and data collection methods can be called into question. But in each of these cases, the role of data is central and fundamental. Scientists have a “show me, don't tell me” attitude.
- **Scientists are not alone.** Scientists make observations and are trained to accurately report to other scientists and the public. You can be sure that many other scientists will follow up on the findings by conducting research that replicates and extends these observations.

- **Science is adversarial.** Science is a way of thinking in which ideas do battle with other ideas in order to move ever closer to the truth. Research can be conducted to test any idea; supporters of the idea and those who disagree with the idea can report their research findings, and these can be evaluated by others. Some ideas, even some very good ideas, may prove to be wrong if the research fails to provide support for them. Good scientific ideas are testable, which means that they can be either supported or falsified by data—the latter concept is called **falsifiability** (Popper, 2002). If an idea is falsified when it is tested, science advances because this result can spur the development of new and better ideas.
- **Scientific evidence does not rely solely on authority—it is peer-reviewed.** Before a study is published in a top-quality scientific journal, it is reviewed by other scientists who have the expertise to carefully evaluate the research. This process is called **peer review**. The role of these reviewers is to recommend whether the research should be published. This review process ensures that research with major flaws will not become part of the scientific literature. In essence, science exists in a free market of ideas in which the best ideas are supported by research, and scientists can build upon the research of others to make further advances.

Skepticism

The advantage of the scientific approach over other ways of knowing about the world is that it provides an objective set of rules for gathering, evaluating, and reporting observations. It is an open system that allows ideas to be refuted or supported by other scientists, with other data. This does not mean that intuition, anecdote, and authority are unimportant, however. As noted previously, scientists often rely on intuition and assertions of authorities for ideas for research. Moreover, there is nothing wrong with accepting the assertions of an authority as long as we do not accept them as scientific evidence. Scientific evidence is not obtainable for many things, such as certain beliefs that religious figures or texts ask us to accept on faith. Some beliefs cannot be tested and thus are beyond the scope of science. In science, however, ideas must be evaluated on the basis of available evidence that can be used to support or refute the ideas.

There is also nothing wrong with having opinions or beliefs as long as they are presented simply as opinions or beliefs. However, we should always ask whether the opinion can be tested scientifically or whether scientific evidence exists that relates to the opinion. For example, opinions on whether exposure to violent movies, TV, and video games increases aggression are only opinions until scientific evidence on the issue is gathered.

As you learn more about scientific methods, you will become increasingly **skeptical** of the research results reported in the media and the assertions of scientists as well. You should be aware that scientists often become authorities when they express their ideas. When someone claims to be a scientist, should we be more willing to accept what they say? First, ask about the individual's credentials.

It is usually wise to pay more attention to someone with an established reputation in the field and attend to the reputation of the institution represented by the person. It is also worthwhile to examine the researcher's funding source; you might be a bit suspicious when research funded by a drug company supports the effectiveness of a drug manufactured by that company, for example. Similarly, when an organization with a particular social-political agenda funds the research that supports that agenda, you should be skeptical of the findings and closely examine the methods of the study. In fact, you should always closely examine the methods of studies!

You should also be skeptical of pseudoscientific research. **Pseudoscience** is the use of seemingly scientific terms and demonstrations to substantiate claims that are not based on scientific research. The claim may be that a product or procedure will enhance your memory, relieve depression, or treat autism or post-traumatic stress disorder. The fact that these are all worthy outcomes makes us very susceptible to believing pseudoscientific claims and forgetting to ask whether there is a valid scientific basis for the claims.

A good example comes from a procedure called *facilitated communication* that has been used by therapists working with children with severe autism. Some children with severe autism spectrum disorder lack verbal skills for communication; to help them communicate, a facilitator holds the child's hand while the child presses keys to type messages on a keyboard. This technique produces impressive results, indicating that the children are now able to express themselves. Of course, well-designed studies revealed that the facilitators, not the children, controlled the typing. The problem with all pseudoscience is that it creates false hopes and makes promises that will not be fulfilled. Often the techniques can be dangerous as well. In the case of facilitated communication, a number of facilitators typed messages accusing a parent of physically or sexually abusing the child. Some parents were actually convicted of child abuse. In these legal cases, the scientific research on facilitated communication was used to help the defendant parent. Cases such as this have led to a movement to promote the exclusive use of evidence-based therapies—therapeutic interventions grounded in scientific research findings that demonstrate their effectiveness (Brown, 2016; cf. Lilienfeld et al., 2004).

