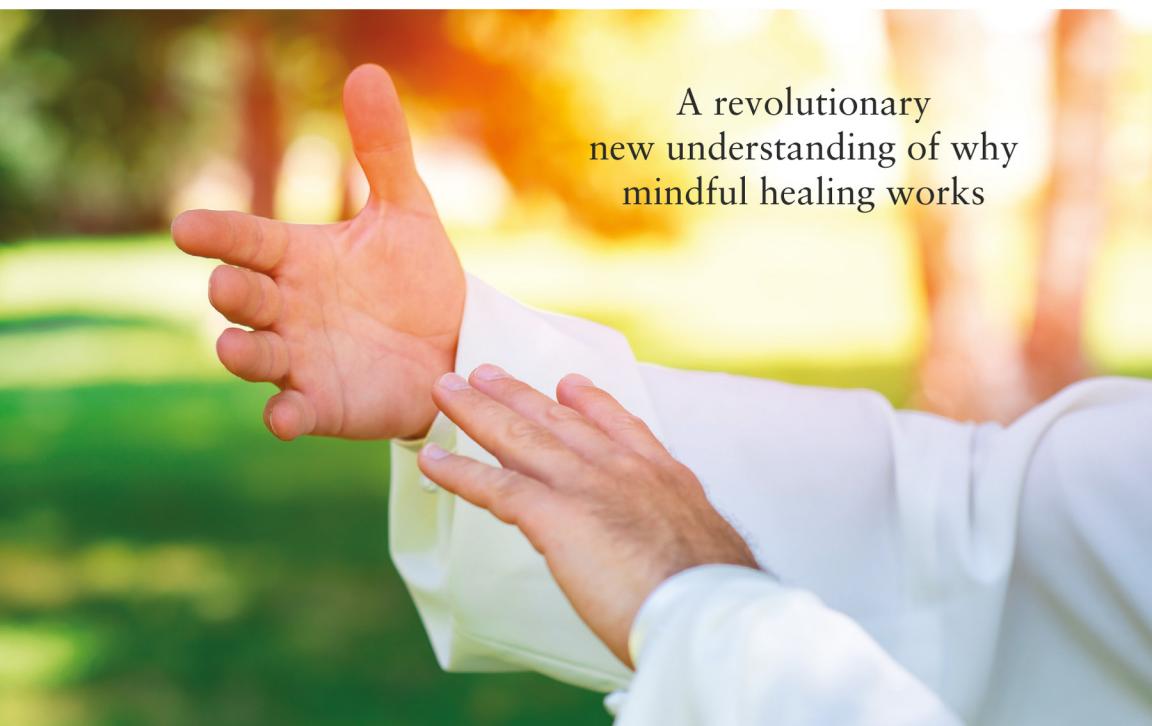


Mindful Exercise

Metarobics, Healing, and the
Power of Tai Chi



A revolutionary
new understanding of why
mindful healing works

PETER ANTHONY GRYFFIN, PHD

Forewords by Roger Jahnke, OMD,
and Bill Douglas, founder of World Tai Chi & Qigong Day

Today, more doctors than ever are prescribing tai chi for patients recovering from injury, illness, and surgery.

"A persuasive picture of tai chi's healing effects bolstered by compelling data and enlivened by an array of personal testimonials." —Kirkus Reviews

"Will surely become 'the prescription' of choice for all responsible medical providers! I am enthusiastic about recommending it!"
—Roger Jahnke, OMD, author of *The Healing Promise of Qi*

"Mindful Exercise and the metarobic approach opened my eyes, and they can open yours too."
—Dr. John Day, author of *The Longevity Plan*

"Merge meditation and exercise ... may well lead to a new definition of optimal well-being."
—Rudolph E. Tanzi, PhD, professor of neurology, Harvard Medical School; *New York Times* best-selling author of *The Healing Self*

"A portal that will change the way tai chi and qigong are approached; modern medical science can join hands with these ancient mind-body sciences to become coevolutionary."
—Bill Douglas, author of *The Complete Idiot's Guide to T'ai Chi & Qigong*

This book presents over ten years of research into how and why tai chi benefits health from an evidence-based, medical perspective.

