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This is an extraordinary book. The authors have curated an extensive selection of research, providing the first state-of-the-art review of yoga therapy as an edited, scholarly, medically oriented textbook with a strong evidence-based focus on research and practice. There is strong representation internationally from both leading yoga researchers and yoga therapists.

There are introductory and concluding sections, examining the background of the subject and providing a perspective on the future. In the body of the book, 60 research scientists have contributed 17 chapters describing the scientific rationale and research evidence for yoga therapy in a variety of conditions. Each chapter includes two senior research investigators in the field in order to ensure a balanced representation and also stronger authority. In addition, 30 experienced yoga therapists have appended to the chapters their perspectives on how to translate this research evidence into practical, clinical applications.

We tend to think of all advances in medicine as being high-tech and expensive, such as a new drug, laser, or surgical procedures. We often have a hard time believing that something as simple as comprehensive lifestyle changes can make such a powerful difference in our lives—but they often do. In our own research, at the Preventive Medicine Research Institute in the United States, we have used some high-tech, expensive, state-of-the-art scientific measures to prove the power of some simple, low-tech, and low-cost interventions. These include:

- yoga (gentle stretching, breathing techniques, meditation, and imagery);
- a whole foods, plant-based diet (naturally low in fat, sweeteners, and refined carbohydrates);
- moderate exercise; and
- social support and community (love and intimacy).

In short—eat well, move more, stress less, and love more.

This lifestyle program is based on what I learned from Sri Swami Satchidananda, an ecumenical spiritual teacher with whom I had the privilege of studying, beginning in 1972. He taught me the importance of addressing the underlying causes of many chronic diseases: “For most people, our natural state is to be easeful and peaceful. We are born with ease until we disturb it by making unhealthy lifestyle choices and become dis-eased. We are born fine until we allow ourselves to become de-fined.” In other words, yoga and meditation do not bring us health and well-being. Rather, they help us to identify and change behaviors, diet, and perceptions that disturb our inner peace, joy, and well-being, thereby allowing our bodies’ exquisite healing mechanisms to work optimally.

For almost four decades, I have directed clinical research with my colleagues at the non-profit Preventive Medicine Research Institute and the University of California, San Francisco, proving the many benefits of these comprehensive lifestyle changes. These randomized controlled trials and other studies have been published in the leading peer-reviewed medical and scientific journals.

In addition to preventing many chronic diseases, comprehensive lifestyle changes can often reverse the progression of these illnesses. Our bodies often have a remarkable capacity to begin healing, and more quickly than we had once realized, when we address the underlying lifestyle causes of health and illness.

We proved in randomized controlled trials, for the first time, that lifestyle changes alone can reverse the progression of even severe coronary heart disease. There was even more reversal after 5 years than after 1 year and 2.5 times fewer cardiac events. We also found that these lifestyle changes can reverse type
2 diabetes and may slow, stop, or even reverse the progression of early-stage prostate cancer. And what is true for early-stage prostate cancer is likely true for early-stage breast cancer as well.

Changing lifestyle actually changes your genes—turning on genes that keep you healthy, and turning off genes that promote heart disease, prostate cancer, breast cancer, and diabetes—over 500 genes in only 3 months. People often say, “Oh, it’s all in my genes, there’s not much I can do about it.” But there is. Knowing that changing lifestyle changes our genes is often very motivating—not to blame, but to empower. Our genes are a predisposition, but our genes are usually not our fate.

Our latest research found that these comprehensive lifestyle changes may even lengthen telomeres, the ends of your chromosomes that control aging. As your telomeres get longer, your life gets longer. This was the first controlled study showing that any intervention may begin to reverse aging on a cellular level by lengthening telomeres. And the more people adhered to these lifestyle recommendations, the longer their telomeres became.

While reversing chronic diseases requires intensive changes in lifestyle, it is not all or nothing for preventing disease and staying healthy. In all of our studies, we found that the more people changed their diet and lifestyle, the more they improved and the better they felt—at any age. If you indulge yourself one day, eat healthier the next.

These lifestyle changes are part of the most influential trend in medicine today—what is known as “Lifestyle Medicine,” which is lifestyle as treatment as well as prevention. Lifestyle medicine is cost effective as well as medically effective. Our research has shown that when comprehensive lifestyle changes are offered as treatment (not just as prevention), significant cost savings and clinical improvements occur in the first year because the biological mechanisms that control our health and well-being are so dynamic. For example, Highmark Blue Cross Blue Shield found that overall health care costs were reduced by 50% in the first year when people with heart disease or risk factors went through our lifestyle program. In another study, Mutual of Omaha found that they saved $30,000 per patient in the first year in those who made these lifestyle changes.

Because of these findings, we are grateful that Medicare began covering our program of lifestyle medicine in 2011, and most commercial insurance companies have followed their lead. If it’s reimbursable, it’s sustainable.

We are creating a new paradigm of health care that empowers people by addressing the fundamental lifestyle causes of many chronic diseases. Many others are now doing so as well. Who would have thought 40 years ago that Medicare and insurance companies would reimburse yoga and meditation as therapy? We have come a long way.

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Yoga and Western science

Undisturbed calmness of mind is attained by cultivating friendliness toward the happy, compassion for the unhappy, delight in the virtuous, and indifference toward the wicked.


