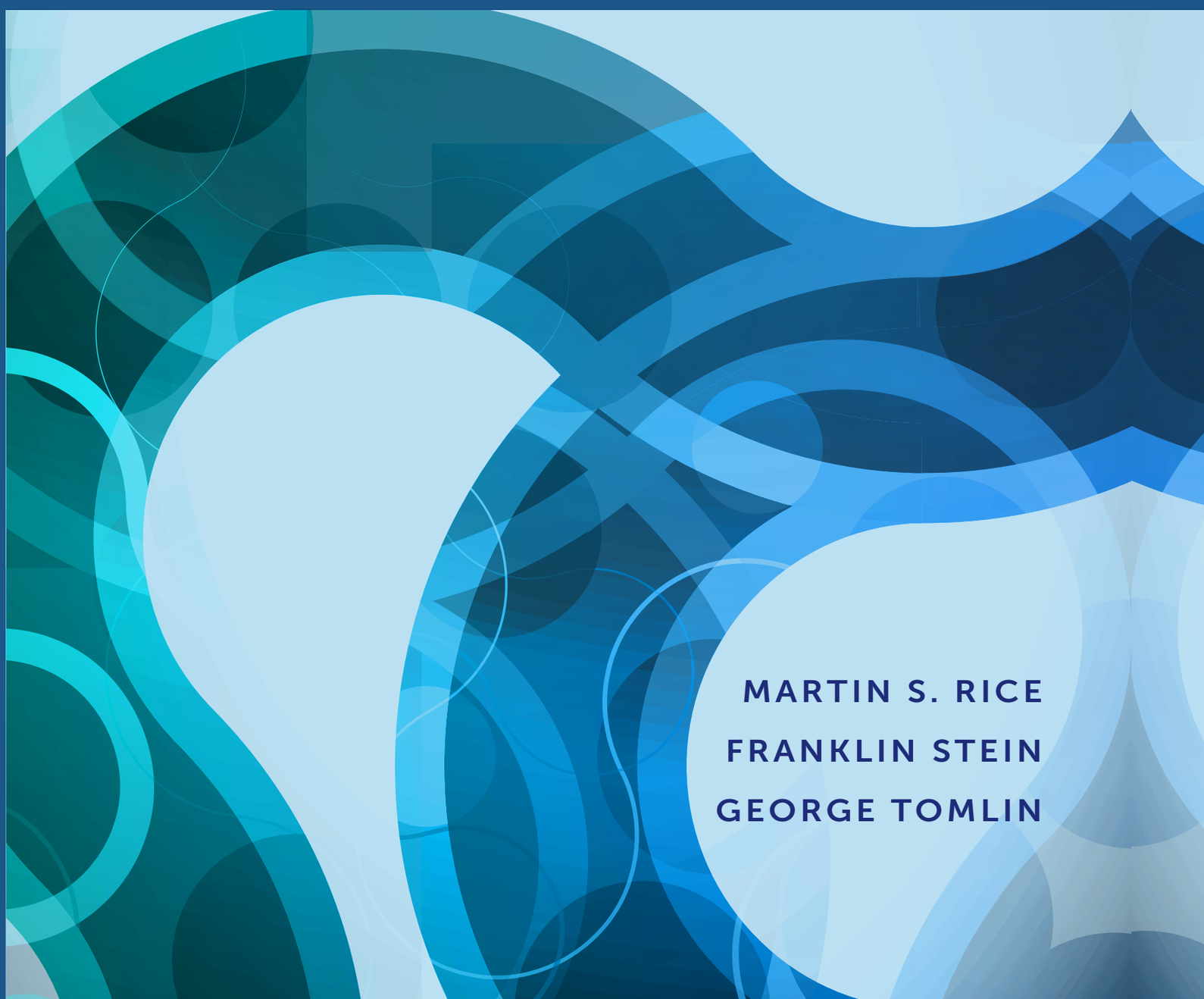
SIXTH EDITION

CLINICAL RESEARCH
in Occupational Therapy



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FRANKLIN STEIN
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SLACK Incorporated

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—Martin S. Rice, PhD, OTRL, FAOTA

I acknowledge the contributions and feedback from the many students in my classes as I was teaching research design over the years at Boston University, University of Wisconsin-Milwaukee, University of Manitoba, and University of South Dakota. I also acknowledge the help from college colleagues who have been helpful and encouraging over the years. This book has been a labor of love since I began this project in 1974 when I was a young professor in the Graduate Division in the School of Allied Health at Boston University. Occupational therapy as a profession has grown tremendously since then and clinical research has been a strong factor in demonstrating the effectiveness of the profession in improving the lives of millions of people coping with disabilities.

I am also grateful to Martin and George who have substantially improved the quality of the book. I also have to give much credit to my previous co-author, Sue Cutler, who lent her expertise in the writing and reorganization of the third, fourth, and fifth editions of the book.

—Franklin Stein, PhD, OTR/L, FAOTA

For this edition, I would like to thank four University of Puget Sound colleagues who helped update the list of assessments in Chapter 10: Juli McGruder, PhD, OTR/L (mental health), Tatiana Kaminsky, PhD, OTR/L (geriatrics), Anne James, PhD, OTR/L, FAOTA (physical disabilities), and Sheryl Zylstra, OTD, OTR/L, BCP (pediatrics), for their prompt and generous efforts. Also many thanks are due to Jean Deitz, PhD, OTR/L, FAOTA for her encouragement to tackle the subject of single-case experimental designs. I would also like to thank the many students I have learned with over the years, who have taught me that every discipline has its realm of knowledge, and then a parallel realm of knowledge about how to "teach" that original knowledge. Finally, I would like to express my thanks to my wife, Sybille, whose occupational therapy experience is a deep and steady sounding board for my own investigations.

