Consuming and Producing Research in Communication Sciences and Disorders

DEVELOPING POWER OF PROFESSOR

Consuming and Producing Research in Communication Sciences and Disorders

DEVELOPING POWER OF PROFESSOR

Robert Goldfarb, PhD

PLURAL PUBLISHING INC.

PLURAL PUBLISHING
INC.

5521 Ruffin Road
San Diego, CA 92123

e-mail: information@pluralpublishing.com
Website: http://www.pluralpublishing.com

Typeset in 10.5/13 Palatino by Flanagan's Publishing Services, Inc.
Printed in the United States of America by Integrated Books International

Library of Congress Cataloging-in-Publication Data

Names: Goldfarb, Robert (Robert M.), author.
Title: Consuming and producing research in communication sciences and disorders : developing power of professor / Robert Goldfarb.
Description: San Diego, CA : Plural Publishing, [2021] | Includes bibliographical references and index.
Identifiers: LCCN 2019015046 | ISBN 9781635500677 (alk. paper) | ISBN 1635500672 (alk. paper)
Subjects: | MESH: Communication Disorders | Research Design | Biomedical Research
Classification: LCC RC423 | NLM WL 340.2 | DDC 362.196/855--dc23
LC record available at https://lccn.loc.gov/2019015046

CONTENTS

Introduction *xv*
Acknowledgments *xxiv*
Reviewers *xxv*

PART I. CONSUMING RESEARCH IN CSD

1 Developing Power of Professor: The Nature of Research in CSD 3
Introduction 3
Learning Objectives 4
Why Professors and Clinicians Do Research 4
Research and Development (R & D) versus Objective Research 5
R & D 5
Objective Research 6
Clinical Research: A Case Study 7
Skepticism 9
Power of Professor 10
References 11

2 Academic–Clinical Integration of Research 13
Introduction 13
Learning Objectives 13
Types of Research Evidence 14
Levels of Research Evidence 14
Systematic Reviews and Meta-Analyses 16
International Classification of Functioning, Disability, and Health 19
Clinical Trials 20
Aphasia 20
Dementia 21
Traumatic Brain Injury 21
Dysarthria 23
Apraxia of Speech 24
Augmentative and Alternative Communication 25
Specific Language Impairment 25
Autism Spectrum Disorders 26
Stuttering 26

Voice Disorders 27
Best Practices and Evidence-Based Practice 27
A Model of Therapy 29
Some Clinical Research Concerns 31
Dosage of Therapy 31
Should Exercises and Practice be Massed or Distributed? 33
The Adequate Stimulus 34
Implications of Noncompliance 36
Advanced Study 38
References 39

3 Ethics of Research 45
Introduction: Principles of Research 45
Learning Objectives 45
The Rules of Ethics 45
Rule 1: Equipose 46
Rule 2: Valid Design 47
Rule 3: Risk Minimization 48
Rule 4: Posttrial Access 48
Rule 5: Risk Payment 49
Rule 6: Undue Inducement 49
Rule 7: Right of Withdrawal 50
Unintended Consequences of Research 50
Negative: Rapist Roosters 50
Positive: Curb Cuts 51
NIH/CITI Online Training Course 51
The Belmont Report 52
Introduction 52
Respect for Persons 54
Beneficence 55
Justice 56
Ethical Blindness and Society's Responses 57
The Dachau Hypothermia "Study" and Other Unethical Research 57
The Nuremburg Code 58
The Declaration of Helsinki 58
The Tudor Study 59
AAA and ASHA Codes of Ethics 60
Health Insurance Portability and Accountability Act of 1996 (HIPAA) 63
Conclusion 64
Advanced Study 65
References 66

4 The Scientific Method 69
Introduction 69
Learning Objectives 69

The Scientific Method 70
The Rules of Science 72
Empirical Verification 73
Operational Definition 73
Controlled Observation 74
Statistical Generalization 75
Empirical Confirmation 76
The Scientific Method Versus Common Sense or Conventional Wisdom 76
Psychological Verification 77
Verbal Definition 78
Uncontrolled Observation 79
Overgeneralization 79
Psychological Confirmation 79
The Scientific Method and Pseudoscience 80
Untestable 81
Unchanged 82
Confirming Evidence 82
Anecdotal Evidence 83
Inadequate Evidence 83
Avoiding Peer Review 84
Conclusion 84
Advanced Study 85
References 85

5 Types of Research 87
Introduction 87
Learning Objectives 87
Experimental, Quasiexperimental, and Nonexperimental Designs 87
Group Experimental Design 88
Quasiexperimental Designs 88
Single-Subject and Case Studies 91
Controlled Single-Subject Experiments 91
Case Study Research 92
The A-B-A-B Design 93
Multiple-Baseline Design 95
Proof-of-Concept and Pilot Studies; Phase O, I, II, III, and IV Trials 95
Pilot Study or Pilot Experiment 95
Some Examples of Published Pilot Studies in CSD 96
Proof-of-Concept Studies 96
Group Designs 97
Quantitative Designs 97
Qualitative Designs 97
Mixed-Methods Designs 98
Retrospective Research 98
Strengths 98

Weaknesses 99
Survey Research 99
Strengths 100
Weaknesses 100
Longitudinal Studies (Developmental Research) 105
Strengths 105
Weaknesses 106
Translational Research 106
Advanced Study 107
References 109

6 Really Basic Statistics 113
Introduction 113
Learning Objectives 114
Some Statistical Concepts 114
Statistics 114
Parametric and Nonparametric Statistics 114
Random Sampling and Random Assignment 115
Degrees of Freedom 117
Lies, Damned Lies, and Statistics (Mark Twain): The *p* Value 118
Descriptive Statistics: Measures of Central Tendency and Dispersion 119
Central Tendency 119
Dispersion 120
All You Need Are Sums of Squares 120
Calculation of Variance and Standard Deviation 121
Sample CSD Experiment 122
Calculation of *t* for Dependent Groups 127
Sample Calculation for One-Way Analysis of Variance 129
Calculation of the Correlation Coefficient *r* 131
The Chi-Square (χ^2) Test of Independence 135
Are We Playing with Loaded Dice? 137
Presenting the Data: Frequency Distributions, Histograms, Line Graphs 137
The Bell-Shaped Curve 137
The Histogram 138
The Frequency Polygon 138
Recipe for Repeated Measure Analysis on SPSS 138
Definitions of Terms 140
Statistics of the Future: Bayesian Inference 143
Advanced Study 144
References 146

