Text

Description automatically generated

*Research Methods in   
Psychology*

**4th edition**

Rajiv S. Jhangiani; I-Chant A. Chiang; Carrie Cuttler; and Dana C. Leighton

Kwantlen Polytechnic University

Surrey, B.C

Research Methods in Psychology by Rajiv S. Jhangiani, I-Chant A. Chiang, Carrie Cuttler, & Dana C. Leighton is licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License](https://creativecommons.org/licenses/by-nc-sa/4.0/), except where otherwise noted.

This adaptation constitutes the fourth edition of this textbook, and builds upon the [second Canadian edition by Rajiv S. Jhangiani (Kwantlen Polytechnic University) and I-Chant A. Chiang (Quest University Canada)](https://opentextbc.ca/researchmethods/), the [second American edition by Dana C. Leighton (Texas A&M University-Texarkana)](https://osf.io/2j3pt/), and the [third American edition by Carrie Cuttler (Washington State University)](https://opentext.wsu.edu/carriecuttler/) and feedback from several peer reviewers coordinated by the [Rebus Community](https://www.rebus.community/). This edition is licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License](http://creativecommons.org/licenses/by-nc-sa/4.0/).

*Contents*

[Acknowledgements](#front-matter-acknowledgements)

[About this Book](#front-matter-about-this-book-2)

[About the Authors of the Current Edition](#front-matter-about-the-authors)

[Preface](#front-matter-preface-4)

[The Science of Psychology](#part-the-science-of-psychology)

[Methods of Knowing](#chapter-methods-of-knowing)

[Understanding Science](#chapter-understanding-science)

[Goals of Science](#chapter-goals-of-science)

[Science and Common Sense](#chapter-science-and-common-sense)

[Experimental and Clinical Psychologists](#chapter-experimental-and-clinical-psychologists)

[Key Takeaways and Exercises](#chapter-key-takeaways-and-exercises)

[Overview of the Scientific Method](#part-overview-of-the-scientific-method)

[A Model of Scientific Research in Psychology](#chapter-a-model-of-scientific-research-in-psychology)

[Finding a Research Topic](#chapter-finding-a-research-topic)

[Generating Good Research Questions](#chapter-generating-good-research-questions)

[Developing a Hypothesis](#chapter-developing-a-hypothesis)

[Designing a Research Study](#chapter-designing-a-research-study)

[Analyzing the Data](#chapter-analyzing-the-data)

[Drawing Conclusions and Reporting the Results](#chapter-drawing-conclusions-and-reporting-the-results)

[Key Takeaways and Exercise](#chapter-key-takeaways-and-exercise)

[Research Ethics](#part-research-ethics)

[Moral Foundations of Ethical Research](#chapter-moral-foundations-of-ethical-research)

[From Moral Principles to Ethics Codes](#chapter-from-moral-principles-to-ethics-codes)

[Putting Ethics Into Practice](#chapter-putting-ethics-into-practice)

[Key Takeaways and Exercises](#chapter-key-takeaways-and-exercises-2)

[Psychological Measurement](#part-psychological-measurement)

[Understanding Psychological Measurement](#chapter-understanding-psychological-measurement)

[Reliability and Validity of Measurement](#chapter-reliability-and-validity-of-measurement)

[Practical Strategies for Psychological Measurement](#chapter-practical-strategies-for-psychological-measurement)

[Key Takeaways and Exercises](#chapter-key-takeaways-and-exercises-3)

[Experimental Research](#part-experimental-research)

[Experiment Basics](#chapter-experiment-basics)

[Experimental Design](#chapter-experimental-design)

[Experimentation and Validity](#chapter-experimentation-and-validity)

[Practical Considerations](#chapter-practical-considerations)

[Key Takeaways and Exercises](#chapter-key-takeaways-and-exercises-4)

[Non-Experimental Research](#part-non-experimental-research)

[Overview of Non-Experimental Research](#chapter-overview-of-non-experimental-research)

[Correlational Research](#chapter-correlational-research)

[Complex Correlation](#chapter-complex-correlation)

[Qualitative Research](#chapter-qualitative-research)

[Observational Research](#chapter-observational-research)

