

RESEARCH METHODS

A Framework for Evidence-Based
Clinical Practice

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To Gram—When I was a child, you read to me as I sat on your lap, you encouraged my curiosity, you allowed me to ask questions, you supported my dreams and imagination, and you always showed me love and acceptance. I miss you. To Dr. Bruce W. Young, Mr. David J. Tomasi, Dr. Lori A. Michener, Dr. Bradley D. Hatfield, Dr. W.E. Buckley, Dr. Craig R. Denegar, and Dr. Karl M. Newell—My beloved teachers, respected mentors, and trusted professional role models. Your lessons continue to provide guidance and direction as I hear your words in my mind's ear and see your examples in my mind's eye. This book would never have been possible without your belief in me, and your lasting influences on me both personally and professionally. It is my greatest privilege to remain your humble and loyal student. I honor you with my gratitude, love, and devotion. To my students—We learn together, and I grow as you teach me what I need to do to become better at helping you learn how to learn. I am fortunate to share my academic passions and my favorite sagacious musings from the philosophies of Zen, Buddhism, and Taoism with you. To Brent—You understand me, and I love you. And, to Luka—Always.

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JH

FOREWORD

This research methods textbook distinguishes itself from other textbooks by providing a unique framework and perspective for users/students to establish the relevancy of research in their clinical practice. Many, if not most, students in professional preparation allied health care programs view the research methods/statistics course requirement of the curriculum as an obstacle to be overcome, or at best, as a necessary evil. Most research methods textbooks promote these notions because of the way they are presented. Of course, most times they are written by researchers or statisticians and are absolutely correct in presenting the theoretical underpinnings and mechanistic applications of the scientific method. They correctly present explanations as to why one type of methodology requires a certain type of statistical analysis based on the characteristics of the study population, the type of data collected, or the underlying assumptions pertinent to a specific statistical model. So, while technically beyond reproach, their failure is in establishing how and why research activity and understanding is integral to a professional practice.

In this textbook, the authors appreciate professional realities that have relevancy to professional preparation and the role of research within that preparation. First, they promote that understanding research is a *required competency* in allied health care preparation. That is, most allied health care professionals are going to be consumers of research literature for the duration of their professional lives. This is often enforced by continuing education requirements that reflect the understanding that medical and allied medical bodies of knowledge are ever expanding and/or being refined and must be communicated to clinicians. Thus, at a minimum, professional preparation programs must provide the opportunity for the student to establish competencies in reading, critically evaluating, and synthesizing research into their clinical practice.

The reality is that most medical and allied medical professions have accepted that their disciplines need to follow an evidence-based best practice approach to clinical practice and professional preparation in order to be effective today. Most of their professional organizations actively promote through funding and dissemination vehicles this research paradigm. This is not at the exclusion of other valuable research paradigms, but rather as an emphasis commensurate with current disciplinary interest.

The authors have taken these realities and developed the research elements of this textbook to be professionally relevant to clinical movement practitioners (e.g., physical therapists and certified athletic trainers). They use a commonsense-style presentation of the conceptual and theoretical bases for the clinical research enterprise and provide clear examples of application, evaluation, and integration into clinical practice.

Part I introduces the reader to the basic tenets of the research enterprise as it relates to clinical practice. A wonderful chapter is presented on how to read and evaluate research articles. This is a very pragmatic chapter that highlights the elements of an article so the reader can critically appraise the quality of the article. The history of evidence-based clinical practice is presented along with a chapter about how research can be used to establish best practices. The last chapter in this section provides an overlay of ethical principles that need to be operative in research and clinical practice enterprises.

Part II has seven chapters that effectively make the case that the conceptual, elemental parts of research have a role in the reader's effort to establish an evidence-based practice. This is accomplished by describing how a reader could have a clinical question and that the question is what dictates the research methodology and analysis. One chapter provides the reader with a way to find resources on clinical practice topics and evaluate the quality of the resources. Another establishes that there is a hierarchy of evidence and the reader needs to know what level or quality of evidence is important for them to use in their clinical practice. Several chapters are nicely presented that introduce the most common types of scientific inquiry and statistical analysis related to evidence-based practice.