Dr. Peter Anthony Gryffin demonstrates the link between health and metarobics, his term for slow, meditative exercises that enhance blood oxygen saturation, diffusion, and oxygen-based metabolism. Metarobics—including tai chi, qigong, and yoga—focus on relaxation and deep breathing. Dr. Gryffin's research shows that these exercises offer a wide range of benefits for treating chronic disease.

Dr. Gryffin cites numerous scientific studies as well as testimonials from patients who have experienced the natural healing benefits of metarobic exercise. Many have surmounted chronic health problems to improve their quality of life. Some even overcame grave diagnoses.

This book features

- More than 120 scientific studies on tai chi and other metarobic exercises
- More than 50 case stories from tai chi, qigong, and yoga practitioners
- Clear, straightforward language
- Tested guidelines to improve your metarobic exercise and maximize health benefits

Dr. Gryffin says, "The links I discovered will allow everyone from novice students to veteran teachers to maximize benefits for health and chronic conditions."



Author photo: Lee Gryffin
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PETER ANTHONY GRYFFIN, PhD, MS, has over thirty years of experience with tai chi, qigong, and yoga. His research includes implications related to hypoxia, cancer, and tai chi; the development of the theory of metarobics; and the application of mindfulness-based practices for dealing with stress, trauma, addiction, and destructive behavior. Dr. Gryffin holds a PhD in health and human performance and a master's degree in kinesiology and health. He resides in Los Angeles, California.



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that simple movements coupled with focused breathing help us with so many health benefits? His answer: Metarobics.

“Using dozens of stories of people who have had their lives enhanced by tai chi and qigong, *Mindful Exercise* helps us understand Metarobics. We can now understand how the relaxed body, aided by abdominal breathing, enhances our health in a variety of ways.

“Students of tai chi and qigong, as well as other mind-body disciplines, will find *Mindful Exercise* an important work to add to their personal libraries. Instructors of the healing arts will add to the value of their classes by sharing the information in Dr. Gryffin’s eye-opening work. I know I will.”

—Arthur Stalbow, tai chi qigong instructor, On Top of the World Community, The Ranch Fitness Center, Stone Creek Community, Cherrywood Community, Health 2 You Senior Fitness, all in Ocala, Florida

“Dr. Gryffin presents an understandable Western perspective on tai chi, qigong, yoga, and other Eastern disciplines. The language and the argumentation used to explain the benefits of these disciplines from an Oriental perspective have been, in many cases, something quite mysterious and difficult to verify from the Western perspective. The advantage of Metabolic theory is that it can be accompanied by a fairly simple system of testing: the use of an oximeter during the execution of these exercises. The finding that a ‘metabolic’ or Metabolic mode of doing these exercises directly affects the oxygenation, oxygen diffusion, and metabolism of the body is in itself very important. *Mindful Exercise* establishes the relationship between hypoxia, oxygen diffusion, and the evolution of different diseases such as cancer, heart disease, arthritis, diabetes, and more.”

—Dr. Juan Carlos Cernuda, professor of educational sciences at the National University del Litoral, Parana, Argentina; author

“This book is a landmark melding of East and West and the art of tai chi. For too long, the understanding of this unique form of exercise and

healing has been obscured by divergent schools and secretive practices. *Mindful Exercise* combines testimonials, a wide range of research, and dedicated original writing. It respectfully conveys a modern approach to an ancient art. This is an important book for anyone thinking of starting a tai chi practice or for practitioners who want to understand the therapeutic potential of this meditative training.”