Sage Patanjali’s Yoga Sutras were the most important sutras in the timeless ancient Indian wisdom—sanathana dharma—of the Sankhya school of philosophy. The human mind, according to the Sankhya school, has five levels, whereas in English the mind is described in a single word. The mind of an innocent child, filled with universal love, is called manas. Manas knows no negative traits. Once the child is fed with information in school, the level of mind is called buddhi. As the child grows up and acquires more information, the ego gets into the mind. That level of buddhi with ego added is called chitta. With the arrival of ego, the mind becomes filled with negative traits such as anger, pride, hatred, jealousy, and greed. This is where the mind gets into real problems in the world. Sage Patanjali created the Yoga Sutras to help this agitated mind to become tranquil again and allow it to become filled with universal compassion. The other two levels of the mind are purusha and ishvara, but these are not relevant to the discussion in this book. “Chitta vritti nirodahah” was Patanjali’s advice—overcoming the negative thoughts at the chitta level was his main concern here.

With the advent of Western science, the mind became defined in a reductionist way, as a materialistic brain-related activity. Today, however, some of the thinkers in the West are slowly returning to the old holistic nonmaterial view of the mind (consciousness) (Wiebers, 2015). Our universe is a living process and not a collection of separate entities. “Consciousness is not contained in the brain matter but consciousness contains all matter and the world,” writes Wiebers (p. 70). This is entirely in accordance with the Sankhya school’s definition of mind. If the human mind is not in the brain, all our healing methods of mental disorders targeting the brain with powerful chemicals do not make sense. Yoga, thus defined, becomes the panacea for most ills of the body and mind. The core identity of man is his consciousness.

The asanas and behavioral rules of yoga (such as the yamas and niyamas) are but the tools for constant ease in the practice of pranayama and meditation, the integral parts of the yogic science. Science is defined by me as “organized curiosity with logical skepticism”. In that sense the study of yoga becomes a science. In addition, scientific methods of enquiry can now be applied to yoga to see if it helps change the outcomes at the end of the day. The multiple asanas designed by yoga masters reveal the deep knowledge of human anatomy these great sages had. In every single asana the gravity and anti-gravity muscles are so well balanced that one wonders at their access to divine knowledge! They must have also known that stretching would release soothing opioids to the circulation, thus aiding in pain relief. To reiterate, the main thrust of yoga is to bring tranquility of mind, without pharmaceuticals, through masterly breathing techniques collectively called pranayama. Slow deep breathing and mindfulness of one’s deep breathing may help almost all the systems of the human body and make the human mind tranquil. Breathing, being the most dominant rhythm in the human system, mode-locks all other systems under its control.

My personal research work has taught me one other lesson. The conventional Western cross-sectional reductionist research to show improvement in surrogate end points such as blood pressure, heart rate variability, and so on will limit what we can truly learn from this ancient discipline. The highly regarded but inherently limiting research design of the randomized controlled trial (RCT) will only reveal a portion of the changes that can be achieved through a deep yoga practice and leading a yogic lifestyle. What we need for the future is a more comprehensive healing outcomes research approach, which can be discussed.
FOREWORDS

separately. It is altogether a major subject in its own right and needs its own discussion. This is the final holistic outcomes research in place of surrogate end points such as blood pressure, blood sugar, etc.

The efforts of this group of researchers to put together a textbook of the yogic sciences is a timely contribution to bring yogic sciences to mainstream healing efforts. The many leading international yoga researchers who have contributed to this volume have presented the scientific rationale for yoga therapy and the existing published biomedical research evidence in a rigorous and comprehensive manner that will be appreciated by both conventional and integrative medicine researchers and clinicians, and the contribution of leading yoga therapists on practical clinical applications is invaluable. Given that this is the first textbook of its kind, it fills an important need, and will therefore serve a significant role for health care and healing in modern society. I wish this book all success.

“Exercises are like prose, whereas yoga is the poetry of movements.”

Amit Ray, Yoga and Vipassana (2010)

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Historically, yoga was a contemplative practice aimed at the transformation of the self through the systematic adoption of specific behavioral and spiritual practices. Although there is little evidence that yoga was originally viewed as a system for the prevention or treatment of disease, its capability of improving psychophysiological functioning was recognized by the fourteenth century, if not before, and it began to be formally utilized as a therapeutic intervention in the early twentieth century. Yoga therapy has since become popular internationally, and the pace of this growth appears to be exponential. This proliferation has been accompanied by an associated increase in both the publication of books on yoga therapy and biomedical research on yoga as a therapeutic intervention for a number of medical conditions. The research evidence base has grown to such an extent that a medically oriented textbook is now possible and warranted. The intention of this text is to serve as a comprehensive resource for physicians and other healthcare professionals, as well as yoga therapists, instructors, researchers, and practitioners. We are grateful to our yoga research colleagues who have so willingly agreed to contribute chapters reviewing the scientific rationale and the research evidence for yoga therapy for a wide variety of medical conditions. We are also grateful to the many yoga therapists who have contributed practical clinical perspectives. We hope that this text will introduce, elucidate, and promote what we believe is the remarkable potential of yoga practices to serve as a practical behavioral self-care strategy for both disease prevention and therapy, as well as the promotion of overall well-being.

Sat Bir Singh Khalsa, Lorenzo Cohen, Timothy McCall, and Shirley Telles, 2016
Sat Bir Singh Khalsa, PhD, has conducted research in neuroscience, biological rhythms, and sleep since 1978. Since 2001, he has been fully engaged in research on the efficacy of yoga and meditation practices in improving physical and psychological health. He has been personally involved in the practice of a yoga lifestyle since 1971 and is a certified instructor of Kundalini Yoga as taught by Yogi Bhajan. He is currently the Director of Research for the Kundalini Research Institute, Research Director for the Kripalu Center for Yoga & Health, Research Associate at the Benson-Henry Institute for Mind Body Medicine, Board Member of the Guru Ram Das Center for Medicine and Humanology, Scientific Advisor for the Alzheimer’s Research and Prevention Foundation, and an Assistant Professor of Medicine at Harvard Medical School in the Department of Medicine at Brigham and Women’s Hospital in Boston, USA.