7 Journal Article Critique 147
Introduction 147
Learning Objectives 147

Structure of a Journal Article 149
Title 149
Abstract 150
Introduction 150
Methods 152
Results 152
Conclusion and Discussion 153
References 153
Threats to Internal and External Validity of Experiments 153
Internal Validity and Factors That Affect It 154
External Validity and Factors That Affect It 156
Peer Review 157
Examples of Peer Review 158
Advanced Study 162
References 163

8 Diagnostic Test Critique 165
Introduction 165
Learning Objectives 166
Levels of Evidence in Diagnostic Tests 166
Problems in Diagnosis: Dumping It in the Chocolate 166
Psycholinguistic Studies 167
Neuroimaging Studies 168
Threats to Accurate Diagnosis 168
Increasing Accurate Diagnosis 170
The Diagnostic Test Manual 171
Theory and Development 172
Administration and Scoring 174
Reliability and Validity of Tests and Measurements 175
Reliability 175
Validity 177
Choosing Which Test to Give 179
Advanced Study 179
References 180

PART II. PRODUCING RESEARCH IN CSD

9 Mentoring 185
Introduction 185
Learning Objectives 186
What Is the Mentor–Protégé or Mentor–Mentee (Hereafter Called Mentor–Student) Relationship? 186
Definition of Mentoring 186

Peer Mentoring 187
Distance Mentoring 187
Mentoring of Student Clinicians by Clients 188
Mentor–Student Relationships 188
Does Mentoring Work? 189
Academic Mentoring 189
Other Types of Mentoring 190
Managing Up 190
Summary 191
Do Being Older, Having More Experience, and Having Greater Professional Authority Qualify an Individual To Be a Mentor? 191
What Are the Ethical Concerns of a Relationship with a Large Power Differential? 192
Power Differentials 194
What Kinds of Mentoring Can You Expect? 195
Academic Mentorship 196
Clinical Mentorship 196
Teaching Mentorship 196
What Is the ASHA S.T.E.P. Mentor Model? 196
How Does Gender Affect the Mentor–Mentee Relationship? 197
Mentoring Programs for Females 198
Are e-Supervision and e-Mentoring the Wave of the Future? 199
E-Mentoring 199
E-Supervision 201
Conclusion 202
Advanced Study 202
References 204

10 Institutional Review Board (IRB) Research Approval 207

Introduction 207
Learning Objectives 207
Overview 207
University Policies 208
Student Research Application 210
IRB Ethics 210
Location and Membership 211
History of the IRB 211
The United States Public Health Service (USPHS) Syphilis Studies in Tuskegee, Alabama, from 1932 to 1972 212
The Nazi Holocaust Experiments and the Resulting Doctors' Trial at Nuremberg, Germany, 1946 to 1947 212
USPHS Sexually Transmitted Diseases Inoculation Study, Guatemala, 1946 to 1948 212
Pfizer Trovan Study, Nigeria, 1996 214

Dates and Events That Led to Today's Version of the IRB 214
Completing an IRB Review Form 215
Brief Description of the Project's Purposes, Methodology, and Design 215
Dates for Initiation and Completion of the Project 219
Number and Characteristics of Participants 220
Method of Recruitment 221
Potential Risks, Stresses, or Discomforts, and the Precautions Taken to Minimize Them 222
Debriefing Form, Sign-Up Sheet, Advertisement 223
An Example from CSD 227
Advanced Study 228
References 228

11 Conducting Clinical Research 231
Introduction 231
Learning Objectives 232
Developing a Clinical Hypothesis 232
Setting Goals 233
Therapy Objectives 235
Data Collection 236
The Operant Conditioning Paradigm 237
Schedules of Reinforcement 241
Strategies for Data Collection 243
Experimental Design: Case Report or Single-Subject Multiple Baseline 243
Disseminating Results 246
Advanced Study 247
References 248

12 Conducting Academic Research 251
Introduction 251
Learning Objectives 251
Selecting a Research Topic and Finding a Mentor 252
Selecting a Research Topic 252
Finding a Mentor 252
Capstone Projects 255
The Master's Thesis 258
Doctor of Audiology (AuD) Research Requirements (from Their Websites, Listed Alphabetically) 260
PhD in Speech-Language-Hearing Sciences Research Requirements (from Their Websites, Listed Alphabetically) 262
Clinical Doctorate in Speech-Language Pathology (SLP-D) Research Requirements (from Their Websites, Listed Alphabetically) 264
Doctor of Clinical Science (ClinScD/CsCD) Research Requirements (from the Website) 265

Funding Sources 265
Peer Review for Grant Applications 268
Advanced Study 270
References 271
Appendix 12–1. BA or BS CSD Programs 273
Appendix 12–2. MA or MS SLP Programs 288
Appendix 12–3. PhD and AuD Programs 303

PART III. DISSEMINATING RESEARCH IN CSD

13 Dissemination by Publication 311
Introduction 311
Learning Objectives 311
The Article in a Peer-Reviewed Journal 311
Advantages and Disadvantages of Peer Review 312
Open Access Journals 315
The Editorial Process 317
Submission Decisions 320
Responding to Ad Hoc Peer Reviewers 321
Books and Portions of Books 324
How Do You Know If a Book Has Been Peer Reviewed? 325
Writing Style 326
Publishing a Contribution to a Book 328
Advanced Study 329
References 330