—Deng Ming-Dao, practitioner of xingyiquan, baguazhang, and taijiquan; author of numerous books including *365 Tao: Daily Meditations*

“Dr. Peter Anthony Gryffin’s theory of Metarobics—a new category of exercise that focuses on a dynamic state of relaxation and enhanced respiration found within the slow movements of tai chi, yoga, and qigong—may provide a key to preventing and fighting various illnesses and degenerative diseases. In this unique book, Dr. Gryffin explains why Metarobics should be included along with aerobic exercise and strength training as vital elements to health and fitness. *Mindful Exercise* is an interesting and informative read for anyone interested in health, aging, and longevity.”

—Alain B. Burrese, fifth dan, Hapkido; best-selling author of numerous martial arts books

“I thought I already had a whole checklist of good reasons to practice and teach tai chi chuan. After reading the manuscript for Peter Anthony Gryffin’s new book, *Mindful Exercise*, I feel I’ve now added several additional and compelling reasons to that list.

“This book amounts to nothing less than a brilliant, and very welcome, treatise on its subject matter. *Mindful Exercise; Metarobics, Healing, and the Power of Tai Chi* casts new and important light and credence on tai chi and qigong, et al. as health and wellness disciplines that now enjoy a credible scientific basis to their long-standing empirical status. This book’s content is precisely what tai chi teachers have long been waiting for: a comprehensive body of mainstream evidence-based claims with the potential to shift both the reality and the public’s

and medical community's perception of tai chi from its former realm of New Age curiosity to a bona fide health and wellness resource."

—John Loupos, MS, Hanna Somatics Education, tai chi instructor; author of numerous books including *The Sustainable You*

"This book will awaken the interest of readers and provide motivation to seek mindful exercises to benefit their health. *Mindful Exercise* is easy to read with powerful information that can have a life-lasting impact. I am certainly motivated to find a tai chi class in my community."

—Guillermina Solis, PhD, APRN, FNP+C, GNP-C, University of Texas at El Paso School of Nursing

"In this debut mind/body guide, a tai chi instructor details the unique physiological benefits of the technique's slow-moving exercises. For tai chi instructor Gryffin, what has been 'missing in the research' in studies of the wellness/healing power of tai chi and similar exercises (qi gong, some forms of yoga, etc.) 'was why these exercises were having such benefits.' Here, he seeks to remedy this perceived gap by presenting research supporting his observations that, in conjunction with slow abdominal breathing, these kinds of exercises can relax the body and enhance blood oxygen saturation, diffusion, and metabolic function. Such enhancements create an 'effect unique from other forms of exercise' to prevent or combat hypoxia, a reduction in the amount of oxygen reaching various areas of the body, a condition that can lead to cancer; heart, kidney, and lung diseases; stroke; asthma; diabetes; and other chronic ailments. Given tai chi and similar activities are neither aerobic nor strength-based, Gryffin coins these exercises 'Metarobics' and asserts that they deserve the same kind of attention and uptick in popularity that aerobic exercises have achieved. Alongside his research discussions, first detailing the overall physiological effects, then going deeper into specific health conditions, Gryffin includes an array of first-person testimonials regarding these exercises' lifesaving effects and psychological benefits. Debut author Gryffin, who holds a PhD in health and human performance from the University of

Florida, makes a convincing case to draw more people to both practice and advocate for Metarobics. He includes an extensive reference list to support his assertions and is careful not to tout his ideas at the expense of traditional medicine; at one point, for instance, he notes that boosted oxygen around tumors allows for more efficient chemotherapy treatments. The various testimonials, some 50 in all, also support his cause while offering readers relief from the occasionally dry, repetitive detailing of data.”

—Kirkus Reviews

*A persuasive picture of tai chi's healing effects
bolstered by compelling data and enlivened
by an array of personal testimonials.*

PETER ANTHONY GRYFFIN, PhD

MINDFUL EXERCISE

Metarobics, Healing,
and the Power of Tai Chi

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NOTE TO READERS

This publication is based on research, but in a new and emerging area. The ideas and thoughts presented in this publication are the opinions and views of the author. It is meant to provide helpful information to bring greater awareness to potential exercises for health. The practice, treatments, and methods described in this book should not be used as an alternative to professional medical diagnosis or treatment. The authors and publisher of this book are NOT RESPONSIBLE in any manner whatsoever for any injury or negative effects, which may occur through following the instructions and advise, contained herein. It is recommended that before beginning any treatment or exercise program, you consult your medical professional to determine whether you should undertake this course of practice.