[Key Takeaways and Exercises](#chapter-key-takeaways-and-exercises-5)

[Survey Research](#part-survey-research)

[Overview of Survey Research](#chapter-overview-of-survey-research)

[Constructing Surveys](#chapter-constructing-surveys)

[Conducting Surveys](#chapter-conducting-surveys)

[Key Takeaways and Exercises](#chapter-key-takeaways-and-exercises-6)

[Quasi-Experimental Research](#part-quasi-experimental-research)

[One-Group Designs](#chapter-one-group-designs)

[Non-Equivalent Groups Designs](#chapter-non-equivalent-control-group-designs)

[Key Takeaways and Exercises](#chapter-key-takeaways-and-exercises-7)

[Factorial Designs](#part-factorial-designs)

[Setting Up a Factorial Experiment](#chapter-setting-up-a-factorial-experiment)

[Interpreting the Results of a Factorial Experiment](#chapter-interpreting-factorial-results)

[Key Takeaways and Exercises](#chapter-key-takeaways-and-exercises-8)

[Single-Subject Research](#part-single-subject-research)

[Overview of Single-Subject Research](#chapter-overview-of-single-subject-research)

[Single-Subject Research Designs](#chapter-single-subject-research-designs)

[The Single-Subject Versus Group “Debate”](#chapter-the-single-subject-versus-group-debate)

[Key Takeaways and Exercises](#chapter-key-takeaways-and-exercises-9)

[Presenting Your Research](#part-presenting-your-research)

[American Psychological Association (APA) Style](#chapter-american-psychological-association-apa-style)

[Writing a Research Report in American Psychological Association (APA) Style](#chapter-writing-a-research-report-in-american-psychological-association-apa-style)

[Other Presentation Formats](#chapter-other-presentation-formats)

[Key Takeaways and Exercises](#chapter-key-takeaways-and-exercises-10)

[Descriptive Statistics](#part-descriptive-statistics)

[Describing Single Variables](#chapter-describing-single-variables)

[Describing Statistical Relationships](#chapter-describing-statistical-relationships)

[Expressing Your Results](#chapter-expressing-your-results)

[Conducting Your Analyses](#chapter-conducting-your-analyses)

[Key Takeaways and Exercises](#chapter-key-takeaways-and-exercises-11)

[Inferential Statistics](#part-inferential-statistics)

[Understanding Null Hypothesis Testing](#chapter-understanding-null-hypothesis-testing)

[Some Basic Null Hypothesis Tests](#chapter-some-basic-null-hypothesis-tests)

[Additional Considerations](#chapter-additional-considerations)

[From the “Replicability Crisis” to Open Science Practices](#chapter-from-the-replicability-crisis-to-open-science-practices)

[Key Takeaways and Exercises](#chapter-key-takeaways-and-exercises-12)

[Glossary](#back-matter-glossary)

[References](#back-matter-references)

1

*Acknowledgements*

This textbook represents a labor of love and a deep commitment to students. Each of us had previously worked on adapting, updating, and refining successive editions of this textbook since its initial publication. In coming together to produce this fourth edition collaboratively, we were able to build on our own expertise and classroom experience as well as thoughtful feedback from several peer reviewers.

We would like to thank the Rebus Community, especially Zoe Wake Hyde and Apurva Ashok, for guiding and supporting us through the process of peer review and for building an intellectually supportive and encouraging community of authors and open educators.

We are immensely grateful to our peer reviewers Judy Grissett (Georgia Southwestern State University), Amy Nusbaum (Washington State University), and one additional anonymous reviewer, who volunteered their time and energy to provide valuable suggestions and feedback that improved the quality and consistency of the 4th edition of this book.

Finally, we are grateful to Lana Radomsky for her assistance with formatting and compiling the glossary and references.