—George Tomlin, PhD, OTR/L, FAOTA

About the Authors

Martin S. Rice, PhD, OTR/L, FAOTA, is the Dean of the School of Health Sciences, and Professor of Occupational Therapy at the Indiana Wesleyan University in Marion, Indiana. Dr. Rice received his PhD in 1996 in Motor Learning and Control and his BS in 1984 in Rehabilitation Education from the Pennsylvania State University. In 1987, he received his MS in Occupational Therapy from the Western Michigan University. Dr. Rice has served on the editorial boards and as a reviewer for several rehabilitation sciences and occupational therapy peer-reviewed journals. He has published over 50 articles and has given over 100 presentations regionally, nationally, and internationally. He completed a sabbatical at the Sheffield Hallam University where he studied safe patient handling practices within the United Kingdom.

Currently, *Franklin Stein, PhD, OTR/L, FAOTA* is Professor Emeritus of Occupational Therapy at the University of South Dakota, founding editor of *Annals of International Occupational Therapy,* and life member of the American Psychological Association. Previously, he was the Director of the School of Medical Rehabilitation at the University of Manitoba in Winnipeg, Canada, Director of the Occupational Therapy Program at the University of Wisconsin-Milwaukee, and Associate Professor, Graduate Division at Sargent College, Boston University. He is the first author with Kristine Haertl of the *Pocket Guide to Interventions in Occupational Therapy, Second Edition* (2019), the first author with Martin Rice and Susan Cutler of the textbook *Clinical Research in Occupational Therapy, Fifth Edition* (2013), *Occupational Therapy and Ergonomics* (2006) with Ingrid Soderback, Susan Cutler, and Barbara Larson, *Psychosocial Occupational Therapy: A Holistic Approach, Second Edition* with Susan Cutler (2002), *PocketGuide to Treatment in Occupational Therapy* (2000) with Becky Roose, and *Stress Management Questionnaire* (2003), as well as over 50 publications in journals and books related to rehabilitation and psychosocial research. He has also presented more than a hundred seminars, workshops, institutes, short courses and research papers at national and international conferences

George Tomlin, PhD, OTR/L, FAOTA has degrees from Massachusetts Institute of Technology, Boston University, University of Puget Sound, and the University of Washington in philosophy, international relations, occupational therapy, and educational psychology, respectively. He has enjoyed 35 years of teaching occupational therapy to students at Puget Sound, from those who grew up locally in Tacoma, Washington, to those from far away: India, Iran, Norway, Taiwan, Germany, Australia, Jordan, and the West Bank. He has brought practice experience in pediatric mental health, adult rehabilitation, and vocational rehabilitation, as well as teaching experience and research interests, to faculty, therapists, and students overseas, especially in Germany and other parts of Europe. Since 2006 he has continued a collaboration with Prof. Dr. Bernhard Borgetto, at the University of Applied Arts and Sciences, Hildesheim, Germany, advancing the ideas of the pyramid model of research evidence. From 2007 to the present he has served as a volunteer for the National Board for Certification in Occupational Therapy, first on the teams developing clinical simulations, and currently as a member of the Board of Directors. His newest project is with a group of six U.S. colleagues, investigating a more inclusive understanding of the uses of evidence in practice, and of how therapists make and justify intervention decisions.

Preface to the Sixth Edition

The first edition of this book, previously called *Anatomy of Research in Allied Health*, was published by Schenkman Publishing Company in Cambridge, Massachusetts, and John Wiley and Sons in 1976. As such, this text, in one form or another, has been in print for over 40 years. The original author was Dr. Frank Stein, who conceived the idea for the text and wrote the first draft of its pages during his sabbatical in Cambridge, England, in 1974 while on faculty at Sargent College, Boston University. This was the first textbook authored by an occupational therapist on research methodology. Dr. Stein wanted to write a text to demonstrate how the health science professions, including occupational therapy, were part of medical progress throughout the world. Furthermore, he believed that occupational therapy was very much tied to the knowledge base of scientific medicine. In the first edition, Dr. Stein wrote, "The overall purposes of the book are two-fold. One is to assist clinicians and students in the health fields to become effective evaluators and consumers of published research and two is to facilitate research skills by communicating the process of research and the abilities needed to plan and implement a research project" (Stein, 1976, p. viii). These goals are still relevant and appropriate today.

In this new edition, I am delighted to announce the addition of Dr. George Tomlin. Dr. Tomlin is a Professor in the School of Occupational Therapy at the University of Puget Sound. Dr. Tomlin is a leader in occupational therapy and is recognized as a profound thinker and contributor to the literature. We are fortunate to have his expertise and knowledge. I have assumed the first author's position and am grateful for the support, guidance, and input from Dr. Stein who is this edition's second author. While Dr. Tomlin and I met some years ago and have been good friends since we first met, Dr. Stein and I have known each other for 2 decades. Dr. Stein has been a good friend and mentor for all of these years and I have come to love and appreciate his love for the profession. A wise person once said, "If you want to end up like someone, become friends with that person." Not only has Dr. Stein modeled a level of professionalism that I deeply respect, his level of community involvement is remarkable and I am honored to call him friend. Dr. Stein is the epitome of a true gentleman and scholar. While not a current author, this current edition would not have been possible without the invaluable work of Dr. Sue Cutler, who co-authored several of the previous editions.