Dr Khalsa has conducted federally funded clinical research trials evaluating yoga for insomnia, post-traumatic stress disorder, chronic stress, and generalized anxiety disorder. His current primary interest is the evaluation of the efficacy of yoga within the academic curriculum of public schools to determine the benefits to students in mental health characteristics, including perceived stress, resilience, emotion regulation, and anxiety; and this work is funded federally by the Kripalu Institute for Extraordinary Living. He views yoga as a practice deserving of widespread implementation within society, including into the educational and medical systems.

Dr Khalsa has relationships and collaborations with fellow yoga researchers internationally, working closely with the International Association of Yoga Therapists to promote research on yoga therapy, and serving as the scientific coordinator for the annual Symposium on Yoga Research and as editor-in-chief of the International Journal of Yoga Therapy. He is author of the Harvard Medical School ebook entitled *Your Brain on Yoga* and since 2005 he has been teaching an elective course at Harvard Medical School in mind-body medicine.

Dr Lorenzo Cohen is the Richard E. Haynes Distinguished Professor in Clinical Cancer Prevention, Director of the Integrative Medicine Program, and Chief, Section of Integrative Medicine, Department of Palliative, Rehabilitation, and Integrative Medicine at the University of Texas MD Anderson Cancer Center. He is also Distinguished Clinical Professor, Fudan University Cancer Hospital, Shanghai, China. Dr Cohen is a founding member and past president of the international Society for Integrative Oncology and is passionate about educating others on how to prevent cancer and maintain optimal health throughout life. As the majority of cancers are preventable, Dr Cohen is conducting research to demonstrate that lifestyle factors including healthy diet, physical activity, stress management, and social support – in other words, leading a yogic lifestyle – can influence cancer outcomes. Dr Cohen leads a team conducting NIH-funded research and delivering clinical care of integrative medicine practices such as meditation, Tibetan Yoga, Patanjali-based yoga, tai chi/qigong, massage, diet, exercise, acupuncture, and other strategies, such as stress management, music therapy, emotional writing, and more aimed at reducing the negative aspects of cancer treatment and improving quality of life and clinical outcomes. He is interested in examining different types of complementary programs that can be easily incorporated into conventional cancer treatments to decrease the psychophysiological consequences associated with treatment and to improve outcomes. Dr Cohen has conducted some of the first randomized clinical trials of yoga in cancer patients and continues this important research today, examining the psychological, behavioral, physiological,
and biological benefits of yoga. He was the recipient of the 2007 International Scientific and Technological Cooperation Award of Shanghai Municipality, the 2008 Magnolia Silver Memorial Award, and the 2011 Magnolia Gold Memorial Award for his contributions in furthering research into the use of traditional Chinese medicine.

**Timothy McCall**, MD, is a board-certified internist and the author of two books, *Examining Your Doctor: A Patient's Guide to Avoiding Harmful Medical Care* (Citadel Press) and *Yoga as Medicine: The Yogic Prescription for Health and Healing* (Bantam Books). He practiced medicine for more than 10 years in the Boston area before devoting himself full-time to investigating and teaching yoga therapy. He is the Founder/Director of Yoga as Medicine Seminars and Teacher Trainings and the Co-Director of the Simply Yoga Institute for Yoga Therapy and Holistic Health, in Summit, New Jersey, near Manhattan.

Timothy has traveled extensively, studying with many of the world’s leading yoga teachers and yoga therapists including BKS Iyengar and TKV Desikachar. His main teachers have been Patricia Walden, Rod Stryker, and Donald Moyer. He has practiced yoga and meditation from various traditions for over 20 years and Tantra for more than a decade. Since 2005, he has studied with a traditional ayurvedic doctor, Chandukutty Vaidyar, and has spent more than a year at his clinic in Kerala, India.

McCall’s articles have appeared in dozens of publications, including the *New England Journal of Medicine*, *JAMA*, the *Los Angeles Times*, *The Nation*, *Redbook* (where he was a contributing editor), the *Philadelphia Inquirer*, and the *Boston Globe*. His column appeared monthly in the newsletter *Bottom Line Health* between 1995 and 2003, and from 1996 to 2001 his medical commentaries were featured on the public radio program *Marketplace*. In 2004–5 he was a scholar-in-residence at the Kripalu Center for Yoga & Health in Stockbridge, Massachusetts, and since 2002 he has been the medical editor of *Yoga Journal*. He has given presentations at medical schools, the NIH, and numerous workshops, and keynote addresses at conferences sponsored by *Yoga Journal*, the International Association of Yoga Therapists, and the Smithsonian Institute. He teaches yoga therapy seminars and teacher trainings in Summit, New Jersey, and worldwide.