14 Oral Presentation of Research 333
Introduction 333
Learning Objectives 334
Conference Presentations 334
Submitting an Abstract 334
Preparing the Presentation 337
Rehearsing the Presentation 338
Practice-Based Networks 341
Educational Technology 342
Use Your Computer to Record a Research Presentation to YouTube 342
Use Your iPad or iPhone to Make a YouTube Recording 343
Narrating PowerPoint Presentations 343
Securing Funding for Travel and Expenses 344
Government Support 344
Support from CSD Faculty Members 344
Support from the University Administration 344

Advanced Study 345
References 345

15 Nontraditional Dissemination of Research 347
Introduction 347
Learning Objectives 347
Challenges to Dissemination 348
Marketing and Distribution 348
Web 2.0 Technologies 349
Disseminating Research Through Social Media 350
Disseminating Research to Communities 352
Summary 354
Support Groups for Communication Disorders 355
Augmentative and Alternative Communication 355
Aphasia 355
Autism 355
Childhood Apraxia of Speech 356
Cleft Lip and Palate 356
Cochlear Implants 356
Dysphagia 356
Hearing Loss 357
Laryngectomy 357
Stuttering 357
Advocating for the Professions 358
In the News 359
University News 359
Association Publications 359
Conclusion 361
Advanced Study 362
References 363

Index *365*

INTRODUCTION

Power of attorney has been part of general business law since 1948 and includes durable and nondurable forms, with the former continuing in effect even if the individual who grants the power becomes disabled or incompetent. Nondurable general power of attorney gives a designated person powers to handle property, acting as an agent. These powers end if the person designating the power becomes disabled or incompetent. The powers permit the assigned individual to mortgage, sell, or dispose of any real or personal property without advance notice or approval. This power does not authorize anyone to make medical or other health care decisions, which require a health care proxy.

Just as the above powers are consistent with the duties of a licensed attorney-at-law, the power to conduct research is consistent with the duties of a professor. The job description of any university professor is likely to include references to the three areas of academic instruction; service to department, school, university, and professional organizations; and research, including publication in refereed, peer-reviewed journals. The proposal here is to begin a discussion of what constitutes power of professor and what obligations an individual, professor or not, has before being permitted to do research. This book represents some preliminary thoughts.

Unlike other texts on evaluating research in communication sciences and disorders (CSD), this book includes the "doing" of research, considering the welfare and confidentiality of patients and participants. Preparation for power of professor should also include an understanding of types of research, threats to reliability and validity, philosophy of science, and the relationships among theory, research, and therapy. The emphasis is NOT on professors, but on clinically oriented professionals who can perform the research associated with professors, much as individuals who are not attorneys can perform contractual work. The purpose of the book is to guide nonprofessors in attaining the competencies required to consume, produce, and disseminate research (and achieve power of professor).

Why have I chosen to write this book? I have spent my career as a practicing speech-language pathologist as well as a consumer and producer of research—as a professor teaching master's- and doctoral-level courses in Research Methods and as a research mentor to students and junior faculty. Further, for nearly 30 years, I have also been a senior administrator or program director in three university settings where research is a major focus.

Who is this book written for? It is a core textbook for undergraduate and first-year graduate students taking Research Methods courses in speech-language pathology and audiology. It is not for advanced graduate students, especially those in Research 1 universities where students are supported by senior faculty who

have multiyear, renewable grants. Those privileged students will not need this book to develop power of professor because it is likely that they will earn doctorate (PhD) degrees and become professors. My hope is that students whose passions and goals are to provide best practices to individuals with communication disorders will realize that evidence-based practice is research-based practice. I hope these students, as well as their clinical supervisors and other practicing clinicians, will learn how much fun it is to do research, that is, to discover a small piece of truth about communication sciences and disorders. It is well worth the hard work involved in mastering research methodologies, because the payoffs are better treatment of the individuals we serve and a deeper understanding of communication disorders and clinical interventions.

There are many fine books on evaluating research in CSD, including some published by Plural, that tend to focus either on statistics or on the student as a consumer of research. The relevant chapter (Chapter 6) of the current text addresses only the statistics most essential to interpreting the Results section of a journal article. Part I also includes academic–clinical integration of research, as well as information required for consumption of research such as research ethics, the scientific method, types of research, and how to critique a journal article and a diagnostic test. The second part of the book should help guide the undergraduate student in producing a capstone project or senior thesis and the master's student in producing a graduate thesis or research project. Part II of the book also addresses mentoring, the Institutional Review Board, and conducting academic and clinical research. Part III addresses dissemination of research, from the traditional (presenting and publishing academic and clinical research) to the nontraditional (marketing, social media, and Web 2.0 technologies).

There is a shortage of people with PhDs in CSD. In fact, some university searches to replace faculty who retire from or leave their positions fail because of a lack of an adequate application pool. If we restrict clinical CSD research only to individuals who have a PhD, then it will be necessary to have scholars in other disciplines (e.g., psychology) answer our research questions for us. If that happens, our right to exist as an independent discipline will be in jeopardy. The quality of experimental research in CSD is not at risk; in fact, it gets more competitive (in terms of success in funding multiyear, renewable grants), sophisticated (in terms of use of technology and advanced instrumentation), and valid (in terms of adhering to the highest standards of research) with each passing year. In other words, evidence-based practice is in pretty good shape. Practice-based evidence, on the other hand, is not, nor is dissemination of research.

This book is meant to empower students who want to be clinicians to generate the clinical evidence that will go back to the laboratories for experimental researchers to generate new theories about communication disorders. It is meant to help translate new research findings not only from the lab to the clinic (called "bench-to-bedside" in the medical community) and back again, but also from clinic to community and back again, as well as to influence public health policies. My vision is to help create a cohort of students who are equipped with power of professor when they graduate. Individuals with power of professor will have the knowledge and

skills provided in this book that are necessary and sufficient to conduct research, even if they do not have a PhD degree.