This sixth edition brings some changes, improvements, and enhancements. Some of the more noteworthy changes include the following:

- The addition of Dr. George Tomlin as the third author
- A thorough update of the published research in occupational therapy and health care
- Major revisions in all of the chapters
- The addition of a totally new chapter on single-case experimental research (Chapter 9), spearheaded by Dr. Tomlin
- Updated research boxes and contemporary examples of both quantitative and qualitative research
- Updated compilation of tests and evaluations used by occupational therapists in research studies as outcome instruments and for clinical assessments
- Revision and additions to the glossary of terms and statistics
- Updated examples of the institutional review board application forms, including an informed consent form template from Indiana Wesleyan University
- Updated landmarks in the history of occupational therapy
- Updated interfacing example with a popular statistical software, including data organization analysis and interpretation
- Updated statistical tables
- In general, the sixth edition enables the graduate student and clinical researcher to carry out a research study from the formulation of a research hypothesis to collecting, analyzing, and interpreting data in user-friendly, step-by-step procedures

—Martin S. Rice, PhD, OTR/L, FAOTA

Introduction

A Manifesto for a Great Clinical Research Text for Occupational Therapy

The first edition of this text was published in 1976. At that time, it was the first textbook on clinical research in the allied health professions. Since then, numerous texts have been published about research from the perspective of clinical practice in occupational therapy, physical therapy, and speech-language pathology and audiology. The current edition, the sixth, is a collaborative effort where the three authors combine their expertise as professors, researchers, and clinicians. In preparing this edition, we raised the question: What characterizes a good textbook in clinical research? In reviewing other textbooks and reexamining the strengths and weaknesses of this text, we proposed the following points:

- The textbook should be practical, well-written, and easily understood by researchers, clinicians, and students. Complex concepts should be explained carefully and presented in a logical step-by-step sequence.
- There should be a historical perspective in the text that connects the reader to other researchers who laid the foundation for research-validated practice. The development of the occupational therapy profession is a continuation of the scientific and medical revolutions that created the health professions. As health care clinicians, we are dependent on the early research in anatomy and physiology, testing and measurement, medical instrumentations, clinical medicine, and environmental health. The knowledge gained in the basic sciences strongly impact the clinical professions. As scholars, we know that current practice stands on the shoulders of the past and current researchers in basic and clinical science.
- Within the context of the text, there should be many examples from the current scientific literature, as well as hypothetical examples explaining theoretical concepts and research principles. The text should come from a pragmatic perspective that presents feasible ideas for best practice.
- The text should be a resource for further study in related areas. References should be liberally found throughout the text so that the researcher can readily locate resources in designing and implementing a research study.
- Statistical procedures and tests should be clearly explained in a stepwise procedure. The concept underlying the statistical technique should be emphasized. Although there are a number of available statistical software options, it is important for the student to understand how the statistical results are derived. The student should have a strong background in descriptive statistics before learning inferential statistics.
- In the textbook, there should be an example of a research proposal that can serve as a model for the researcher. The research proposal should be clearly described and realistically implemented.
- The textbook should be comprehensive and include several research models that are appropriate for research in occupational therapy.
- Qualitative and quantitative research models should be described with examples from the literature. Both models are appropriate and relevant. The research design is judged on its own merits as far as validity and application to clinical practice.
- An important emphasis in research is in raising relevant, significant, and feasible research questions. The researcher should be encouraged to ask questions that generate intellectual interest and curiosity. Research should be a process of discovery and intellectual excitement.
- The individual who is designing and carrying out a research study should see the relationship between one's research study and one's professional role, whether it be a clinician, administrator, educator, or researcher. Basic research and applied research are equally important in leading to effective interventions; however, collecting data alone without purpose is not appropriate.
- The research text should help the student to develop a critical view of research. The student should be able to read the literature with a critical eye and carry over this knowledge to clinical practice, especially in applying clinical reasoning. The researcher should also be able to critique the research methodology and evaluate the validity and limitations of the study.
- The researcher should have a strong appreciation of the ethical issues involved with human investigation. Researchers should be able to design an informed consent form and be able to safeguard the research participant from unnecessary psychological or physical risks.

One of the major purposes of this textbook is to link research to clinical practice. It is important that the researcher raise questions relating to clinical practice, including the practical implications, when developing the research proposal. The content of this textbook's chapters are organized comprehensively to include all the components in research: generating a significant research question, carrying out a literature review, designing a research study including the method and

procedures, outlining a statistical analysis of data, and writing a scientific manuscript suitable for submission to a peer-reviewed journal.

In writing this sixth edition, the authors developed a conceptual model that serves as a rationale for the text.

- Although the medical model is an essential component of health care systems throughout the world, it is important to note that, in practice, other interventions exist that are effective and deserve research considerations. For example, alternative medicine has become a significant area of practice outside the traditional allopathic medical model. Historically, the medical model includes arriving at a diagnosis that serves as the basis of treatment. The consideration of educational, psychological, and sociological factors in treatment do not negate the medical model. Effective rehabilitation and habilitation depends on a holistic approach that often includes a combination of approaches and models.
- The goal of clinical research is to discover, through objective and systematic inquiry, the most effective interventions that can be applied to the client with a condition or disability. Research should be driven by theory and rational explanation.
- The relationship between clinical research and clinical practice is based on the premise that effective treatment depends on multiple factors, including the occupational therapist's skill, the efficacy of a treatment methodology, the suitability of the intervention given the situation and goals of the client, and the environmental factors that affect treatment. Clinical research should strive to understand the relationships among these factors in clinical treatment.
- Doing research and critically evaluating the findings help the student to become an effective clinician. Because clinical practice is dependent on clinical reasoning and decision making, the effective clinician applies the scientific method in practice. The research-oriented practitioner is able to evaluate the literature and to incorporate current research findings into clinical practice as appropriate.