Part III carries this utilitarian presentation approach to the research enterprise even further. The chapters are organized into clinical categories rather than research method categories. That is, Chapter 13 presents what clinical research methodology and analysis is appropriate when the reader is trying to find out about the evaluation and diagnosis of orthopaedic conditions. Chapter 14 is about screening and prevention of illnesses and injuries and what kinds of clinical research and analysis are appropriate. Chapter 15 presents the research options that clinical movement practitioners can use to develop evidence about the efficacy of treatment/intervention options they may want to use. Chapter 16 further develops the concepts of treatment outcomes and broadens the focus to present common methods and relevant data analysis techniques. The last two chapters in this part focus on how to extend research results to a clinical practice and how to organize many research results into a usable body of clinical evidence.

Parts IV and V provide sections that are unique to this text. But, again, the utilitarian approach is taken. These sections are "how-to's" for a clinical movement practitioner to appreciate how clinical research results are disseminated. As a research consumer, this is important for them to know. Also, the authors provide some guidance on how to effectively write a funding proposal for a research project. Again, many students in professional preparation programs begin to favor the research element of their discipline and want to become actively involved in developing and answering their own clinical questions. Finally, the authors provide insight into how clinical evidence can be used in clinical learning and teaching.

The genius of this text is that it is written for clinical professionals to understand and appreciate research elements that are going to positively affect their

clinical practice. All the research methodology and analysis contained herein is within the context of improving clinical outcomes. In other words, the authors illustrate how clinical practice should drive the research enterprise rather than the converse. In this way, the information becomes relevant to something clinical professionals value and are therefore willing to accept and incorporate research competencies in their clinical practice.

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Process transforms any journey into a series of small steps, taken one by one, to reach any goal. Process transcends time, teaches patience, rests on a solid foundation of careful preparation, and embodies trust in our unfolding potential.

~Dan Millman (Millman D. The Laws of Spirit: Simple, Powerful Truths for Making Life Work. Tiburon, CA: H J Kramer Inc; 1995.)

PURPOSE AND AUDIENCE

The purpose of this book is to provide a theoretical framework that will enable students and practitioners to interpret and apply research into an evidence-based best practice model. This book will serve as a primary course textbook in upper-level undergraduate and graduate allied health programs for clinical movement practitioners in both athletic training education programs and physical therapy programs. The focus of this book is research methods, with emphasis on application to evidence-based best practice for clinical allied health programs.

This book is intended to fill the void that exists in medical professions for a textbook on research methods for evidence-based clinical practice for movement practitioners. We've been teaching research methods for a combined 30 years to both undergraduate and graduate students in allied health programs that emphasize evidence-based clinical practice, and throughout this time, there has continued to be a void in existing research methods textbooks to address the specific needs of disciplines and educational programs that follow an evidence-based best practice approach to clinical practice and clinical education. As a result, we've been left to use our own personal notes on research methods supplemented by research methods textbooks designed and intended for nonclinical programs such as Physical Education, or nonmovement practitioners such as nurses.

Existing materials currently do not provide the breadth and depth of discipline-appropriate informational substance necessary for application to evidence-based

clinical practice for movement practitioners in the professional practices of physical therapy and athletic training. The approach to research methods is often dry and theoretical. If examples are provided, they tend to be methodological and scientific rather than practical. As a result, the texts are often uninteresting and read like instruction manuals. All too often, the unfortunate outcome has been that students reject their research methods text or put it aside because they feel as though they cannot connect with the material and the manner in which it is presented.