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Dedication

This book is dedicated to my students who benefited from tai chi and got me looking in the direction of Metarobics. I am also grateful to Sifu Duke Y. M. Cheng, whose lineage and teaching in the traditional elements of tai chi and kung fu gave me such a strong base from which to develop my understanding. I also wish to thank Bill Douglas, World Tai Chi Day founder, for his dedication to popularizing tai chi and making it more accessible, and for his support of my work with Metarobics. I also wish to thank Deng Ming-Dao for his support and feedback, and for his own contributions to preserving the traditional side of these arts. Many others have also assisted me on my path. To the doctors and tai chi teachers too numerous to name, thank you for your support and feedback. And of course, my thanks to my family, who have had the patience to put up with my love of tai chi.

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Foreword

AM VERY EXCITED ABOUT THIS book and the Metarobics framework! The Institute of Integral Qigong and Tai Chi (IIQTC) has been committed to supporting the ancient insights regarding mind-body practice to be articulated for contemporary culture. While traditional concepts from former eras have incredible power, the magnitude of their influence is dramatically increased when those concepts are translated into contemporary terms.

As a practitioner with over thirty years of clinical practice as a physician of traditional Chinese medicine, I can say that the approach presented in this book is respectful of the profound ancient traditions of mind-body practice in original cultures—China, India, and other indigenous shamanic communities. Simultaneously, this exploration of Metarobics creates an understanding that will inform science and inspire the public to better understand the profound benefits of mindful forms of exercise, which maximize the mind-body interaction. I have taught and researched the Chinese self-cultivation arts for many years, having learned over several decades from numerous master teachers in dozens of visits to hospitals, institutes, and training centers in China. Amazingly, there is an almost limitless and miraculous potential to these arts from which to create powerful programs for health and wellness—for all populations, with both personal and socioeconomic benefits.

I stated in my books, *The Healer Within* and *The Healing Promise of Qi*, that contemporary culture has only begun to explain the benefits of qigong and tai chi in terms of our Western-culture-centric science. *Mindful Exercise* takes this a leap further and presents a physiological understanding of how and why many of these benefits occur. The research evidence base is exploding for a variety of conditions, including

potential benefits for cancer; heart, lung, and kidney disease; diabetes; chronic pain; asthma; arthritis; and immunity—the list of potential benefits is stunning. Yet Dr. Gryffin shines the light of contemporary science without detracting from the depth and profundity of these traditional arts.

Disseminating the ancient arts of qigong and tai chi (as well as yoga) is in many ways a radical breakthrough, one that is transforming health care (self-care) and the delivery of medical intervention. The Metarobic concept, as presented by Dr. Gryffin, makes this breakthrough much more understandable to modern medicine and much more approachable for a widening public audience. This excellent book taps the physiological essence of the human-potentiation arts, which actually have their foundation in the physics of the boundless universe and its ultimate energetic nature.

Tai chi and qigong are wonderful and inspiring treasures of ancient culture that create subtle changes within the human system—to naturally produce what we at the IIQTC call “the most profound medicine.” This medicine, referenced in the ancient literature as “inner elixir,” is produced within the body—*for free*. In Dr. Gryffin’s Metarobic approach, hypoxia (the deficiency of oxygen in the cells) parallels the basic ingredient and functional agent of the Chinese paradigm *qi*. The reader is treated to a measurable and scientific understanding of how and why these Metarobic practices create such significant benefits for health maximization and disease prevention. As noted by Dr. Gryffin, hypoxia underlies or complicates almost every chronic condition and illness experienced by the body, just as *qi* deficiency underlies almost every disease in Chinese medicine. The best news, the “inner elixir” is the ultimate nonpharmacological medicine—produced within the human system for no cost!