1

A Short History of the Scientific Method in Medicine, Rehabilitation, and Habilitation

Supporters of evidence-based medicine say that it has many benefits: (1) it allows clinicians to draw upon the objective experience of many researchers working with accepted scientific standards; (2) it improves efficacy and efficiency of providers; (3) it decreases the use of ineffective clinical practices; (4) it promises to better inform patients and clinicians about clinical practices by offering collectively agreed upon and publicly available information about treatment options; and (5) it provides a scientific basis for the construction of health care policy.

—Romana (2006)

Operational Learning Objectives

By the end of this chapter the learner will be able to:

- Define *clinical research* and explore its primary purposes and its application to occupational therapy.
- Describe the seven stages in the history of medicine.
- Explain the cyclical nature of medical progress into the 21st century.
- Recognize the important contributions of medical researchers toward eliminating disease and improving the health of individuals.
- Understand the importance of methodological discoveries in diagnosis, assessment, prevention, and intervention.
- Describe the history and growth of occupational therapy and the allied health professions.
- Outline occupational therapy's role in the school system.
- Identify trends in rehabilitation research.

Rice, M. S., Stein, F., & Tomlin, G.
Clinical Research in Occupational Therapy, Sixth Edition (pp. 1-36).

1.1 Definition and Purposes of Clinical Research in Occupational Therapy Within the Model of Evidence-Based Practice

What is research in general and how can it best be defined? What is the relationship between clinical research and evidence-based practice? How are the results of clinical research transferred to clinical practice using the model of evidence-based practice in occupational therapy?

Research is a systematic and objective investigation utilizing the scientific method of identifying a significant problem, stating a testable hypothesis or guiding question, and objectively collecting primary data. Clinical research in occupational therapy is the systematic and objective study of treatment methods or interventions to improve health, prevent illness, and develop or restore function in individuals with disabilities. Evidence-based practice, as initially defined by Sackett, Rosenberg, Gray, Haynes, and Richardson in 1996, is "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of the individual patient. It means integrating individual clinical expertise with the best available external clinical evidence from systematic research" (p. 71). In applying the concept of evidence-based practice to occupational therapy, clinical reasoning is the most important skill necessary in transferring research results to clinical practice. The occupational therapist has to weigh the validity of the research study and its relevance to practice.

Clinical research in occupational therapy has many purposes, some of which are listed in the following examples:

- *Measure effectiveness of treatment methods or interventions.* For example, a clinical researcher seeks to determine the effectiveness of sensory integration therapy in individuals diagnosed with autism (Watling & Hauer, 2015). The results of this study have direct implications for clinical practice. The results can be used to justify the application of sensory integration programs with individuals diagnosed with autism or to recommend further research.
- *Communicate to the public, third-party payers, and government agencies the effectiveness of occupational therapy interventions in improving the health of or restoring function in individuals with disabilities.* For example, the researcher decides to publish the results of a systematic review demonstrating that exercise is effective in improving cognition for people who have had a stroke (Vanderbeken & Kerckhofs, 2016). The results of this systematic review can be used to persuade third-party payers that this approach is effective and should be funded.
- *Explore and compare different strategies for interventions.* For example, clinical researchers compare the effectiveness of constraint induced movement therapy vs. motor relearning with individuals who have had a stroke (Batool, Soomro, Amjad, & Fauz, 2015).
- *Help clinicians to plan action research in site-specific environments.* For example, occupational therapists may wish to collect data on how to decrease the number of Medicare rejections in a specific hospital. In this study, occupational therapists will be collecting descriptive data and comparing it to the data published by the Centers for Medicare and Medicaid Services (https://www.cms.gov).
- *Enable clinicians to transfer the results of clinical research to practice.* For example, a clinician using splinting in hand therapy can evaluate research studies, as was done in the article "Effectiveness of Occupational Therapy Interventions for Adults With Musculoskeletal Conditions of the Forearm, Wrist, and Hand: A Systematic Review" (Roll & Hardison, 2017). This systematic review has direct clinical implications for hand therapists and can help them to select the most effective splint.
- *Develop interventions, treatment protocols, educational strategies, assessment procedures and tools, or software products that will later be evaluated for effectiveness.* For example, an occupational therapist may be interested in developing a treatment protocol to reduce anxiety in individuals with clinical depression (Krogh, Speyer, Gluud, & Nordentoft, 2015).
- *Reconstruct historical events to understand the basis for a current treatment.* For example, an occupational therapist may want to examine the historical basis for treating individuals with spinal cord injuries in the United States in the 20th century (Lifshutz & Colohan, 2004).
- *Examine reasons for improvement or failure of a specific intervention through a retrospective case study.* For example, a client with a diagnosis of multiple sclerosis (Woo, Olek, & Frohman, 2006).
- *Explore relationships between associated variables.* A clinician might want to examine the relationship between perceptual motor skills and self-care abilities or between perceptual motor skills and writing achievement in children with autism (MacDonald, Lord, & Ulrich, 2013).

The rise and development of occupational therapy as a health care profession over 100 years ago, beginning in 1917, is the direct result of the progress in medical research and practice that came before (Box 1-1). The rehabilitation professions of occupational therapy, physical therapy, speech pathology, and audiology emerged from the scientific findings in medicine that began in the 19th and 20th centuries. In this chapter, we review the seven stages in scientific medicine that are the forerunners of scientific inquiry in the rehabilitation professions.

Box 1-1. Selected International Landmarks in the History of Occupational Therapy as a Profession

1752 Pennsylvania Hospital in Philadelphia was established. Psychiatric patients were prescribed manual labor to counteract disease process.

1780 Clement-Joseph Tissot, a French physician in the cavalry, published a book prescribing the use of crafts and recreational activities for individuals with muscle and joint injuries.

1786 Philippe Pinel, a French psychiatrist in the Bicetre Asylum for the Insane, prescribed humane treatment in the care of the mentally ill, including physical exercises, manual occupation, and music.