Rajiv, Carrie, and Dana (May 2019)



2

*About this Book*

This textbook is an adaptation of one written by [unnamed original author] and adapted by The Saylor Foundation under a [Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License](https://creativecommons.org/licenses/by-nc-sa/3.0/) without attribution as requested by the work’s original creator or licensee. The original text is available here: <http://www.saylor.org/site/textbooks/>

The first Canadian edition (published in 2013) was authored by Rajiv S. Jhangiani (Kwantlen Polytechnic University) and licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License](https://creativecommons.org/licenses/by-nc-sa/3.0/). Revisions included the addition of a table of contents, changes to Chapter 3 (Research Ethics) to include a contemporary example of an ethical breach and to reflect Canadian ethical guidelines and privacy laws, additional information regarding online data collection in Chapter 9 (Survey Research), corrections of errors in the text and formulae, spelling changes from US to Canadian conventions, the addition of a cover page, and other necessary formatting adjustments.

The second Canadian edition (published in 2015) was co-authored by Rajiv S. Jhangiani (Kwantlen Polytechnic University) and I-Chant A. Chiang (Quest University Canada) and licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License](http://creativecommons.org/licenses/by-nc-sa/4.0/). Revisions included:  (throughout) language revision, spelling & formatting, additional video links and website links, interactive visualizations, figures, tables, and examples; (Chapter 1) the Many Labs Replication Project; (Chapter 2) double-blind peer review, contemporary literature databases, how to read academic papers; (Chapter 3) Canadian ethics; (Chapter 4) laws, effects, theory; (Chapter 5) fuller description of the MMPI, removal of IAT, validity descriptions; (Chapter 6) validity & realism descriptions, Latin Square design; (Chapter 7) Mixed-design studies, qualitative-quantitative debate; (Chapter 8) 2 × 2 factorial exercise; (Chapter 9) Canadian Election Studies, order and open-ended questions; (Chapter 13) p-curve and BASP announcement about banning p-values; “replicability crisis” in psychology; (Glossary) added key terms.

The second U.S. edition (published in 2017) was authored by Dana C. Leighton (Southern Arkansas University) and licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License](http://creativecommons.org/licenses/by-nc-sa/4.0/). Revisions included reversion of spelling from Canadian English to U.S. English and the addition of a cover photo: [“Great Wave off Kanagawa”](https://commons.wikimedia.org/w/index.php?curid=5576388) after Katsushika Hokusai (葛飾北斎) is public domain.

The third U.S. edition (published in 2017) was authored by Carrie Cuttler (Washington State University) and licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License](http://creativecommons.org/licenses/by-nc-sa/4.0/). Revisions included general reorganization, language revision, spelling, formatting, additional video links, and examples throughout. More specifically, the overall model section was moved from Chapter 1 to Chapter 2, new sections were added to Chapter 1 on methods of knowing and goals of science, and a link on the replication crisis in psychology was added to Chapter 1. Chapter 2 was also reorganized by moving the section on reviewing the research literature to earlier in the chapter and taking sections from Chapter 4 (on theories and hypotheses), moving them to Chapter 2, and cutting the remainder of Chapter 4. Sections of Chapter 2 on correlation were also moved to Chapter 6. New sections on characteristics of good research questions, an overview of experimental vs. non-experimental research, a description of field vs. lab studies, and making conclusions were also added to Chapter 2. Chapter 3 was expanded by adding a definition of anonymity, elaborating on the Belmont Report (the principles of respect for persons and beneficence were added), and adding a link to a clip dispelling the myth that vaccines cause autism. Sections from Chapter 4 (on defining theories and hypotheses) were moved to Chapter 2 and the remainder of the previous Chapter 4 (on phenomenon, theories, and hypotheses) was cut. Chapter 5 was reorganized by moving the sections on four types of validity, manipulation checks, and placebo effects to later in the chapter. Descriptions of single factor two-level designs, single factor multi-level designs, matched-groups designs, order effects, and random counterbalancing were added to Chapter 5 and the concept of statistical validity was expanded upon. Chapter 6 was also reorganized by moving sections describing correlation coefficients from Chapters 2 and 12 to Chapter 6. The section of the book on complex correlation was also moved to Chapter 6 and the section on quasi-experiments was moved from Chapter 6 to its own chapter (Chapter 8). The categories of non-experimental research described in Chapter 6 were change to cross-sectional, correlational, and observational research. Chapter 6 was further expanded to describe cross-sectional studies, partial correlation, simple regression, the use of regression to make predictions, case studies, participant observation, disguised and undisguised observation, and structured observation. The terms independent variable and dependent variable as used in the context of regression were changed to predictor variable and outcome/criterion variable respectively. A distinction between proportionate stratified sampling and disproportionate stratified sampling was added to Chapter 7. The section on quasi-experimental designs was moved to its own chapter (Chapter 8) and was elaborated upon to include instrumentation and testing as threats to internal validity of one-group pretest-posttest designs, and to include sections describing the one-group posttest only design, pretest-posttest nonequivalent groups design, interrupted time-series with nonequivalent groups design, pretest-posttest design with switching replication, and switching replication with treatment removal designs. The section of Chapter 9 on factorial designs was split into two sections and the remainder of the chapter was moved or cut. Further, examples of everyday interactions were added and a description of simple effects was added to Chapter 9. The section on case studies that appeared in Chapter 10 was edited and moved to Chapter 6.  Further, labels were added to multiple-baseline across behaviours, settings, and participants designs, and a concluding paragraph on converging evidence was added to Chapter 10. Only minor edits were made to the remaining chapters (Chapters 11, 12, and 13).