Dr. Gryffin does an excellent job laying a foundation for a much-needed area of citizen empowerment: self-initiated health maximization. There is an incredible power to bringing quantifiable metrics to bear on how and why Metarobic methodologies benefit health, while respecting their traditional roots and origins. Based on my experiences,

along with colleagues and fellow researchers Linda Larkey, Jennifer Etner, and Julie Gonzalez, we identified a need to define a new category of exercise: meditative movement. *Meditative movement* is an umbrella construct for forms of exercise that incorporate meditation and purposeful breath regulation from a Western scientific perspective. The Metarobic approach to mindful exercise corroborates this, adding to the growing body of work related to meditative movement, as my colleagues and I have defined. It takes the meditative-movement approach, the focus on attention/awareness, relaxation, and enhanced oxygenation, a substantial step further. It creates a measurable approach that defines a category of exercise, one that integrates as an independent component of exercise along with aerobic practices and strength training.

As noted in my own books, the roots of tai chi and qigong have origins that go far beyond Western views of science and healing. Yet these practices result in benefits that can be quite profound, are radically practical, economically potent, and, as Dr. Gryffin has demonstrated, influence well-understood physiological features. Having a measurable, physiological, and scientifically-based understanding of these exercise methods lays a foundation that can make these wonderful arts more widely accessible through programming and policy. The Metarobic approach promises to neutralize skepticism, which can occur among mainstream exercise physiologists and medical providers, regarding the efficacy and mechanisms of benefit underlying these exercises. Rigorous research has shown significant benefits. *Mindful Exercise* explains why, in a measurable and evidence-based approach. Thus, Metarobic practices will surely become “the prescription” of choice for all responsible medical providers!

Mindful Exercise is a comprehensive yet accessible resource for traditional tai chi and qigong practitioners and teachers, as well as for the contemporary wellness professional. This book is also a powerful introduction to those who are new to these arts, and possibly skeptical of their benefits. This book can be a bridge to bring mindful exercises such as tai chi and qigong into our hospitals, schools, older adult communities, recreation centers, and the military and VA on an even larger

scale. As such, this is a much-needed and invaluable book in Western society.

It makes a timely and significant contribution to a rapidly expanding body of literature, which can transform the face of medicine and health-care by allowing people to safely and conveniently take charge of their health. It is time to compare inexpensive nonpharmacological strategies to the ultraexpensive reliance on pills and medicine. Why would a somewhat sophisticated society like ours neglect such a beneficial approach to disease prevention? Metarobics practices have the potential to free individuals and society from explosively increasing and inappropriate medical costs.

Finally, in addition to the Metarobic approach to mindful exercise, Dr. Gryffin also concludes with a very accessible and inspiring overview of the psychological benefits of mindful exercise for dealing with stress, depression, and addiction. Overall, the research presented in this book lays the groundwork for maximizing health and longevity in a way that respects time-honored traditions. This understanding will ultimately support the application of the Metarobics framework to a wide range of dynamic and quiescent meditative practices beyond tai chi and qigong, to include forms of breath-focused yoga and walking.

Mindful Exercise adds a powerful perspective to a growing body of literature on the many benefits of these exercises, which in time may see exercises such as tai chi and qigong becoming as popular as the many forms of aerobic exercise currently practiced in society. I am not just comfortable, but enthusiastic, about recommending it widely!

Roger Jahnke, OMD

Author of *The Healing Promise of Qi* and *The Healer Within*

Director, Institute of Integral Qigong and Tai Chi (IIQTC)

Santa Barbara, California

Foreword

AS FOUNDER/DIRECTOR OF THE WORLD'S largest tai chi and qigong health education event (World Tai Chi & Qigong Day), and connecting with teachers of these arts worldwide following release of four editions of my own best-selling tai chi book published in several languages, and as a nearly forty-year student of the evolution of tai chi and qigong in America and worldwide . . . I have seen three paradigm shifts that profoundly expanded the global use of these extraordinary mind-body arts: Ken Cohen's *The Way of Qigong: The Art and Science of Chinese Energy Healing*, Dr. Peter Wayne's *Harvard Medical School Guide to Tai Chi*, and now . . . Dr. Peter Anthony Gryffin's *Mindful Exercise*.