**Shirley Telles** has a degree in conventional medicine (MBBS) after which she completed an MPhil and PhD in Neurophysiology at the National Institute of Mental Health and Neurosciences in Bengaluru, India. Dr Telles’ MPhil and PhD theses were related to research on the effects of yoga practice and their applications in health and rehabilitation, and she has continued her research in this area since then. After her doctorate she joined the Swami Vivekananda Research Foundation in Bengaluru and had the unique postdoctoral experience of setting up the laboratories there before starting research. Dr Telles received a Fulbright fellowship in 1998 to assess fMRI in meditators, which was conducted at the Department of Radiology, University of Florida, Gainesville, USA. She has been awarded the first ever Indian Council of Medical Research Center for Advanced Research in Bengaluru to assess the effects of meditation through autonomic and respiratory variables, evoked and event related potentials, polysomnography and fMRI. This was followed by a grant from the Department of Science and Technology to study attention in meditators using high density EEG and event related potentials during fMRI. Since 2007, Dr Telles has been the Director of the Patanjali Research Foundation in Haridwar, India, which is committed to researching the effects of yoga and ayurveda. She has 152 yoga-related publications cited in major research databases, and is first and main author on most of these. Dr Telles has been invited to talk on yoga and its applications in health and treatment across India and internationally, including Australia, Brazil, Canada, China, Germany, Hong Kong, Norway, Portugal, Serbia, the UK, and the USA. Dr Telles finds that the response to yoga worldwide is interesting and enriching; she is an enthusiastic practitioner of yoga, and believes that yoga research can positively impact all aspects of life.
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The need for this textbook has arisen for a number of reasons. One is the remarkable growth in popularity of yoga practice among the general public. Yoga is found on every continent, in urban and rural areas, in health clubs, yoga studios, church basements, public parks, retirement homes, military bases, high school gymnasiums, corporate boardrooms, and on the wards of major teaching hospitals. In countries where multiple surveys have been conducted over time, the percentage of the population actively practicing yoga is increasing (Ding & Stamatakis, 2014), with US figures growing from 5.1% in 2002 to 6.1% in 2007 to 9.5% in 2012 (Clarke, Black, Stussman, Barnes, & Nahin, 2015). The increase in popularity by 50% in the 5-year span from 2005 to 2012 suggests that this is not a steady linear increase, but rather an exponential one, and it is likely that sometime soon, 15% of the population will be practicing yoga. Indeed, the 2016 Yoga in America Study commissioned by Yoga Journal and Yoga Alliance estimated that the number of people practicing yoga in the US is more than 36 million, compared to 20.4 million in 2012. Furthermore, more than one-third of non-practitioners surveyed said they were “somewhat” or “very likely” to practice yoga in the next 12 months, suggesting that 80 million are likely to try yoga in 2016 (http://www.yogajournal.com/yogainamericastudy/). Arguably, yoga has become an integral part of modern society with no signs of diminishing popularity. Examples of yoga’s widespread cultural influence include the proclamation by the United Nations General Assembly in 2014 of June 21 as the annual International Yoga Day; the appearance of yoga practice rooms in major airports; and even the pervasive use of yoga images by the advertising industry.

Yoga therapy, the application of yoga for therapeutic purposes and as preventive medicine, is also on the increase, both in communities and within conventional medical systems. In recent years there has been a proliferation of yoga therapists (yoga teachers with additional training who work with individuals with a broad range of health conditions), yoga therapy training programs, and professional yoga therapy associations such as the International Association of Yoga Therapists, the Australian Association of Yoga Therapists, and the Japanese Association of Yoga Therapists. This growth is linked with and contributes to the expansion of integrative medicine practices, clinics, and centers, as evidenced by the founding and growth of the Academic Consortium for Integrative Medicine and Health.

In turn, this popularity of yoga and yoga therapy has been coincident with, and likely linked to, an increase in both biomedical research on the psychophysiology of yoga practices and clinical trials research on yoga therapy. This research has been driven in part by support of national government agencies that fund research on yoga, including the National Institutes of Health (NIH), especially the NIH’s National Center for Complementary and Integrative Health (NCCIH), in the United States, and the Ministry of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH) in India. A bibliometric analysis of yoga therapy research publications through 2003 revealed a total of 169 yoga clinical trial research publications (Khalsa, 2004); however, the number grew to 486 through 2013 (Jeter, Slutsky, Singh, & Khalsa, 2015), almost a three-fold increase in 10 years. The total number of published randomized controlled trials (RCTs) that included yoga interventions up to 2014 was 312, of which 205 were therapeutic efficacy trials and the remainder basic research trials (Cramer, Lauche, & Dobos, 2014). All three of these bibliometric analyses have demonstrated accelerating growth in the biomedical research on yoga and yoga therapy. The quantity and quality of this research has been sufficient to lead in turn to the
publication of an increasing number of systematic reviews and meta-analyses of yoga trials (Bussing, Michalsen, Khalsa, Telles, & Sherman, 2012). The most obvious example of this is the expansion in cancer-related yoga research, with over a dozen systematic reviews or meta-analyses published through 2013. It is this growth in research on yoga and yoga therapy that has allowed for the publication of this book. One underlying reason for this boom in popularity and research in yoga and yoga therapy appears to be the burgeoning incidence of chronic lifestyle diseases, which our health care systems, and society as a whole, are failing adequately to address.

**Yoga in lifestyle and stress-related diseases**

Modern medicine has made tremendous progress in controlling infectious/communicable diseases such as tuberculosis, polio, and smallpox. In fact, communicable diseases are no longer the main cause of death worldwide. It is now the noncommunicable diseases (NCDs), in which lifestyle is the major causative factor, that have reached epidemic proportions, causing the majority of deaths worldwide. Indeed, NCDs are responsible for more deaths in developing countries than all other causes of mortality combined. Countries such as India and China now lead the world in the incidence of type 2 diabetes (T2DM) and likely soon will have the highest incidence of cancer as well, largely due to the widespread adoption of elements of a Western lifestyle. The World Health Organization (WHO) estimates that 80% of the NCD deaths are due to four main disease groups: (1) cardiovascular disease (heart disease and stroke); (2) cancer; (3) diabetes; and (4) respiratory diseases. Furthermore, NCDs are rapidly increasing in prevalence (Hunter & Reddy, 2013). The good news is that the overwhelming majority of the incidence of deaths from these four disease groups appears to be preventable (McGinnis & Foege, 1993).