This fourth edition (published in 2019) was co-authored by Rajiv S. Jhangiani (Kwantlen Polytechnic University), Carrie Cuttler (Washington State University), and Dana C. Leighton (Texas A&M University—Texarkana) and is licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License](http://creativecommons.org/licenses/by-nc-sa/4.0/). Revisions throughout the current edition include changing the chapter and section numbering system to better accommodate adaptions that remove or reorder chapters; continued reversion from the Canadian edition; general grammatical edits; replacement of “he/she” to “they” and “his/her” to “their”; removal or update of dead links; embedded videos that were not embedded; moved key takeaways and exercises from the end of each chapter section to the end of each chapter; a new cover design. In addition, the following revisions were made to specific chapters:

Chapter 1:

Updated list of empirically supported therapies.

Chapter 2:

Added description of follow-up research by Drews, Pasupathi, and Strayer (2004) demonstrating that cell phone conversations while driving carry a greater risk than conversations with a passenger

Added the term meta-analysis along with a definition of this term

Replaced terms men and women with males and females

Updated the description of the number of records returned with different search terms to a broader description of the relative number of records (that will not change as more articles are added to PsychINFO)

Replaced the term “operationally define” variables with a more general statement about measuring variables since the term operational definition is not formally defined until later in the text

Added a citation for Zajonc’s (1965) research

Added a brief description of factors (i.e., small sample size, stringent alpha level) that increase the likelihood of a Type II error.

Chapter 3:

Removed titles of tables in references to tables

Added statement that many people, including children, have died as a result of people avoiding the MMR vaccine

Added a statement about self-plagiarizing being unethical and provided an example of submitting the same assignment in multiple classes

Explained the respect for persons principle

Revised the levels of IRB review to match terminology used in federal regulations

Footnotes for references were made actual footnotes in Pressbooks

Chapter 4:

Removed potentially offensive or stigmatizing examples

Clarified definition of levels of measurement

Added citations for the various scales described

Added further description of why IQ is measured on an interval scale

Added descriptions of the indicators of central tendency that are appropriate to compute and report for each of the scales of measure (nominal, ordinal, interval, ratio)

Added a paragraph on operationally defining the construct that reviews the process of transferring a conceptual definition to something that can be directly observed and measured

Added brief description of PsycTESTS and link to these tests

Removed the statement that family and friends can serve as good pilot subjects

Chapter 5:

Clarified the distinction between independent and dependent variables

Moved up the discussion of a control condition

Briefly discussed research ethics within the description of the study by Guéguen & de Gail (2003)

More clearly defined a power analysis and emphasized the importance of conducting one

Referenced confounds within the discussion of internal validity

Noted that within-subjects experiments require fewer participants

Removed duplicate reference

Added citations

Updated language

Chapter 6:

Clarified when non-experimental approaches are appropriate

Added information about Milgram’s non-experimental study of obedience to authority

Added a discussion of cross-sectional, longitudinal, and cross-sequential studies

Revised organization of non-experimental approaches

Removed description of experimenter-selected independent variable

Specified types of variables that may be measured in correlational research

Added an example of a correlational study that uses categorical variables

Added a factor analysis table

Listed more examples of nonstatistical data analysis techniques

Added a table to summarize some differences between quantitative and qualitative research