I take certain liberties in using the first person ("I," rather than "the author") when referring to some of my own clinical and research experiences and the second person ("you," rather than "the reader") when referring to some of the skills needed to develop power of professor. There is also some intentional redundancy when I find it useful to rephrase some important concepts in different contexts. Finally, although I have tried to include a wide variety of topics and authors, including some articles that have won awards from ASHA, I include many of my own studies, not to be self-serving (I hope), but because I have been intimately involved in the research.

The book is organized in three parts devoted to consuming, producing, and disseminating research.

PART I. CONSUMING RESEARCH IN CSD

It is important to become an educated consumer of research before attempting to produce or disseminate it. You need to know what typical researchers do before attempting it, just as your undergraduate CSD curriculum was structured to include typical language development and basic hearing and speech science before delving into communication disorders. Recall that your undergraduate CSD curriculum started with phonetics, anatomy and physiology of the speech and hearing mechanisms, speech and hearing science, and typical acquisition of language before you learned about language, speech, and hearing disorders. Chapters 1 through 8 focus on educating the consumer of research with a primary focus on clinical research, although laboratory and group studies are also addressed.

Chapter 1. Developing Power of Professor: The Nature of Research in CSD

Learning Objectives

After reading this chapter, the student will be able to

- explain why academic and clinical research is important;
- critically evaluate whether research is independent or self-serving; and
- outline the research review process.

The discussion in Chapter 1 includes reasons why students and professors do research, differences between research and development (R & D) and objective research, the need for skepticism, and the concept of power of professor. A clinical case study conducted by the author and a first-year graduate student in our university's speech and hearing center illustrates some of the concepts that are reviewed.

Chapter 2. Academic–Clinical Integration of Research

Learning Objectives

After reading this chapter, the student will be able to

- interpret how professors and clinical supervisors bridge the academic–

clinical practicum gap in educating CSD students;

- describe how evidence-based practice is research-based practice; and
- synthesize a large body of literature by studying systematic reviews and meta-analyses.

The discussion in Chapter 2 includes types of research evidence, including levels of evidence; the International Classification of Functioning, Disability, and Health (ICF); clinical trials; and systematic reviews and meta-analyses. The chapter highlights best practices and evidence-based practice. Finally, a model of therapy considers dosage of therapy, whether or not exercises and practice should be massed or distributed in the therapy session, a consideration of what constitutes an adequate stimulus, and the implications of noncompliance. Starting with this chapter and including all the following chapters, advanced study includes practice in the subject matter of the chapter that is needed for the student to earn power of professor.

Chapter 3. Ethics of Research

Learning Objectives

After reading this chapter, the student will be able to

- describe the rules of ethics;
- infuse the highest ethical standards in research and clinical practice;
- comply with standards for best practices; and
- prepare for the Praxis II examination in speech-language pathology and audiology.

The discussion in Chapter 3 includes seven rules of ethics; unintended consequences of research, both positive and negative; the NIH/CITI online training course on the protection of human research participants; the Belmont Report that guides the Institutional Review Board (IRB) as well as ethical decision making in research; and some examples of ethical blindness and society's responses, including an example from CSD. The chapter continues with a summary of the research portion of the code of ethics of both the American Academy of Audiology (AAA) and the American Speech-Language-Hearing Association (ASHA), and concludes with a discussion of the Health Insurance Portability and Accountability Act of 1996 (HIPAA).

Chapter 4. The Scientific Method

Learning Objectives

After reading this chapter, the student will be able to

- describe the scientific method;
- differentiate the rules of science from "common sense" and pseudoscience; and
- formulate experimental and clinical hypotheses.

The discussion in Chapter 4 addresses the rules of science and the scientific method. The rules of science include empirical verification, operational definition, controlled observation, statistical generalization, and empirical confirmation. In comparison to the scientific method, "common sense" (which is sometimes nonsense) includes psychological verification, verbal definition, uncontrolled

observation, overgeneralization, and psychological confirmation. Differences between the scientific method and pseudoscience is that the latter may be untestable; unchanged in the light of new data; may lack confirming evidence, including only anecdotal or inadequate evidence; and may avoid peer review.

Chapter 5. Types of Research

Learning Objectives

After reading this chapter, the student will be able to

- evaluate different types of research;
- interpret clinical files and design evidence-based clinical research studies; and
- critically examine survey forms.

The discussion in Chapter 5 addresses experimental, quasiexperimental, and nonexperimental designs. Single-subject and case studies are addressed in terms of strengths and weaknesses, as are proof-of-concept and pilot studies. The chapter also shows strengths and weaknesses of group designs, including quantitative, qualitative, and mixed-methods designs; retrospective research; survey research; longitudinal studies; and translational research.

Chapter 6. Really Basic Statistics

Learning Objectives

After reading this chapter, the student will be able to

- reject innumeracy and feel confident about basic math skills;
- interpret the Results section of a journal article; and
- select appropriate measures of statistical analysis to answer some clinical or academic research questions.

Before you have a MEGO (my eyes glaze over) moment, remember that only ninth grade math skills (elementary algebra) are all you need. In fact, to paraphrase a song from the Beatles, all you need are sums of squares to calculate variance and standard deviation, as well as *t*-tests, one-way analyses of variance, and the correlation coefficient *r*. Descriptive statistics include measures of central tendency and dispersion that should be a review for most readers. The chapter also includes some statistical concepts including random sampling, with the potential of Type I and Type II errors, degrees of freedom, and the *P* value. One nonparametric test, the chi-square (χ^2) test of independence, is included because it is often used to analyze demographic data. There is an alphabetical list of definitions of terms in statistics that should help as a reference as well as a guide for exams. Finally, there are a few more advanced concepts such as Bayesian inference and repeated measure analysis at the end of the chapter.

Chapter 7. Journal Article Critique

Learning Objectives

After reading this chapter, the student will be able to

- identify the structure of a journal article;

- control threats to internal and external validity of experiments; and
- explain the peer-review process.

Empirical research published in a peer-reviewed journal typically adheres to a formal style that is described and explained in Chapter 7. The experimenter seeks to control threats to the internal and external validity of the study in order to maximize generalizability of the findings. The peer-review process leads to a recommendation to accept or reject a manuscript submitted to a journal, and I provide two sample ad hoc reviews.