1803 Johanann Christian Reil, a German psychiatrist, advocated that activities such as swimming, dancing, gymnastics, arts and crafts, music, and theater be part of the everyday routine for patients.

1812 Benjamin Rush, the father of American psychiatry, prescribed work, leisure activities, chess, and other board games, exercise, and theater for treatment of mental illness.

1813 Samuel Tuke, an English Quaker, founded the Retreat Asylum for the Insane in York, England. Tuke introduced the term *moral treatment,* which was the application of humane practices—including exercise, recreation, arts and crafts, gardening, and regular employment—in the maintenance of the hospital.

1833 Samuel Woodard, a physician at the Worcester State Lunatic Hospital in Massachusetts, introduced the term *occupational therapy* as a therapeutic method to keep inmates active in varied tasks and leisure activities in regular routines. The therapeutic program was clinically effective and produced a significant recovery rate.

1838 Jean Etienne Esquirol, a French psychiatrist, described the importance of corporal exercise, horseback riding, tennis, fencing, swimming, and travel for the treatment of depression.

1840 Francois Leuret, a French psychiatrist, advised that moral treatment, including arts and crafts and work, are effective in treating individuals with mental illness and intellectual disabilities.

1843 Dorothea Dix, a social reformer, worked diligently in the United States for humanistic care for individuals with mental illness, which included the use of therapeutic activities.

1854 Thomas Kirkbride, one of the founders of the American Psychiatric Association advocated a highly structured regimen for patients that included exercise, lectures, music, arts and crafts, and entertainment.

1895 William Rush Dunton, a psychiatrist and innovator in applying occupational therapy, used arts and crafts activities at Sheppard and Pratt Asylum in Baltimore, Maryland.

1895/1922 Adolf Meyer, a strong advocate of occupation, believed in a holistic approach to treatment centering on sleep habits, nutrition, work, play, and socialization.

1895 Mary Potter Meyer, a social worker and wife of Adolf Meyer, used arts and crafts activities in the State Hospital in Worcester, Massachusetts.

1904 Herbert Hall, a physician, prescribed occupation as a medicine to regulate the life and direct interests of the patient. He called this the *work cure*.

1905 Susan Tracy, a nurse, applied occupational therapy activities in working with individuals with mental illness while she was director of the Training School for Nurses at the Adams Nervine Asylum in Boston, Massachusetts.

1906 Herbert Hall was awarded a grant of $1000 by Harvard University to study the application of activities and graded manual occupation in the treatment of psychiatric disorders.

1908 Training courses in occupations for hospital attendants were initiated at Chicago School of Civics and Philanthropy.

1909 Clifford Beers, founder of the National Committee for Mental Hygiene, described his emotional illness in the book, *A Mind that Found Itself* (Beers, 1908). Beers reinforced the application of therapeutic activities in treating individuals with mental illness.

1910 Susan Tracy authored the first book on occupation studies, *Studies in Invalid Occupations: A Manual for Nurses and Attendants* (Tracy, 1910).

(continued)

Box 1-1. Selected International Landmarks in the History of Occupational Therapy as a Profession (continued)

1911 Susan Tracy initiated the first course on occupation in a general hospital at Massachusetts General Hospital in Boston.

1911 Eleanor Clark Slagle, a social worker, established an occupation department at Phipps Psychiatric Clinic at Johns Hopkins University in Baltimore.

1914 George Edward Barton, an architect who had contracted tuberculosis, reintroduced the term *occupational therapy* at a meeting in Boston of hospital workers.

1917 The National Society for the Promotion of Occupational Therapy was founded in Consolation House in Clifton Springs, New York. The charter members included George Barton, an architect; Eleanor Clark Slagle, a social worker at Hull House in Chicago, Illinois; Thomas Kidner, a vocational specialist from Canada; William Rush Dunton, a psychiatrist at Sheppard and Pratt Hospital in Baltimore, Maryland; Susan Cox Johnson, an arts and crafts instructor from New York City; Isabel Gladwin (Newton) Barton, first Secretary of the Society ; and Susan E. Tracy, a nurse at the Adams Nervine Asylum in Boston, Massachusetts. This meeting led to the occupational therapy profession in the United States.

1917 Reconstruction aides were recruited to serve in U.S. army hospitals during World War I, applying arts and crafts and exercises in the treatment of physical and mental disorders.

1918 Formal educational training programs in occupational therapy were established at the Henry B. Favil School in Chicago, Teachers College of Columbia University, and the Boston School of Occupational Therapy.

1919 Bird T. Baldwin authored the *U.S. Army Manual on Occupational Therapy* (Baldwin, 1919), which included information on evaluation and treatment procedures for the restoration of physical function.

1919 George Barton (1919) wrote the book *Teaching the Sick, A Manual of Occupational Therapy as Reeducation*.

1922 The *Archives of Occupational Therapy* was published and became the official journal of the American Association of Occupational Therapy.

1925 *Occupational Therapy and Rehabilitation* was first published.

1928 Six programs were available to prepare occupational therapists: Boston School, Philadelphia School, St. Louis School, Milwaukee-Downer College, University of Minnesota, and the University of Toronto

1931 National registry for the American Occupational Therapy Association was established.

1933 The American Medical Association (AMA) began the accreditation of occupational therapy educational programs

1934 Essentials of an acceptable education curriculum in occupational therapy was adopted by the American Medical Education Council on Medical Education and Hospitals.

1939 Among all AMA-approved hospitals, 13% employed occupational therapists.

1943 The Barden-LaFollette Vocational Rehabilitation Act was passed by Congress providing coverage of medical services, including occupational therapy, for individuals in vocational rehabilitation programs.