Described some group dynamics and personality characteristics that might influence participation in focus groups

Discussed Festinger’s research on cognitive dissonance that used disguised participant observation

Described the Hawthorne effect

Added an example of a study that used structured observation within a laboratory environment

Chapter 7:

Clarified language concerning data collection methods vs. research designs

Mentioned randomizing the order of presentation of questions as another way of reducing response order effects

Explained reverse coding

Described additional types of non-probability sampling

Reiterated the importance of conducting a power analysis

Added common online data collection sites

Chapter 8:

Discussed how the inclusion of a control group rules out threats to internal validity within a one-group design study

Chapter 9:

Clarified discussion of non-experimental factorial designs.

Chapter 10: No substantive changes

Chapter 11:

Added regional psychology association conferences to list of conferences

Condensed and clarified discussion of final manuscripts

Updated discussion of open sharing of results to acknowledge some journals that require open data

Added explanation of person-first language

Chapter 12:

Corrected erroneous APA style recommendations and added references to specific Publication Manual sections

Standardized the use of the terms “figure” and “chart” to better correspond with APA style

Minor changes to discussion of poster formatting

Moved list of conferences to end of discussion to not break up the material

Chapter 13:

Defined p-hacking and clarified discussion of p-hacking

Made definition of p-value more technically correct

3

*About the Authors of the Current Edition*

**Rajiv S. Jhangiani**

A person smiling for the camera

Description automatically generated with medium confidence

Dr. Rajiv Jhangiani is the Associate Vice Provost, Open Education at [Kwantlen Polytechnic University](http://www.kpu.ca/) in British Columbia. He is an internationally known advocate for open education whose research and practice focuses on open educational resources, student-centered pedagogies, and the scholarship of teaching and learning. Rajiv is a co-founder of the [Open Pedagogy Notebook](http://openpedagogy.org/), an Ambassador for the [Center for Open Science](https://cos.io/), and serves on the BC Open Education Advisory Committee. He formerly served as an Open Education Advisor and Senior Open Education Research & Advocacy Fellow with [BCcampus](https://bccampus.ca/), an OER Research Fellow with the Open Education Group, a Faculty Workshop Facilitator with the [Open Textbook Network](https://research.cehd.umn.edu/otn/), and a Faculty Fellow with the [BC Open Textbook Project](https://open.bccampus.ca/). A co-author of three open textbooks in Psychology, his most recent book is [Open: The Philosophy and Practices that are Revolutionizing Education and Science](https://www.ubiquitypress.com/site/books/10.5334/bbc/) (2017). You can find him online at [@thatpsychprof](https://twitter.com/thatpsychprof) or [thatpsychprof.com](http://thatpsychprof.com/)

**Carrie Cuttler**

A person smiling for the camera

Description automatically generated with medium confidence

Dr. Carrie Cuttler received her Ph.D. in Psychology from the University of British Columbia. She has been teaching research methods and statistics for over a decade. She is currently an Assistant Professor in the [Department of Psychology at Washington State](https://psychology.wsu.edu/people/faculty/carrie-cuttler/) University, where she primarily studies the acute and chronic effects of cannabis on cognition, mental health, and physical health. Dr. Cuttler was also an OER Research Fellow with the Center for Open Education and she conducts research on open educational resources. She has over 50 publications including the following two published books: [A Student Guide for SPSS (1st and 2nd edition)](https://he.kendallhunt.com/product/student-guide-spss) and [Research Methods in Psychology: Student Lab Guide](https://he.kendallhunt.com/product/research-methods-psychology-student-lab-guide). Finally, she edited another OER entitled [Essentials of Abnormal Psychology](https://opentext.wsu.edu/abnormalpsychology/). In her spare time, she likes to travel, hike, bike, run, and watch movies with her husband and son. You can find her online at [@carriecuttle](https://twitter.com/CarrieCuttler?ref_src=twsrc%5egoogle|twcamp%5eserp|twgr%5eauthor)r or [carriecuttler.com](http://carriecuttler.com)