These four disease groups are in large measure caused by four shared behavioral risk factors: tobacco use, physical inactivity, unhealthy diets, and the harmful use of alcohol (that can be viewed as an aspect of one’s diet) (Hunter & Reddy, 2013). To that list, one can add chronic psychological stress, which has both direct and indirect effects on NCDs by changing biology and influencing behavior. And, chronic stress in the modern world is highly prevalent. The American Psychological Association’s annual *Stress in America* surveys have been conducted since 2007 (American Psychological Association, 2014). In the 2014 survey, 42% of adults reported not doing enough to manage their stress or not being sure if they are doing enough, and 20% said they are not doing anything. Those of lower socioeconomic status—and greater NCD risk factors—reported greater stress levels than those of higher income. Other groups found more likely to be affected adversely by stress included women and young adults.

It is now widely accepted that modification of behavior in these four areas: (1) no tobacco use, (2) increasing physical activity, (3) eating a healthy diet with no or moderate alcohol consumption, and (4) managing stress could prevent the majority of disease-related suffering and deaths in our world, as well as the enormous expenses, both societal and individual, they cause. Yet, our health care systems, and the world as a whole, have made little investment in the area of NCD prevention relative to the investments in treatment, and treatment strategies have fallen short in trying to control NCDs. And this is an area where yoga can be extremely helpful. Although yoga is often perceived in the West as a form of physical activity with a focus mainly on movement and stretching, there are many Western yoga schools and styles incorporating traditional yoga practices, which include breathing exercises, deep relaxation, and meditation, among several others (see Chapter 2). In addition, many serious practitioners, including most yoga therapists, go beyond basic aspects of yoga to lead what can be called a “yogic lifestyle.” This lifestyle includes abstaining from tobacco; little or no alcohol consumption; maintaining a healthy diet with a
focus on fresh, unprocessed, plant-based vegetarian or vegan foods; incorporating mindfulness into all behaviors and interactions; and leading a balanced life with a strong commitment to healthy behaviors. Clearly, broad adoption of a yogic lifestyle could help prevent many NCDs.

In addition, yoga’s ability to help manage the stress of modern life has been well documented (Sharma, 2014). Maintaining health and fitness and managing stress are the leading reasons people indicate they adopt yoga practices (Penman, Cohen, Stevens, & Jackson, 2012; Quilty, Saper, Goldstein, & Khalsa, 2013). Effectively managing stress is critically important, because uncontrolled chronic stress has been recognized as either an etiological factor in certain medical conditions (e.g., heart disease), can precipitate medical conditions in at-risk populations (e.g., obese individuals), or is a negative prognostic indicator in people struggling with chronic health conditions (e.g., cancer). Poorly controlled chronic stress increases the risk for heart disease (Torpy, Lynam, & Glass, 2007), myocardial infarctions (Li, Zhang, Loerbroks, Angerer, & Siegrist, 2015), sleeping difficulties (Cohen, Janicki-Deverts, & Miller, 2007), digestive problems (Chang, 2011), progression of disease in cancer patients (Satin, Linden, & Phillips, 2009), and depression (Hammen, 2005). Chronic stress may literally speed the aging process through telomere shortening (Epel et al., 2004). Moreover, stress can lead patients to engage in dysfunctional coping strategies such as smoking and substance abuse and to forego healthy eating and exercise habits, all of which increase the risk for NCDs.

Each disease condition chapter in this book has a section describing the psychophysiological rationale for the application of yoga for that condition. What is seen across most of these chapters is the pivotal role of yoga in countering stress and inflammatory processes—inflammation is a common etiological factor of many of the NCDs (e.g., heart disease, diabetes, many cancers, etc.). It is now well recognized that chronic stress affects almost every biological system in the body and leads to chronic inflammation (Chrousos & Gold, 1992). Stress can have a direct effect on diseases (e.g., increasing platelet-clotting time relevant to myocardial infarction) and indirect effects on diseases (e.g., increased cortisol levels promoting visceral fat deposition, which heightens the risk of developing metabolic syndrome). By decreasing the activity of the sympathetic nervous system (SNS) and hypothalamic–pituitary–adrenal (HPA) axis, yoga can reduce the downstream harm attributable to chronic stress. In fact, emerging research is showing that lifestyle factors such as diet, exercise, stress management, and sleep quality (which yoga also appears to improve) can positively influence health states and the underlying biological processes that help to maintain health and well-being (Ornish, Magbanua et al., 2008; Ornish, Lin et al., 2008; Puterman, Lin, Krauss, Blackburn, & Epel, 2015) (see Chapter 21).

The complementary worldviews of yoga and modern medicine

Another reason for yoga therapy’s increasing popularity is that its approach is consonant with many people’s values: it is a natural, mind–body treatment that is low-tech, relatively inexpensive, and generally very safe. Despite the growing use of mind–body approaches for healing among patients, our health care systems have generally neglected these and other behavioral treatments, focusing instead on pharmaceuticals, surgical procedures, and other invasive treatments. Psychosocial and spiritual influences on healing have also been largely overlooked. Forgiveness, acceptance, fulfillment, a sense of meaning, a lessening of suffering—all areas that the yoga therapist may help patients to cultivate—may be more amorphous and harder to quantify than serum cholesterol and systolic blood pressure, yet they are all vital to health and well-being and to many who seek medical care. In addition, in spite of the tremendous successes of technological approaches, many feel that in modern health care a personal touch can
be missing. Like other treatments grouped into the category of complementary and integrative medicine, yoga therapy is client centered. Clinical sessions allow ample time for patients to tell their stories and get an attentive evaluation of their complaints, one that is not solely focused on either just physical or just psychological symptoms, but on all aspects of a patient’s life: physical, psychological, social, and even spiritual (McCall, 2007).