Chapter 8. Diagnostic Test Critique

Learning Objectives

After reading this chapter, the student will be able to

- evaluate sensitivity and specificity of diagnostic tests;
- explain what motivates his or her decision to use a particular diagnostic test; and
- identify threats to validity and reliability in tests and measurements.

Before evaluating a diagnostic test or writing a critique of one, it is important to recognize some problems in diagnosis. These problems may relate to the limited knowledge we have about a disorder, our tendency to underdiagnose or overdiagnose depending on the whims of the profession, and shortcomings in our theories or working models. Chapter 8 also goes through the structure of a typical diagnostic test manual, addressing theory, development, administration, and scoring of the test.

PART II. PRODUCING RESEARCH IN CSD

Chapters 9 through 12 address the "doing" of research from the perspective of a student or a new researcher. Since 2000, all proposed research that uses human participants must be approved by an Institutional Review Board (IRB) and the applicant must have satisfactorily completed the review course on the protection of human research participants (NIH certification or CITI certification as of October 2018). New researchers need mentors, and the student beginning to produce research will likely be guided by faculty, clinical supervisors, and even peers. As our practice is built on an evidence base (evidence-based practice [EBP]), most undergraduate and virtually all graduate CSD programs require an EBP project. Finally, undergraduate students are usually required to produce a research project in their major, called a capstone project or senior thesis, and graduate students are required to produce a clinical research project, a master's thesis, or both.

Chapter 9. Mentoring

Learning Objectives

After reading this chapter, the student will be able to

- establish mentor–student relationships;

- establish peer mentoring relationships; and
- end or advance mentoring relationships.

The mentor–student relationship usually refers to a younger person (the student) receiving academic, clinical, and employment guidance from an older person (faculty member, clinical supervisor, and employer, respectively). Chapter 9 includes these relationships as well as others, such as peer mentoring and even mentoring of clinicians by clients. In addition, I raise ethical concerns of mentoring and discuss the ASHA S.T.E.P. model of mentoring, as well as e-mentoring and e-supervision.

Chapter 10. Institutional Review Board (IRB) Research Approval

Learning Objectives

After reading this chapter, the student will be able to

- describe the history and purpose of the IRB;
- earn the certificate of completion from the National Institutes of Health (NIH) or Collaborative Institutional Training Initiative (CITI) training course on protection of human research participants; and
- prepare a research proposal that will be approved by the local IRB.

Chapter 10 is constructed in two sections: an overview of the IRB that looks at breaches of ethics that motivated creation of IRBs, university policies of IRBs, and common mistakes that appear in an IRB proposal by a student; and the second section that guides the student in completing an IRB review form.

Chapter 11. Conducting Clinical Research

Learning Objectives

After reading this chapter, the student will be able to

- apply the scientific method to clinical practice;
- develop a capstone project in evidence-based practice; and
- set clinical goals.

Producing clinical research starts with developing a clinical hypothesis that is based on critical thinking about relevant professional literature. You will also learn how to determine the appropriate experimental design for your study, how to set goals and take data, and how to disseminate the results of your work. A large part of this chapter is devoted to the operant conditioning paradigm that will guide you in goal setting and data collection.

Chapter 12. Conducting Academic Research

Learning Objectives

After reading this chapter, the student will be able to

- conduct research at basic and more advanced levels of education;
- decide which CSD programs in U.S. colleges and universities are the best fit; and

- explore options of funding for research.

Through spreadsheets and descriptions from university websites, Chapter 12 presents a selection of undergraduate and graduate requirements for CSD research. These include capstone projects and senior theses for undergraduates, master's theses and clinical evidence-based projects for master's students, and other, often archival, research projects for those who pursue the doctorate of audiology (AuD), clinical doctorate in SLP, or PhD degrees.

PART III. DISSEMINATING RESEARCH IN CSD

This last part of the book includes three chapters on dissemination of research. In the first two parts of this book you have learned how to be an educated consumer of research and a producer of clinical research. This third part addresses what to do with completed research. At one time, students and scholars depended on books for professional information. Books are fine (or I would not be writing this one), but are hardly cutting edge information. For example, I received a contract for the present book from Plural Publishing, Inc. in 2017. Most of the references in the book are from 2017 or earlier, representing work that was probably conducted 2 to 3 years before publication. After peer reviewers sent back corrections and recommendations, the completed manuscript was sent to Plural by June 1, 2019. In short, by the time the book gets to you, portions of it may be out of date.

If your goal is to learn the latest information on a professional subject, then, books are unlikely to be your best choice. As noted in Chapter 13, ad hoc peer reviewers for journals have access to the most current studies that are about to be published, so serving as an external peer reviewer should be a goal for someone who wants a future in academia. Chapter 14 addresses conference presentations as well as opportunities for continuing education that are required for maintenance of clinical certification and state licensure. Research that is being presented at scientific meetings is likely to be current and may even be still in progress. Chapter 15 that ends the book considers nonacademic dissemination of research. While every effort is made to present advocacy groups and social media that are currently relevant to CSD, these sources are most likely to change over time.

Chapter 13. Dissemination by Publication

Learning Objectives

After reading this chapter, the student will be able to

- identify aspects of peer review;
- identify the editorial process for acceptance or rejection of a manuscript; and
- identify how chapters are reviewed and edited differently from journal articles.

Research is traditionally disseminated in peer-reviewed journals. Chapter 13 begins by addressing advantages and disadvantages of peer review and continues with a discussion of the editorial process and how to respond to ad hoc

peer reviewers. There is also a section on open-access and predatory journals. Peer review may be less clear when it comes to books and portions of books, and the rest of the chapter is devoted to determining whether or not a book has been peer reviewed, as well as publishing a contribution to a book and some tips on writing style.

Chapter 14. Oral Presentation of Research

Learning Objectives

After reading this chapter, the student will be able to

- write an abstract for a platform or poster presentation;
- prepare and rehearse the presentation;
- present the poster or platform information orally; and
- use educational technology to support the presentation.