1945 Eighteen approved occupational therapy programs were available in the United States, compared with five in 1940.

1947 First national registration examination for U.S. occupational therapists was given.

1947 Advanced master's degree in occupational therapy was offered at the University of Southern California and New York University.

1947 Helen Willard and Clare S. Spackman, occupational therapy educators, authored the first textbook in occupational therapy.

1952 The World Federation of Occupational Therapy (WFOT) was established. The 10 founding member countries were Australia, Canada, Denmark, Great Britain, India, Israel, New Zealand, South Africa, Sweden, and the United States.

1958 Essentials and Guidelines for an approved Educational Program for Occupational Therapy Assistant in the U.S. adopted.

(continued)

Box 1-1. Selected International Landmarks in the History of Occupational Therapy as a Profession (continued)

1964 Certified occupational therapy assistant (COTA) certifications were available in the United States.

1964 The first entry-level master's program in occupational therapy was established at the University of Southern California. Shortly thereafter, basic master's programs were begun at Boston University and Virginia Commonwealth University.

1965 The American Occupational Therapy Foundation (AOTF) established as a philanthropic organization for advancing the science of occupational therapy.

1965 Lyndon B. Johnson signed Medicare into law on July 30, 1965.

1973 The Rehabilitation Act passed by Congress protecting the rights of persons with disabilities. Section 504 of the Rehabilitation Act of 1973 prohibits discrimination based on disability in programs or activities receiving federal financial assistance. (See http://www.access.gpo.gov/nara/cfr/waisidx_99/34cfr104_99.html and http://www2.ed.gov/policy/speced/reg/narrative.html)

1974 New York University developed the first doctoral program in occupational therapy.

1975 Education for All Handicapped Children Act (EHA; PL. 94–142) facilitated free appropriate public education services for students with disabilities at all levels and provided funding for these services. The concept of least restrictive environment, inherent in the law, specifies that students with disabilities are educated with typical students "to the maximum extent possible."

1976 Support was given to students for development of their organization on a national level, which was later named the American Student Occupational Therapy Alliance.

1979 "Uniform Terminology System for Reporting Occupational Therapy Services" developed and adopted by the Representative Assembly (RA).

1980 AOTF published the *Occupational Therapy Journal of Research*.

1981 Entry-level role delineation for OTRs and COTAs adopted by RA.

1986 Medicare amendments expanded coverage for occupational therapy services under Part B in the United States.

1990 The Americans with Disabilities Act (ADA; PL 101–336; [42 USC 12101]) was passed by Congress and signed by President George H. W. Bush. The ADA guarantees equal opportunity for individuals with disabilities in employment, public accommodations, transportation, governmental services and telecommunications (Family Center on Technology and Disability, 2010). (See also http://www.usdoj.gov/crt/ada/cguide.htm#anchor62335 and http://www.ada.gov)

1990 PL 94–142 reauthorized and renamed the Individuals with Disabilities Education Act (IDEA). This law continued federal funding from 94–142, and increased services by adding related services, transition from school to work, and parental involvement. Under this act, occupational therapy is considered a related service in helping students with disabilities in public schools.

1991 The AOTA RA approved a physical agent modalities (PAMs) position paper that recommended the use of PAMs as an adjunct to purposeful activity to enhance occupational performance.

1994 *Occupational Therapy Internationa*l is founded as the first refereed journal publishing manuscripts by occupational therapists throughout the world

1997 The Balanced Budget Act (BBA; PL 105–33) significantly changed the procedures for payment of services for rehabilitation personnel affecting the quality of care, especially in home health.

1998 The Assistive Technology Act (PL105–394 [29 USC 2201]) passed. This legislation provides funds to the States to support the establishment of assistive technology (AT) demonstration centers, information centers, facilities, referral services, and advocacy services to help people with disabilities access AT services. The act also provides low interest loans to purchase AT (FCTD, 2010). (See also http://www.ataporg.org/atap/index.php and http://www.assistivetech.net/webresources/stateTechActProjects.php for information regarding State projects)

(continued)

Box 1-1. Selected International Landmarks in the History of Occupational Therapy as a Profession (continued)

1998 Carl D. Perkins Vocational and Technical Education Act Amendments of 1998 (PL105–332 Section 1 (b) [20 USC 2302]). This act requires schools to integrate academic, vocational, and technical training; increase technology use; provide professional development opportunities; develop, implement, and expand quality programs; and link secondary and post-secondary vocational education (FCTD, 2010). (See also http://www.ed.gov/offices/OVAE/CTE/legis.html)

1999 The AOTA RA passes a resolution to mandate that entry-level education in occupational therapy should be at the post-baccalaureate level.

2001 The *International Classification of Functioning, Disability and Health*, known more commonly as ICF, is a classification of health and health-related domains. These domains are classified from body, individual, and societal perspectives by means of two lists: a list of body functions and structures, and a list of domains of activity and participation. As an individual's functioning and disability occur in a context, the ICF also includes a list of environmental factors. The ICF is the World Health Organization's (WHO) framework for measuring health and disability at both individual and population levels.

2002 No Child Left Behind (NCLB; PL 107–110; http://www2.ed.gov/policy/elsec/leg/esea02/index.html) enacted. As part of the need to improve education, the law focused on requiring each state to develop and implement a statewide accountability system that insured adequate yearly gain for all schools in reading and math. It is based on the concept that setting standards and measurable educational goals can improve academic performance in the classroom.

2002 The *Occupational Therapy Practice Framework: Domain and Process* was developed in response to current practice needs, intended to "more clearly affirm and articulate occupational therapy's unique focus on occupation and daily life activities and the application of an intervention process that facilitates engagement in occupation to support participation in life" (AOTA, 2002, p. 609).