While the procedural methods of empirical research are consistent across disciplines, the examples and connections to clinical programs are left the responsibility of the professor. Often this has resulted in feedback from students who complain about the expense of buying a textbook that they don't like and don't use because they prefer to use our lecture notes and examples rather than purchase the course textbook. It has been our experience that with the lack of targeted information in the textbook, students struggle to make application to their core curriculum and all too often the result is that students disengage from the learning process and often draw the erroneous conclusions that research is not for them or their future profession. After years of students asking us why we didn't write our own textbook on this subject matter, we feel that it is time to offer a discipline-appropriate course textbook in research methods for movement practitioners in evidence-based clinical practice.

While the concept of evidence-based clinical practice is still relatively new, the body of literature on this topic has grown considerably over the last 5 years. It seems that perhaps this notion has been slow to catch on in the United States, but internationally it has seemed to be more widely recognized as a hot topic. As grant monies become more available nationally to focus on this area in medicine and clinical practice, it is likely that the concept will become more widespread throughout colleges and universities in the United States. (To this point, we felt it important to include a chapter that specifically addresses the issue of grant writing and provides helpful guidelines, examples, and suggestions for writing funding proposals.) This text references much of this current literature and contemporary material with the sole purpose of targeting this untapped audience of allied health professionals and clinical movement practitioners (i.e., physical therapists and certified athletic trainers).

APPROACH

The focal point of our approach to research methods is to provide guidance and direction for students, instructors, and practitioners on how to acquire, read, interpret, assess, and apply research as evidence in clinical practice has not been provided in traditional research methods textbooks. We tend to view statistical analysis as the flip side of research methodology, or two sides of the same coin.

We approach the subject matter conceptually and practically. Using a common-sense style, conceptual and theoretical frameworks are introduced and discussed

with clear application and integration to evidence-based clinical research. While much research methodology is known this information will be restated in a clear, detailed manner targeting practitioners in evidence-based clinical care and students in professional preparation allied health care programs. Discipline-specific vocabulary, examples, and case studies will be used to help the target audience better understand the role and process of research in evidence-based clinical practice.

CHAPTER FEATURES

Each chapter of *Research Methods* provides the following elements to enhance the usability of the text and offers a fresh approach to research methods for clinical movement practitioners and students interested in learning about evidence-based clinical practice:

- Key terms and concepts are bolded throughout the chapter to help the reader focus their attention on scientific nomenclature and vocabulary essential to a basic understanding of the chapter content and context.
- Chapter objectives detail what the reader will learn in the chapter and highlight important pedagogical outcomes while also serving as a three-fold self-assessment for readers (What are some important reasons for me to read this chapter? How does this knowledge help me prepare to read it? And, after reading this chapter, can I satisfy this list of learning outcomes?). Readers are encouraged to make use of the chapter objectives to help guide their reading and assess their level of reading comprehension.
- Concept checks reinforce important chapter content and purposefully reiterate noteworthy theory and viewpoints.
- Examples throughout chapters make concepts easier to grasp and apply to real-life research and clinical decision-making situations.
- A chapter summary at the end of each chapter provides a comprehensive review of the chapter and provides a take-home message for the readers.
- A list of key points further elucidates concepts, theories, and viewpoints presented and elaborated throughout the chapter as both foundation to the current chapter and groundwork to subsequent chapters, thus presenting a full-circle approach by reinforcing the importance of key terms, chapter objectives, concept checks, examples, and the chapter summary within the textbook.
- Chapter references and suggested readings are provided to aid the reader with supplemental materials for breadth and depth of knowledge, and demonstrate appropriate use and formal citation of original sources in empirical research.
- Figures and tables offer illustrations to provide the reader with visual examples that help support important information detailed in the text.

- End-of-chapter critical thinking questions and thought-provoking discussion-based problem-solving questions serve as necessary opportunities for discussion, review, assessment, and critical appraisal to help organize and guide readers' thought processes as we lead them through the thought-structured progression of problem-solving, which is a foundational requirement for learning to apply research methodology and follow an evidence-based model of clinical practice.

By providing consistent features in each chapter, this approach guides the reader as they encounter new vocabulary and learn to interpret and apply content knowledge in a way that makes sense to them. In this manner, the text is both a learning tool and an informational resource for research methods.