Oral presentation of research often refers to conference presentations. The content in Chapter 14 moves from submitting an abstract to preparing and rehearsing the talk to delivering a poster or platform presentation. Practice-based networks are another less formal way of disseminating research. Whether the presentation is formal or informal, education technology offers a variety of ways to enhance your presentation. The chapter ends with some strategies to secure funding for travel.

Chapter 15. Nontraditional Dissemination of Research

Learning Objectives

After reading this chapter, the student will be able to

- describe a marketing strategy for a device, instrument, therapy, or test you have developed;
- describe differences between Web 1.0 and Web 2.0 technologies; and
- describe how to disseminate research through social media.

Nontraditional dissemination of research addresses some challenges to dissemination such as marketing, distribution, and making use of new Web technologies and social media. Some other areas of difficulty in dissemination are raised, including moving research findings from the clinic to the community and from the community to public health policies. An alphabetical list of some support groups in major areas of communication disorders offers contacts to the world outside the laboratory, clinic, and classroom. The last part of the chapter, and of the book, provides information on advocating for the professions and how to highlight your research in university and association news publications.

ACKNOWLEDGMENTS

In recognizing the many people who helped with this project, I want to begin with the peer-review process of Plural Publishing, Inc. Thank you to all reviewers for giving your time and expertise so freely. Plural Publishing continues to be very supportive to its authors, with Valerie Johns and Kalie Koscielak of most notable help in the present project.

Versions of the present book, even before I considered writing it, were shaped by the reactions of my students to information in Research Methods courses at Lehman College; The Graduate Center, CUNY; Adelphi University; and the National Pedagogical University, Bogotá, Colombia. I have also had the extraordinary good fortune of working with two superb master's-level research assistants, Emily Goldman and Yulia Kovalenko for two years. In addition, another graduate student, Monica Fernandes, helped me translate information on the scientific method into South American Spanish for use in Bogotá. The notion of good therapy being a parallel of an experiment where $n = 1$ was shaped by more than 30,000 therapy sessions with homebound adults with aphasia and dysarthria. Thank you for welcoming me into your homes and your lives.

Some very generous colleagues offered comments on various chapters in the book: Reem Khamis-Dawkar inspired the chapter on academic–clinical integration; Elizabeth V. Goldfarb provided information on informed consent for the chapter on ethics; Melissa Randazzo helped with the organization of the chapter on types of research; Fran Redstone clarified an early version of the chapter on statistics, Matthew D. Simon offered a tutorial on Bayesian statistics; Lawrence J. Raphael helped with the organization of the chapter on the IRB; and Wendy Papir Bernstein offered information about nontraditional forms of dissemination.

I offer heartfelt thanks to Chris Code, Audrey Holland, and Leonard L. LaPointe who served as professional and personal cheerleaders during my recent harrowing medical adventure. I will say that there are better ways to improve one's empathy for those who have had a stroke than by having one yourself.

To Shelley, my bride and muse for a half century, this book is dedicated to you. To our daughter, Elizabeth V. Goldfarb—a superb cognitive neuroscience researcher—and our son-in-law, Matthew D. Simon—a world-class molecular biochemist—we love you madly. You have both already had a significant impact on Yale University and the world. Finally, to our granddaughter, Tessera Rose Goldfarb Simon, you are still a baby, but the lives you touch are already enriched by knowing you.

REVIEWERS

Plural Publishing, Inc. and the author would like to thank the following reviewers for taking the time to provide their valuable feedback during the development process.

Mary Jo Santo Pietro, PhD, CCC-SLP, ASHA Fellow
Professor
School of Communication Disorders and Deafness
Kean University
Union, New Jersey

Alfred Valdez, PhD, CCC-SLP
Interim Academic Department Head
Department of Communication Disorders
New Mexico State University
Las Cruces, New Mexico

Anniversary Waltz (to Shelley)

Like a dog, circling before he sleeps,
I have burrowed my head in my pillow
in just the right place.
You choose this moment
to request a kiss.
I am thrilled to comply.

PART I

Consuming Research in CSD

Developing Power of Professor: The Nature of Research in CSD

INTRODUCTION

Consuming research in communication sciences and disorders (CSD) is not optional for students, clinicians, and academic faculty. Increasingly, all are also required to produce the products of their research, even if it does not result in a conference presentation or journal article. Students at all levels, from the BA or BS through the MA or MS and AuD or PhD degrees, are required to produce evidence of their research in the forms of term papers as well as a senior thesis or capstone project, master's thesis or evidence-based practice report, and doctoral dissertation, respectively (see Chapter 12 for details). Clinicians critically evaluate diagnostic and assessment materials and protocols, instrumentation and devices, and intervention techniques before using them in their clinical practices. Academic faculty members evaluate and synthesize the professional literature to create and update course syllabi. All are required to engage in continuing education throughout their professional careers.

Everyone does research, from comparison shopping, to finding a good plumber or accountant, to trying to understand current events. The standard that students, clinicians, and professors have for conducting research is much higher, and there are many rules to be learned and followed. This book is organized to guide the student through the process of becoming an educated consumer of research, to beginning the process of conducting research, and to understanding the options for disseminating research. The theme, as elaborated on at the end of this chapter, is to enable students and clinicians, as well as new faculty, to gain the knowledge and skills necessary to develop what I am calling "power of professor."

Learning Objectives

After reading this chapter, the student will be able to

- explain why academic and clinical research is important;
- critically evaluate whether research is independent or self-serving; and
- outline the research review process.

WHY PROFESSORS AND CLINICIANS DO RESEARCH

Not all professors and clinicians do publishable research. For example, some professors work in teaching institutions that do not require scholarly output in terms of peer-reviewed publications and presentations. The teaching load is usually much higher in institutions that focus mainly on teaching than in research-intensive, or research 1 universities (sometimes referred to as "R1: Doctoral Universities–highest research activity"), where external funding and peer-reviewed publications are required for retention, promotion, and tenure. Evidence of research is critical to college and university peer-review committees that evaluate faculty on three criteria: teaching; scholarship or creative work; and service to the university, community, and profession.