2004 The Individuals with Disabilities Education Improvement Act of 2004 (IDEIA; PL108–556; http://idea.ed.gov/) is the reauthorization of PL 94-142 enacted in 1975. The law ensures that services to more than 6.5 million eligible infants, toddlers, children and youths with disabilities throughout the nation. With this reauthorization, IDEA-2000 was aligned with NCLB. In addition to funding, IDEIA governs how states and public agencies provide early intervention, special education and related services.

2004 The fourth edition of the Canadian Occupational Performance Measure (COPM; Law et al., 2005) is published. It is an individualized, client-centered measure designed for use by occupational therapists to detect change in a client's self-perception of occupational performance over time. It is designed to be used as an outcome measure. The COPM is designed for use with clients with a variety of disabilities and across all developmental stages. The COPM has been used in more than 35 countries and has been translated into over 20 languages.

2008 *Occupational Therapy Practice Framework: Domain and Process, Second Edition* is published (AOTA, 2008; Roley et al., 2008).

2009 New emerging areas of occupational therapy practice in the United States identified by the AOTA: psychosocial needs of children and youth, health and wellness, driver rehabilitation, low vision services, ergonomics, community health, welfare to work, and technology and assistive device development and consulting.

2009 Americans with Disabilities Act Amendment (PL 110–325; http://www.judiciary.state.nj.us/legis/110-325_Law.pdf), signed on September 25, 2008 by President George W. Bush and went into effect on January 1, 2009. Under the Amendment, millions more Americans qualify as disabled and fall under the Act's protections. Under the Amendment, the definition of disability was modified so that the individual may be regarded as having an impairment, without regard to whether it substantially limits a major life activity. The Amendment also expands the phrase "major life activities" as "caring for oneself, performing manual tasks, seeing, hearing, eating, sleeping, walking, standing, lifting, bending, speaking, breathing, learning, reading, concentrating, thinking, communicating, and working." Another important change requires that impairments that are episodic or in remission qualify as a disability if they would qualify in their active stage.

2010 World Federation of Occupational Therapists (WFOT) meets in Santiago, Chile for its 15th Congress. There are 70 member countries of the WFOT.

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Box 1-1. Selected International Landmarks in the History of Occupational Therapy as a Profession (continued)

2010 On March 23, President Barack Obama signed the Affordable Health Care for America Act (PL 111–148; http://democrats.senate.gov/reform/patient-protection-affordable-care-act-as-passed.pdf). The general principle is to ensure that all Americans have access to quality, affordable health care. It is projected that the Act will provide health care coverage to 95% of Americans. (See http://www.aota.org/Practitioners/Advocacy/Federal/Highlights/Reform.aspx for the impact of the Act on occupational therapy)

2014 The third edition of the *Occupational Therapy Practice Framework: Domain and Process* is published by the AOTA (2014).

2014 WFOT meets in Yokohama, Japan for its 16th Congress.

2014 The fifth edition of the Canadian Occupational Performance Measure is published (Law et al., 2014). The COPM is now used in over 40 countries and has been translated into more than 35 languages.

2017 AOTA celebrates its 100th Anniversary in Philadelphia, Pennsylvania during the Annual Conference.

2018 WFOT meets in Cape Town, South Africa. There are now over 92 member organizations and approximately 400,000 occupational therapists internationally.

1.2 Historical Review of Research in Medicine, Rehabilitation, and Habilitation

Before the beginnings of modern science in the latter half of the 19th century, relationships between causes and effects still retained explanations that bordered on the supernatural. Vitalism, a recurrent movement in medicine, was typified by the 18th-century physician who ascribed mysterious substances in the blood to life functions. This theory was an outcome of the prescientific thinking that gave way to the systematic and orderly explanations that we now associate with modern scientific research. The understanding of the disease process began with the laboratory experimentation of Pasteur (1822–1895), who served as a model for the medical scientist. The impact of scientific technology in the treatment and rehabilitation of the sick and the disabled has been a remarkable record in human progress. In few other areas of knowledge has humanity made greater strides.

The analysis of the progress in medical science and rehabilitation is divided into the seven stages identified in Table 1-1. These seven stages are progressive, interactive, and dynamic. For example, basic research in biological and chemical processes in Stage I continues to be important as evidenced by the investigations of DNA and RNA as the building blocks in protoplasm. Similarly, methodological research is in the forefront by the integration of high technology with clinical practice, as demonstrated in the areas of robotics, prosthetics, transplant operations, kidney dialysis techniques, and artificial replacement of bodily organs. Medical scientists are constantly refining treatment and preventive methodologies. Immunologists who formerly sought chemicals to destroy harmful bacteria and viruses have led the way for present-day investigators searching for vaccines to prevent cancerous growths and life-threatening diseases, such as AIDS.

Progress in science is cyclical and cumulative. As knowledge grows, medical scientists refine their methods of research. Stages of development in medicine point to the cumulative process of obtaining knowledge and to the evolutionary process of scientific methodology and its impact on clinical practice.