In modern medicine, whenever possible, physicians practice evidence-based medicine, in which treatment decisions are based mainly on research using third-person objective outcomes and not on patient-reported subjective outcomes. However, while welcoming the contributions of science, yoga has a different opinion about personal testimony. According to yoga epistemology, direct experience is the most reliable way of figuring out what is true (Bryant, 2009). But in order for direct experience to be reliable, yoga teaches that one must first remove obstructions to clear sight. Yoga is a step-by-step path to improve one’s perceptive abilities, awareness, and mindfulness, often starting with the body but extending to the breath, the nervous system, and the mind. In modern medical science, following the tenets of evidence-based medicine, physicians whenever possible rely on RCTs and meta-analyses of large groups to determine the best approach for treating individuals. In yoga therapy, in contrast, the practitioner studies the individual in great detail and crafts a yoga program to address the various imbalances that have been detected. Examples of this approach can be seen in the clinical sections of each disease-condition chapter in this book, which feature the work of leading yoga therapists.

Over time, a yoga student’s proprioceptive and interoceptive abilities grow through the practice of yoga postures and breathing techniques (Farb et al., 2015; Schmalzl, Crane-Godreau, & Payne, 2014). Areas of the body that once were dim to awareness become more readily perceptible, and with ongoing practice, this perception becomes heightened. Similarly, meditation builds the ability to know one’s own mind, with an overall increased sense of awareness/mindfulness that includes thoughts and emotions previously unavailable to the conscious mind. These cultivated perceptual abilities of body and mind, which are developed and enhanced with practice over time, affect how yogis interact with modern medicine, for example, by facilitating the early detection of disease symptoms and risk factors. Thus, long-term or master practitioners of yoga may realize that they are developing pneumonia in a specific area of their lung because they can feel that the tissue is not responding normally during subtle breathing practices (Judith Lasater, personal communication). We might compare it to a highly trained musician who senses that his or her instrument is slightly out of tune.

When examining reality through the lenses of both of these very different paradigms—one focused on individuals, cultivated awareness, and first-person outcomes and the other on more objective third-person outcomes and statistical analysis of groups—the observer may get a more nuanced and accurate overall view, because each approach may detect some truths that the other misses. Although yoga’s methodology is different from that of modern medicine, most yogis consider these paradigms to be complementary and have welcomed the scientific investigation of yoga and yoga therapy. Similarly, modern medicine is becoming increasingly open to what yoga has to offer.

**Disease as understood in ancient yoga texts**

In ancient Indian texts, much importance is given to maintaining a state of balance or homeostasis (called samatvam in Sanskrit) within the individual. In fact, in the Bhagavad Gita, a Hindu scripture compiled circa 500 BCE, the word samatvam is considered synonymous with yoga: Samatvam yoga ucyate, “yoga is equilibrium” (Bhagavad Gita, Chapter 2, Verse 48; Prabhavanada & Isherwood, 1944). We now know
from modern medicine that a shift away from physiological or biological homeostasis can indeed lead to disease (e.g., immune suppression can increase vulnerability to viral infections or cancer; increased blood pressure can lead to heart and renal disease).

Beyond the dimensions of a healthy yogic lifestyle discussed above, the ancient yogis stressed the importance of managing one’s emotions and attempting to modify unhealthy thought patterns. Thoughts and emotions are considered important because of the way disease is believed to originate. According to yoga texts, there are five levels of existence, sometimes referred to as the koshas (Taittreya Upanishad). These are (1) the physical level, (2) the subtle-energy level, (3) the instinctual mental level, (4) the intellectual mental level, and (5) the fifth and ideal level, a state of optimal homeostasis and balance. Many imbalances that can lead to disease are thought to begin at the instinctual mental level.

Mental imbalances are believed to occur due to five main stress-producing factors (called kleshas, in Sanskrit; Patanjali’s Yoga Sutras, Chapter II, Verse 3, avidyasmita-raga-dveshabhinivesah klesah) (Bryant, 2009). The five kleshas are (1) ignorance about the true nature of the Self (avidya); (2) strong desires (raga), (3) strong aversions (dvesha); (4) a sense of self/separateness (asmita); and (5) fear of various things, the most extreme being death (abhinivesha). According to ancient texts, the first overt manifestation of these imbalances is at the level of subtle energy (called prana), which results in irregular breathing. In Patanjali’s Yoga Sutras, universally considered as a seminal ancient text on the fundamentals of yoga, it says, “The symptoms or manifestations of this distracted state (vikshepa) are mental pain, anguish, turmoil, despair, tremors, rough and erratic breathing, and general nervousness and anxiety” (dukha-daurmanasyangamejayatva-svasa-prasvasa viksepa-sahabhuvah; Patanjali’s Yoga Sutras, Chapter I, Verse 31) (Bryant, 2009).