All professors do research to prepare for their courses, and all clinicians do research to prepare for clinical intervention in speech-language pathology (SLP) and audiology (A). At least they should. Many of us have sat through courses where it seemed that the instructor had not updated the curriculum in decades, or observed clinicians who implemented only the same therapies that they used for decades. As noted in Chapter 3, this may be legal, but it is not ethical. Good teaching as well as good therapy is hard work that requires continual updating through critical evaluation of current research, synthesis of professional literature, and continuing education. The student clinician is not finished with education upon graduation. Nearly all states in the United States require licensure for the professional practice of SLP and A, with continuing education hours needed to maintain the professional license.

Some institutions of higher education are known for conservatory programs where creative work (e.g., in art, dance, music, and theatre) is of paramount importance. Communication sciences and disorders (CSD) departments are not located in conservatory programs. The old expression, "publish or perish" applies to faculty in most CSD programs. The requirement for faculty to publish can be a boon to students who may be paid or receive tuition remission to work as a research assistant to a faculty member (see Chapter 9). However, just as all university clinicians and academics must do research for therapy and teaching, respectively, even if they do not publish, students must do research for courses and other institutional requirements even if they do not work as a research assistant to a faculty member. Most colleges and universities require some written or archival document that is based on research at every level of education. Undergraduate CSD students usually prepare what is known as a capstone project or senior thesis in their major; some master's-level

students write a thesis, but nearly all will prepare an evidence-based (or research-based) therapy project for clinical practicum; and doctoral students often do preliminary (or "brown bag") research projects, run pilot studies, and write a dissertation. All will produce research-based written term papers for courses at every level.

Expanding the original question, what is involved when we, as students, professors, or clinicians do research, and why do we do it? The main outlets for the products of our research are peer-reviewed or refereed conference presentations (local, state, national, and international), journal articles, and books or portions of books. The peer-review process that involves evaluation of research by volunteer experts in the field will be discussed in detail in Chapter 7. As professors, we may work for years preparing a journal article to submit to a peer-reviewed publication, and if we are lucky, we get to give it away for free. Sometimes we even have to pay page charges. Your friends in business schools will no doubt find this surprising. We need to publish in order to be tenured and promoted, but there is a more basic motivation. Our business is the pursuit and dissemination of knowledge, and it is exhilarating to find a little piece of truth that had not been uncovered before. As clinicians, we are not required to publish, but the positive effect that our research has on a client's communicative behaviors is more than enough motivation to stay current with the literature. Finally, as students, you get to do both academic and clinical research, either to fulfill your university's scholastic requirements or to succeed in clinical practicum.

RESEARCH AND DEVELOPMENT (R & D) VERSUS OBJECTIVE RESEARCH

R & D

Think of the advertisement that claims a product is "clinically proven to be effective at . . . " (you fill in the sentence). This advertisement is an interpretation of research and development (R & D) that you should not believe. Hypotheses, theories, and therapies are never proven (we can falsify or reject them, but we can only support or strengthen them; see Chapter 5 for an expanded discussion of this topic). By its very existence as an advertisement, there is a potential conflict of interest in the claim of effectiveness; that is, the motivation to sell a product can be at odds with the desire to discover the truth (R & D is usually conducted in an ethical manner, but see Chapter 3 on Ethics of Research for more information).

Private support of research is crucial to the development of new knowledge, as governments cannot afford to pay for all the expenses that research entails. Even though R & D is driven by the profit motive, results of privately supported research can be enormously consequential and even publishable in the best journals if the authors include a disclosure statement. Most scientific convention presentations and journals require authors to state if they have a personal or financial interest in the outcome of the research. The following is part of a critique where the present author served as an ad hoc reviewer for an article submitted to a journal in our field. (The reviewer posed

the question and the authors of the article provided the response.)

> Response to reviewers:
>
> *Q. The purpose of the paper seems to be to support the use of ABaCo (presumably the assessment battery they developed) as a tool to assess the pragmatic language disorder in schizophrenia. If the authors have a financial interest in this tool, it should be stated as a disclosure.*
>
> *R. We have modified the introduction in order to make clearer that the purpose of the paper was not to promote the use of ABaCo as much as to provide a wide-ranging picture of communicative abilities in patients with schizophrenia.*

Following a resubmission with the requested revisions from two reviewers, the paper was accepted for publication in the journal, and a disclosure statement appeared on the first page of the article.

Objective Research

Errors may still appear in objective research, but there are several checks to prevent them. Assume that you are planning your first experiment to fulfill an academic requirement. The first check will be done by your academic adviser and possibly by other faculty members of your thesis or dissertation committee as well. The faculty will help you to write an experiment that you can complete in a reasonable amount of time and that will yield important information. For example, with the approval of the faculty, you plan to implement a protocol to assess expressive syntax in 5-year-old children with specific language impairment (SLI). Your research population is from a protected class (their status as children means that researchers must make extra efforts to protect them from any potential harm in an experiment; see Chapter 3), so you will not be able to get an expedited review from your university's Institutional Review Board (IRB; you will learn how to complete an application to the IRB in Chapter 10). The second check by the IRB will make sure that your research proposal ensures respect for persons, beneficence, and justice for the research participants, as delineated in the Belmont Report (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979; see Chapter 3 for an extended discussion of the Belmont Report), and will also provide a check on the experiment's purpose, methodology, and design. In most instances, the IRB will ask for clarification or additional information, and the proposal will have to be resubmitted for a final approval.

Now assume that you will need funding to complete your experiment. You can fund your study alone or with your adviser in many ways: through an internal or university-based grant, through a private agency, through a professional association (e.g., the American Speech-Language-Hearing Association [ASHA] or the American Academy of Audiology [AAA]), through a government agency, or as part of your adviser's funding for an existing grant. The application for funding must be thorough and competitive, as there are many more applications than available funds. The third check by the funding agency will result in useful feedback, whether or not your proposal is funded (some funding opportunities for students at different levels of education, as well as for junior and senior faculty, are described in Chapter 12).