ORGANIZATION

The book is organized into five parts. Part I (Chapters 1 to 5) is structured as an opening presentation of underlying conceptual frameworks and theoretical underpinnings in clinical research and evidence-based practice, and an introduction to the skills for critiquing and analyzing research is introduced. Chapter 1 covers the concept of empirical research and the basic tenants of research methodology as a collective paradigm. Chapter 2 provides a guide for how to read research and offers a framework for evaluating research articles. Chapter 3 introduces the notion of evidence-based clinical practice and explains how to distinguish best practices. Chapter 4 addresses the historical perspective of evidence-based medicine to provide lead into the necessity of ethics in research and practice (covered in Chapter 5).

Part II (Chapters 6 to 12) is organized around the research process in terms of statistical analyses and the idea of research as evidence. More specifically, this section addresses how the question drives the methods when seeking answers to clinical questions, because we are of the pedagogical and theoretical perspectives that it is difficult to “teach” research methods without simultaneously addressing statistics. Chapter 6 covers informational sources, search strategies, and critical appraisal of research as evidence. Chapter 7 addresses the issue of hierarchy of evidence. Chapter 8 deals with qualitative inquiry, while Chapter 9 begins to sort out quantitative inquiry. Chapters 10 and 11 describe research designs and data analysis while introducing the statistical perspective of research methods. Chapter 10 discusses the fundamentals of statistical analysis, focusing on validity and reliability of measures. Chapter 11 covers tests of comparison. Chapter 12 highlights measures of association.

The concepts that are introduced in Parts I and II and then developed and elaborated in Part III focus on clinical research diagnosis, prevention, and treatment. In this way, Part III (Chapters 13 to 18) is ordered to describe research designs and data analysis for each type of study, and then provide some examples to illustrate its

application. Our goal is to address and apply concepts of research methods into prevention, diagnostics, and intervention outcomes. We are of the perspective that these are the issues at the heart of evidence-based medicine—why disease and injury occur (epidemiology) and what can I, as a clinician, do to prevent the condition in the patient in my office (clinical epidemiology), etc. Chapter 13 addresses evaluation and diagnosis from the perspective of research methods and data analysis. Chapter 14 looks at screening and prevention of illness and injuries, again from the perspective of research methods and data analysis. Chapter 15 explores the notion of treatment outcomes across the disablement spectrum. Chapter 16 expands on this and looks at treatment outcomes from the perspective of research methods and data analysis. Chapter 17 covers the topics of clinical prediction rules and practice guidelines. And, Chapter 18 explores the application and usefulness of systematic review and meta-analysis in evidence-based clinical practice.

Parts IV and V are unique to our book on several levels. The topics covered in these chapters are uncommon in most traditional textbooks and are even rarely mentioned in a book on research methods. Part IV (Chapters 19 and 20) is concentrated on the dissemination of research. Specifically, Chapter 19 offers guidelines and suggestions for presenting research findings; and, Chapter 20 offers a detailed guide with examples for writing the funding proposal. Part V (Chapters 21 and 22) covers the integration of evidence-based medicine into the education experience. Chapter 21 explores the notion of evidence in learning and teaching. Chapter 22 wraps up the discussion and comes full circle to revisit the topic of evidence in the context of the clinical experience.

ADDITIONAL RESOURCES

Research Methods includes additional resources for both instructors and students that are available on the book's companion website at <http://thePoint.lww.com/Hurley>.

Instructor Resources

Approved adopting instructors will be given access to the following additional resources:

- Answers to the critical thinking problems found in each chapter
- One to two example assignments for each chapter
- A chapter assignment template—with accompanying guidelines, directions, and suggestions—that can be used by instructors to create their own chapter assignments
- PowerPoint slides for each chapter
- An image bank of all the figures and tables in the book

Student Resources

All purchasers of the textbook can access the searchable Full Text On-line by going to the *Research Methods* website at <http://thePoint.lww.com/Hurley>. See the inside front cover of this textbook for more details, including the passcode you will need to gain access to the website.

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