If at this stage an individual can realize that something is wrong (e.g., a dysfunctional breathing pattern, a diet that promotes weight gain, a tendency to hyperextend the lumbar spine), he or she may be able to make the necessary changes to correct the imbalance and possibly prevent disease. This is where the heightened awareness and mindfulness, which a regular yoga practice facilitates, becomes important. According to yoga texts, however, what usually happens is that imbalances in the mental state, breathing, and elsewhere (what in the parlance of modern medicine might be considered disease risk factors) continue unchecked and tend to deepen over time. After a while, physical disease manifests, as the imbalances that began at the mental level reach the physical level. This, according to the yoga tradition, is the basis for a wide spectrum of conditions that may be considered to have a psychosomatic basis. That some individuals develop a disease of the respiratory system, while in others the cardiovascular or nervous system is involved, may be due to a genetic predisposition to a particular disease or an inherent weakness or vulnerability of a particular system. By detecting imbalances before full-blown disease manifests, yoga therapy can be a powerful form of preventive medicine, particularly for the lifestyle diseases that remain a struggle for modern medicine to manage.

The clinical practice of yoga therapy

In assessing patients, the yoga therapist considers all aspects of the patient’s mind, body, and spirit, as well as family situation, work environment, socioeconomic level, and cultural factors. Based on this detailed analysis, a personalized therapeutic strategy is tailored to the individual and may be altered regularly over time, as the individual’s situation changes (Desikachar, Bragdon, & Bossart, 2005; Kraftsow, 1999; McCall, 2007). The yoga therapist’s analysis often begins with the body. How is the person’s posture? Are the joints stiff or limber? Are the muscles contracted or loose (or is there, as commonly seen in yoga therapy clients, a complex pattern of overwork in some areas of the musculature and underwork in others)? What about the breath? Does the person breathe through the mouth or the nose?
the inhalation smooth or rough? Is there inadvertent breath holding? How is the balance of the autonomic nervous system?

Most yoga therapists and many yoga teachers are knowledgeable about subtleties of human anatomy. Although they often think about individual muscles the way doctors do, many see patterns of anatomical alignment and kinesiology with a level of detail well beyond what the average physician might notice. Good yoga therapists, for example, routinely notice how subtle misalignments of the feet and/or ankles can contribute to back pain and will incorporate strategies to address such imbalances in their treatment plans.

Increasingly, many yoga therapists base their observation of patients on principles that come not just out of yoga but also from the related field of ayurveda, the ancient indigenous medicine of India. Like the Hippocratic medicine of ancient Greece, ayurveda diagnostically evaluates factors such as bodily humors (doshas), seasons, climatic conditions, and the strength of the agni, or digestive fire (Caldecott, 2006; Svoboda, 1998). This may be off-putting to some physicians who have been taught to distrust such systems, but many yoga therapists find that ayurvedic principles are invaluable in helping them craft personalized yoga programs and tailor dietary and lifestyle advice to the individual patient (McCall, 2007).

In addition to investigating mental balance and stress levels, yoga therapists evaluate the patient’s overall psychological well-being. Yoga therapists are not attempting to be psychotherapists; rather, they recognize dominant emotions such as anger, fear, or sadness, as well as dysfunctional psychological patterns in their patients. This can help them to better understand their patients and to craft individualized therapeutic programs. Similarly, yoga therapists, with patients who are willing, can assess spiritual well-being. Many yogic approaches are explicitly designed to foster spiritual goals, such as cultivating compassion for oneself and others and reducing suffering (whether pain can be diminished or not) (Feuerstein, 2001).

**Yoga therapy’s comprehensive approach**

Consideration of a patient’s entire situation—body, mind, spirit, and environment—is a manifestation of holism, more commonly referred to in the clinical context as holistic medicine, or more recently as integrative or participative medicine. Conventional medicine, in contrast, tends to focus on discrete and often isolated targets when assessing a patient and his/her condition. In its most limited form, which is unfortunately too often the case, the goal of conventional medicine is to relieve the overt symptoms without much effort devoted to determining and treating the underlying causes. An alarming example is the preferred strategy to focus on pharmaceutical and technological solutions to the epidemics of obesity and T2DM, with much less emphasis on addressing the underlying behavioral and lifestyle causes. Another example is the overuse of surgery to treat low-back pain. At its best, when conventional medicine does focus on the cause of the disease, it typically does so with a limited and narrowly focused strategy, often limited to the use of medications and surgery. Historically, this has worked well for communicable diseases, but is less likely to be effective for diseases with multiple interacting risk factors. This is reductionism in modern medicine: reducing the complexity of the whole to a single or a few causative factors that can be attacked. Of course, reductionism, which includes the study of individual organs, cells, and metabolic pathways, has been one of the greatest successes of modern science and medicine. But from the yogic point of view, it is a limited approach that is likely to miss factors that may make the difference between success and failure in clinical treatment.

A holistic, integrative approach, by contrast, tends to view disease as multifactorial, with many factors and functions densely interconnected. Even if there is a specific cause behind a condition, such as a virus,
it is well known that people with similar exposure to a pathogen may have widely divergent clinical outcomes, from no symptoms to debilitating disease (Pedersen, Zachariae, & Bovbjerg, 2010). Even when there is an obvious cause of the patient’s ailments, the yoga therapist will nonetheless assess the individual and plan the intervention in a comprehensive manner. Thus a patient with back pain due to a herniated lumbar disc might be given practices designed to improve spinal posture (alignment), correct dysfunctional breathing habits, lower stress levels, deal with unresolved anger, and help find a sense of meaning or purpose in life. Of note, different patterns of postural dysfunction, breathing habits, and emotional and spiritual issues would alter the yoga therapist’s approach, because of the patient-centered, individually tailored approach of yoga therapy.