1.3 Biological Description: Stage I

1.3.1 The Growth of Scientific Anatomy and Physiology

The earliest medical research started with the discovery of the physiological processes and anatomical systems of the body. Biological description: Stage I, the evolution of medical research, is outlined in Table 1-2. Knowledge of the anatomical structure of animals during the Middle Ages and the Renaissance was greatly influenced by Galen (AD 138–201), who experimented on lower mammals; Leonardo Da Vinci (1452–1519), who made precise drawings of human anatomy; and later by Vesalius (1514–1564), who, through careful dissection, described human anatomy. Identifying and describing the anatomical structures of the body led to increased knowledge about relationships between systems and the interrelationships of cardiovascular, respiratory, and genitourinary functions. For example, Harvey's (1578–1657) concept of the circulation of blood led the way

Table 1-1

Seven Stages in the History of Medicine, Health, and Rehabilitation

STAGE I		**STAGE II**
Biological Description		*Methodological*
Accurate description of anatomical structure and physiological processes, producing a basic understanding of the bodily organs and systems.		Development of instruments, procedures, and tests to produce valid and reliable methods in evaluation, diagnosis, and treatment.
STAGE III	**STAGE IV**	**STAGE V**
Etiology	*Prevention*	*Treatment*
Understanding of the disease process and cause-effect relationships to produce a science of medicine and universal agreement in diagnosing diseases.	Development of medical technology to prevent initial onset of disease, resulting in the science of immunology and public health.	Application of treatment techniques based on a theoretical understanding of disease processes, leading to the growth of chemical intervention, antiseptic surgery, and nursing care in hospitals.
STAGE VI		**STAGE VII**
Rehabilitation		*Habilitation and Special Education/ Programming Interventions*
Development of therapeutic techniques and restoration of maximum function for individuals with chronic disabilities, leading to the evolution of allied health professions.		The identification of treatments for the developmental and social disabilities applying specialized educational and psychological techniques to populations at risk.

Table 1-2

The Emergence of the Medical Scientist—Stage I

MEDICAL EVENTS	DISCOVERY DATES	SCIENTISTS	IMPLICATIONS
Hippocratic writings	400–500 BC	Hippocrates (500 BC)	Provided a model for medical practitioners based on ethical and humane treatment
Systematic study of bodily processes	AD 169–180	Claudius Galen (AD 129–199)	Influenced medical practice for 1300 years, presenting an eclectic synthesis of prior knowledge
The Canon of Medicine	translated 1187	Avicenna (980–1037)	Significant figure of Arabic medicine whose work was dogma during the Middle Ages
Paragranum: The four pillars of medicine: philosophy, astronomy, chemistry, and virtue	1530	Paracelsus (1493–1541)	Created the foundation for general medical practice based on a knowledge of pharmaceutical chemistry

(continued)

Table 1-2 (continued)

The Emergence of the Medical Scientist—Stage I

MEDICAL EVENTS	DISCOVERY DATES	SCIENTISTS	IMPLICATIONS
Atlas of Anatomy (*De humani corporis fabrica*)	1543	Andreas Vesalius (1514–1564)	Made descriptive anatomy the basis of medicine and replaced aspects of Galen's work
Manual of Surgery	1543	Ambroise Pare (1510–1590)	Generated surgical innovations based on accurate anatomical knowledge
Discovery of the circulation of the blood, *Exercitatio*	1628	William Harvey (1578–1657)	Integrated anatomy with physiological knowledge of blood circulation
Digestive system, *Experiments and Observations of Gastric Juice and the Physiology of Digestion*	1833	William Beaumont (1785–1853)	Used objective observation in discovering the process of digestion

to an understanding of the physiological mechanisms in the body. Galen, Da Vinci, and Harvey were among the first scholars to accurately describe the human body; however, the ancient Greeks initially brought rational thought to an evaluation of health and disease. The Hippocratic writings reflect the depth of Greek thought.

1.3.2 The Hippocratic Writings

The first stage in the history of medicine was essentially clinical observation. The healer, applying Hippocratic methods, used himself as a measuring instrument, carefully noting what he saw, felt, smelled, and heard. He used rational thought regarding the causes and treatments of diseases based on these observations. In the ancient Greek civilization, scholars were allowed the freedom to speculate on all aspects of human life. Thus, the model for the Western physician emerged. Hippocrates, who is traditionally called the *Father of Medicine*, was probably representative of several individuals. It is more accurate to speak of the "Hippocratic writings" than to attribute all ancient Greek medicine to one individual. The Hippocratic writings cover many areas of medicine, including ethics, disease etiology, anatomy, physiology, and treatment. These writings are not a consistent work linking theory to practice, but a compendium of clinical histories and a description of Hellenistic medicine.

We know little about Hippocrates' life, except that he lived during the 5th century BCE in Cos, an island off the Greek mainland, and that he was a famous practitioner and teacher of medicine. The following excerpt from the Hippocratic writings, *On the Articulations* (ca. 400 BC/1952) translated by Francis Adams, demonstrates the method of clinical observation used to diagnose a dislocation of the shoulder joint and the importance of individual differences in human anatomy:

> A dislocation may be recognized by the following symptoms: Since the parts of a man's body are proportionate to one another, as the arms and the legs, the sound should always be compared with the unsound, the unsound with the sound, not paying regard to the joints of other individuals (for one person's joints are more prominent than another's), but looking to those of the patient, to ascertain whether the sound joint be unlike the unsound. This is a proper rule, and yet it may lead to much error; and on this account it is not sufficient to know this art in theory, but also by actual practice; for many persons from pain, or from any other cause, when their joints are not dislocated, cannot put the parts into the same positions as the sound body can be put into; one ought therefore to know and be acquainted beforehand with such an attitude. But in a dislocated joint the head of the humerus appears lying much more in the armpit than it is in the sound joint; and also, above, at the top of the shoulder, the part appears hollow, and the acromion is prominent, owing to the bone of the joint having sunk into the part below; there is a source of error in this case also, as will be described and also, the elbow of the dislocated arm is farther removed from the ribs than that of the other; but by using force it may be approximated, though with considerable pain; and also they cannot with the elbow extended raise the arm to the ear, as they can the sound arm, nor move it about as formerly in this direction and that. These, then, are the symptoms of dislocation at the shoulder. (as cited in Hutchins, 1952, pp. 94-95)

With their emphasis on dietetics, exercise, and natural methods, the Hippocratic writings were the complete holistic guide for the ancient physician.