So how can you tell if a claim is pseudoscientific? It is not easy. In fact, a philosopher of science noted that “the boundaries separating science, nonscience, and pseudoscience are much fuzzier and more permeable than ... most scientists ... would have us believe” (Pigliucci, 2010). Here are a few indicators that claims are not based on science:

- Claims that are untestable and therefore cannot be refuted
- Claims that rely on imprecise, biased, or vague language
- Evidence that is based on anecdotes and testimonials rather than scientific data
- Evidence that is from “experts” who have only vague qualifications and do not support their claims with sound scientific evidence

- Claims based only on confirmatory evidence, ignoring conflicting evidence
- Reliance on “scientific” evidence that cannot be independently verified because the methods used to establish that evidence have not been described

Finally, we are all increasingly susceptible to false reports of scientific findings circulated online. Many of these reports claim to be associated with a reputable scientist or scientific organization, and then they take on a life of their own. A widely covered report, supposedly from the World Health Organization, claimed that the gene for blond hair was being selected out of the human gene pool. Blond hair would be a disappearing trait! General rules to follow when reading internet sites: (1) Be highly skeptical of “scientific” assertions that are supported by only vague or improbable evidence. And (2) take the time to do an internet search for supportive evidence. At internet sites like snopes.com, truthorfiction.com, and fact-check.org/askscicheck/ you can check many of the claims that are on the internet.

BEING A SKILLED CONSUMER OF RESEARCH

How much trust we should place in a study depends upon the methods that were used to conduct the study. Sometimes study authors overreach, coming to conclusions that are not justified. Here are eight key questions you can ask of any research study that will reveal a lot about how much the study should be trusted. The better the answers to these questions, the more confident you can be of the study:

1. **“What is the primary goal of this study? Description, Prediction, Determining Cause, or Explaining? Do the authors achieve their goals?”** Every study has a goal. As you have seen in this chapter, the goals vary. For any study you read, it is important to try to understand the overall goal. Are the authors trying to describe a phenomenon? Are they trying to make a prediction? Are they trying to show that one thing causes another?
2. **“What did these researchers do? What was the method?”** Published research always includes a description of how the research was conducted. A skillful consumer of research will review a study’s methodology carefully to see if the researchers’ method is well connected to their goal.
3. **“What was measured?”** All studies in the behavioral sciences start with measurement: identifying the concepts to be studied and figuring out how to measure them. This is related to the idea of construct validity, which will be covered in depth in other chapters.
4. **“To what or whom can we generalize the results?”** **Generalization** involves making broad or general inferences based on the procedures and findings in a specific study. Humans are a very diverse species. Do results based on one population apply (generalize) to other populations? Are the methods that were used applicable to other settings? This is related to the concept of external validity, which will be covered in later chapters.

5. **“What did they find? What were the results?”** After a study author justifies what they are doing in the *Introduction* section and describes what they did in the *Method* section, they will spend time explaining what they found. It is easy to be intimidated by complex statistics. In peer-reviewed research, you can assume that the analyses were probably correctly conducted, and you can attend more closely to “what they found” and not become bogged down in the statistics.
6. **“Have other researchers found similar results?”** A single study can be interesting, but scientific progress involves accumulating studies. We can be more confident in a study if other studies have found the same results.
7. **“What are the limitations of this study?”** Researchers will often include a statement about the limitations of a study—often in the *Discussion* section. You may be able to think of other limitations: Is there another variable at play? Is there a better measure of a variable? Can we generalize the results to other people?
8. **“What are the ethical issues present in this study?”** Every study of human and animal participants poses risks. As such, every study should be evaluated for the ethical treatment of its participants.

GOALS OF BEHAVIORAL SCIENCE

Scientific research on behavior is guided by four general goals: (1) description, (2) prediction, (3) determining causes, and (4) understanding or explanation.

Description

Description is the first goal of science. Psychologists and other behavioral scientists can describe behavior, which can often be directly observed (such as the amount of food consumed, running speed, eye gaze, or loudness of laughter), or mental states (such as happiness, sadness, or boredom), which are often less observable.

A group of researchers studied the amount of digital media use (screen use) by 5,412 adolescents in the United States during the COVID-19 pandemic (Nagata et al., 2022). The participants provided self-reports of screen time (excluding school-related activities)—watching television/streaming, playing games, social media, and so on. Figure 1 shows that the average number of hours of daily screen time for the entire sample was 7.70 hours. This finding illustrates description of behavior. The researchers next decided to separately describe screen use for participants categorized as Asian American, Hispanic/Latinx, Black, and White. As you can see, Asian American and White adolescents report fewer hours of screen time than do Blacks or Hispanic/Latinx. Further research would be needed to explain this finding; explanation is another goal of science.

Researchers are often interested in describing the ways in which events are systematically related to one another. Do the adolescents who report high amounts of screen use have a lower grade point average than peers who report less screen use?