An integrative approach usually involves using multiple, generally safe approaches simultaneously, some aimed at the physical body, others at the emotions and/or spirit, to induce improvement in the patient’s psychophysiological functioning. In yoga therapy, these approaches may include a combination of postures (asana), breathing practices (pranayama), meditation (dhyana), and lifestyle advice. An integrative approach favors gentle, natural remedies but, when necessary, also supports the use of reductionist tools such as pharmaceuticals and surgery. Indeed, yoga therapy is often used as an adjunct to conventional medical treatments. An appropriate analogy would be to compare integrative medicine’s holistic approach to organic gardening, where efforts are made to strengthen the soil and make the plant harder to better resist insects, as opposed to the reductionist approach of simply applying pesticides, but sometimes both are needed to help the garden to flourish. The beauty of a comprehensive approach is that treatment does not necessarily depend on the medical diagnosis and may therefore be helpful even in cases where the diagnosis is unclear or even wrong, which autopsy studies have suggested is surprisingly all too common (Shojania, Burton, McDonald, & Goldman, 2003; Winters et al., 2012).

Although yoga therapy can occasionally cause untoward reactions (see Chapter 22), by and large, its side effects are positive. Because of its comprehensive approach, a variety of imbalances may be simultaneously corrected, potentially benefitting both the primary diagnosis as well as comorbid conditions, possibly leading to the prevention of other diseases. A yoga practice prescribed and adopted for treating hypertension, for example, might not only lower blood pressure but also result in better sleep, improved immune function, elevated mood, and greater resilience in the face of unavoidable stressors. The side effects of a reductionist approach, in contrast, are almost always undesirable because the focus on correction of just one symptom or disease manifestation (high blood pressure, for example) results in imbalances in other parts of the system.

However, the Achilles’ heel of most holistic approaches, which applies to all of behavioral and mind–body medicine, is that they place the burden on patients to execute the vast majority of the therapeutic intervention. It is the patients who will need to practice their yoga poses, sit on their meditation cushions, write about emotionally painful experiences in their journals, or shop at the farmers’ market to reduce the amount of processed food they are eating. This is not easy for many patients in modern society, who are busy and have grown accustomed to the generally accepted paradigm in modern health care that the physician is responsible for the patient’s health, and that the patient generally visits the provider only to “get fixed when something breaks,” without necessarily addressing how his or her own behavior may have contributed to the health problems. In fact, many patients will spurn a prescribed lifestyle change or behavioral intervention in favor of the quick fix of surgery or a pharmaceutical: “Why go through the hassle of practicing yoga, when you can just take a pill?”

The lack of involvement of patients in their own health care can have negative consequences beyond the side effects of pills they might not
otherwise need. In much of conventional medicine, the patient is passive, someone to whom procedures are done, with little control of outcome and a minimal sense of self-efficacy. The resulting lack of empowerment can be discouraging, particularly when the treatments have limited benefit and unpleasant or dangerous side effects and may keep the body’s stress responses activated. Beyond a potentially helpful healing option, what yoga offers patients is a sense that their actions are making a palpable difference in their health and well-being. That realization can alter the mindset from feeling like a passive victim to feeling like a person with some control over what happens—which in itself may be therapeutic.

Yoga practitioners believe that although some health outcomes are unavoidable, in large measure what we do—particularly what we do regularly on a day-to-day basis—has a powerful effect on what happens to us in the future. In the words of Patanjali, “Future suffering can be avoided” (heyam duhkham anagatam, Pantanjali’s Yoga Sutras, Chapter II, Verse 16) (Bryant, 2009). Despite a patient’s genetic predisposition for a particular disease, adoption of appropriate behaviors and practices may effectively prevent manifestation of that disease. To put it in yogic terms, some karma can indeed be changed, and yoga therapy is a process that helps individuals—and society—to do just that.

References


Chapter 1
INTRODUCTION TO YOGA IN HEALTH CARE


The 23 chapters in this textbook are divided into eight sections. Section 1 provides introductory chapters for yoga, yoga therapy, and the basic research on the psychophysiology of yoga. Sections 2 through 7 cover yoga therapy for separate fields of medicine and medical conditions. Section 8 includes chapters on practical implementation issues and future directions for the field. Authors for all of the chapters were invited to contribute based upon their international scholarly leadership in a specific field of yoga, yoga therapy, and/or yoga research. For each chapter, at least two senior academic scholars/scientists from different institutions served as key leading coauthors in order to provide greater expertise, knowledge, and balance to the text; in a number of chapters these senior authors were assisted by other coauthors of their choosing. The structure of each of the 17 clinical chapters in Sections 2 through 7 includes: (1) an introduction/description of the disease category, including pathophysiology, etiology, and prevalence of the medical condition(s); (2) the psychophysiological rationale for the use of yoga for the condition(s); (3) a review of the published clinical trial evidence, including the number of studies, diversity of study characteristics, and quality of research design; (4) a concluding summary including clinical relevance and future research directions; and (5) a limited number of key citations.

Following each of the 17 clinical chapters is a section consisting of clinical insights from yoga teachers and yoga therapists, contributed in part by invited prominent international yoga therapy practitioners listed on page xix as Consulting Yoga Teachers and Yoga Therapists. These sections were compiled and written by Timothy McCall, and the opinions in them do not necessarily reflect his opinions nor those of the authors of the clinical chapters which they follow. The sections are designed to describe how highly experienced practitioners from a variety of yoga traditions (often with quite different perspectives) approach their work. Their observations and recommendations are illustrative, and are based more on the yoga tradition and their own direct clinical experience than on the results of clinical trials. They should not be construed as treatment recommendations, as such practices may not be appropriate for all patients. Especially for those with medical conditions or frailty due to advanced age, yoga should be learned under the supervision of a qualified yoga teacher or yoga therapist. While books and videos can support this process, they are no substitute for the care, attention, and feedback that a well-trained instructor can provide.