**Dana C. Leighton**

A person smiling in front of a bookshelf

Description automatically generated with medium confidence

Dr. Dana C. Leighton is Assistant Professor of Psychology in the [College of Arts, Science, and Education](http://tamut.edu/Academics/Colleges-and-Departments/CASE/index.php) at Texas A&M University—Texarkana. He earned his Ph.D. from the University of Arkansas, and has 15 years experience teaching across the psychology curriculum at community colleges, liberal arts colleges, and research universities. Dr. Leighton’s social psychology [research lab](http://tamut.edu/dana-leighton/research/pjpl/index.html) studies intergroup relations, and routinely includes undergraduate students as researchers. He is also Chair of the university’s [Institutional Review Board](http://tamut.edu/irb). Recently he has been researching and writing about the use of open science research practices by undergraduate researchers to increase diversity, justice, and sustainability in psychological science. He has published on his teaching methods in [eBooks from the Society for the Teaching of Psychology](https://teachpsych.org/ebooks/index.php), presented his methods at regional and national conferences, and received grants to develop new teaching methods. His teaching interests are in undergraduate research, writing skills, and online student engagement. For more about Dr. Leighton see <http://www.danaleighton.net> and <http://danaleighton.edublogs.org>

4

*Preface*

Psychology, like most other sciences, has its own set of tools to investigate the important research questions of its field. Unlike other sciences that are older and more mature, psychology is a relatively new field and, like an adolescent, is learning and changing rapidly. Psychology researchers are learning and changing along with the emerging science. This textbook introduces students to the fundamental principles of what it is like to think like a psychology researcher in the contemporary world of psychology research.

Historically, psychology developed practices and methods based on the established physical sciences. Unlike physical sciences, psychology had to grapple with the inherent variation among its subjects: people. To better account for this, we developed some practices and statistical methods that we (naïvely) considered to be foolproof. Over time we established a foundation of research findings that we considered solid.

In recent years, psychology’s conversation has shifted to an introspective one, looking inward and re-examining the knowledge that we considered foundational. We began to find that some of that unshakable foundation was not as strong as we thought; some of the bedrock findings in psychology were being questioned and failed to be upheld in fuller scrutiny. As many introspective conversations do, this one caused a crisis of faith.

Psychologists are now questioning if we really know what we thought we knew or if we simply got lucky. We are struggling to understand how what we choose to publish and not publish, what we choose to report and not report, and how we train our students as researchers is having an effect on what we call “knowledge” in psychology. We are beginning to question whether that knowledge represents real behaviour and mental processes in human beings, or simply represents the effects of our choice of methods. This has started a firestorm among psychology researchers, but it is one that needs to play out. For a book aimed at novice psychology undergraduates, it is tempting to gloss over these issues and proclaim that our “knowledge” is “truth.” That would be a disservice to our students though, who need to be critical questioners of research. Instead of shying away from this controversy, this textbook invites the reader to step right into the middle of it.

With every step of the way, the research process in psychology is fraught with decisions, trade-offs, and uncertainty. We decide to study one variable and not another; we balance the costs of research against its benefits; we are uncertain whether our results will replicate. Every step is a decision that takes us in a different direction and closer to or further from the truth. Research is not an easy route to traverse, but we hope this textbook will be a hiking map that can at least inspire the direction students can take and provide some absolute routes to begin traveling.

As we wrote at the beginning of this preface, psychology is a young science. Like any adolescent, psychology is grappling with its identity as a science, learning to use better tools, understanding the importance of transparency, and is having more open conversations to improve its understanding of human behaviour. We will grow up and mature together. It is an exciting time to be part of that growth as psychology becomes a more mature science.

# Introduction/Preamble (Reber/NU Edition)

We will start by reviewing methods of experimental psychology research. Typical textbooks for Research Methods start with a review of the scientific method, some history on psychological science, discussion of non-experimental methods and then the process of the design, implementation, and analysis of experimental research. Because this class is designed to be hands-on with active involvement in the actual course of research, we are starting immediately with experimental methodology.

You will notice some redundancy in the text, especially in areas where conceptual ideas are explained related to specific content for the Reber/NU class presentation and then explained again as presented by the original authors of the text. In some places these are left deliberately to help build a better understanding of complex or non-intuitive ideas by multiple explanations from slight different perspectives.