The fourth check will result from a pilot study, where you and your adviser will determine if your protocol is working properly. If adjustments need to be made, and there probably will be some, then piloting, perhaps with neurotypical children, before running the experiment will allow for modifications. If you start running participants with SLI and there are problems with the protocol, then you may have to throw out the data you collected.

Finally, you have completed running the experiment. Your faculty committee must approve the document you wrote (a fifth check), and you may be required to defend it in front of the faculty or at a public event.

Congratulations! You have completed your research, you have earned the approval of your advisers, and you have defended what you have written. Now it is time to disseminate your research (see Chapters 13 through 15 for traditional and nontraditional dissemination opportunities). Together with your adviser and perhaps with other faculty as well, you submit a proposal for presentation at a professional meeting; for example, ASHA or AAA. Proposals for presentation at these conventions are peer reviewed (a sixth check where experts in SLI will evaluate the accuracy and relevance of your work, as well as suitability to the professional society hosting the meeting) to make sure that the content is appropriate for the target audience, is consistent with the theme of the convention, and has scholarly or professional merit. You and the faculty may also decide that the research qualifies for submission to a peer-reviewed journal (a seventh check where ad hoc reviewers with expertise in SLI will determine if the manuscript should be accepted, rejected, or accepted with major or minor revisions). This is a painstaking process that will probably involve responding to journal editors and ad hoc peer reviewers, as well as some rewriting.

These seven checks do not guarantee that everything you read in a refereed journal or elsewhere is of a high quality or even correct. Errors can elude even the most diligent reviewers, and new evidence can falsify old hypotheses. The Internet can sensationalize findings or generalize them incorrectly. Book authors, including this one, can make mistakes in synthesizing a large body of literature. On very rare occasions, researchers cheat. These cheaters may feel pressure to justify a grant, to get promoted or tenured, or to publish what they are sure is correct, even if the data indicates otherwise. The consequences of being caught at cheating are so severe that virtually all researchers are honest. It is likely that the cheating will be discovered, with resultant loss of job and reputation, and sometimes incarceration.

CLINICAL RESEARCH: A CASE STUDY

Danielle, a graduate student, and I sat on child-size chairs next to a child-size table at our university's Center for Communicative Disorders on a hot day in early June. We were waiting for our new client, a 4;5-year-old female with a diagnosis of cerebral palsy and profound hearing loss who was reportedly nonverbal. We had brought toys and other stimulus materials and planned to devote our first therapy session to establishing rapport and evaluating the current status of the client. CM, a thin, white middle-class female entered the therapy room wearing shorts and a

tank top, her knees bent in from her wide stance as she walked shifting her weight from side to side. CM's mother, who stayed in the waiting room, was a homemaker, and her father owned a pizza restaurant. We greeted CM who threw herself on the floor and started screaming.

Danielle, astonished, asked what we should do. I said I didn't know, but suggested we get down on the floor with some of our toys and engage in parallel play. After a brief time, CM started to play with some of the toys, and we shifted our strategy to interactive play. As we were playing with plastic food, CM picked up an apple and said, "poo." I told Danielle that I thought CM might not be deaf as she spontaneously produced the second syllable of a word that had most of its acoustic power in the first syllable, a stressed vowel. CM then picked up a piece of plastic pizza and said, "Dada." I said to Danielle that CM might not be nonverbal either, as her father owned a pizzeria. We spent the rest of the session interacting with CM who seemed to have been misdiagnosed. As an aphasiologist, I suspected that CM's ambulation and language behavior might have resulted from an in utero stroke.

We obtained an MRI that was done when CM was 1 year, 11 months that revealed mild relative prominence of the lateral ventricles, without evidence for acute hydrocephalus. Our university's Faculty Center for Professional Excellence helped me to add ultraviolet digital enhancement to the image that revealed ventricular enlargement in the area of the primary auditory cortex (Figure 1–1).

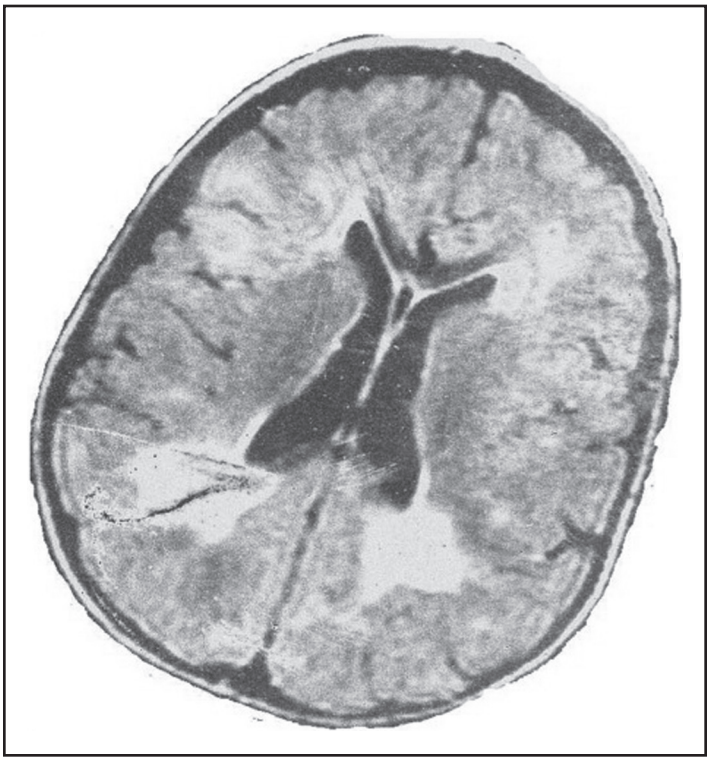

Figure 1–1. *MRI of CM's brain at 23 months of age.*