This book is a portal that will change the way tai chi and qigong are approached, so that modern medical science can join hands with these ancient mind-body sciences to become coevolutionary. Science can help tai chi and qigong evolve and become even more effective. The introduction of mind-body sciences like tai chi and qigong will save global society trillions in health costs. I have seen millions of dollars saved by our health system, just due to my own hospital classes. As this book points out, this is happening all across the globe, which mirrors my experience of organizing World Tai Chi & Qigong Day in over eighty nations and speaking to tai chi and qigong teachers worldwide. Today, according to the National Institutes of Health, over two million Americans do tai chi. This book can help open a portal that will in time see that increase to 20, 30, or even 60 percent of Americans using the highly effective tools of tai chi and qigong, perhaps even expanding them into public education as a hybrid physical education / health science class. This book, and books like it that will surely follow in its wake, could lay the groundwork for such a movement.

I teach tai chi meditation programs through one of the world's largest medical university hospitals, conducting ongoing classes for people dealing with Parkinson's disease, heart disease, multiple sclerosis, chronic pain, balance, dementia, type 2 diabetes, mobility problems and more, and have seen patients experiencing the benefits this book's research cites. But now, thanks to Dr. Gryffin's brilliant book, I have a methodical, clear, and profoundly hopeful and exciting way to much more quickly help my students understand just how vast and multidimensional the benefits they can get are. As teachers, our struggle is to translate the internal experiences we have enjoyed from tai chi and qigong so that another person can understand them, envision them, and then practice them. *Mindful Exercise* does so clearly, methodically, and brilliantly, combining tai chi and qigong insights with modern science. This seminal work should be read not just by all those in my own hospital classes, but by every tai chi and qigong student, by every teacher of the arts, by every health professional and government health ministry or department employee, and by everyone seeking a more enjoyable and profound life and a more abundant, clear, and healthy society.

Bill Douglas

Founder of World Tai Chi & Qigong Day (celebrated in eighty nations)

2009 Inductee to the Internal Arts Hall of Fame in New York

Author of *The Complete Idiot's Guide to T'ai Chi and Qigong* (4th edition)

Recipient of the Extraordinary Service in the Field of Qigong Award

from the National Qigong Association

Recipient of the Media Excellence Award from the World Congress

on Qigong

Preface

OVER THE PAST FIFTEEN YEARS of teaching tai chi, I have heard remarkable stories from students regarding benefits for health. Health concerns can be a driving force for starting tai chi. Indeed, many of those teaching tai chi today began practice as the result of a diagnosis with a life-threatening condition, in a desperate last-ditch effort to avoid death. And it worked, with sometimes miraculous and dramatic effects. Several of the case stories in this book are from those teachers, and their stories are powerful and moving.

As a mindful exercise, tai chi is becoming more popular, with many benefits for the health of the mind. Benefits for stress reduction, anxiety, depression, and addiction are presented in the conclusion of this book, and in more detail in an upcoming book. However, what is particularly remarkable about mindful exercise in general, and tai chi in particular, are the many incredible benefits for the health of the body, as well as for the mind.

Tai chi has been studied by researchers for almost every health condition out there—from heart, lung, and kidney disease, to cancer, stroke, diabetes, asthma, Alzheimer’s, multiple sclerosis, chronic pain, immune system diseases, and more. Much of that research is presented in this book, along with over fifty case stories from those who have directly experienced the benefits of tai chi. But what was missing in the research was *why* these exercises were having such benefits. Chapter 2, “Qi: Science or Magic?” details views from a traditional Chinese medicine and cultural perspective. However, little has been done to understand how and why exercises such as tai chi were having benefits from a physiological perspective.

Following changes in the condition of three of my students with cancer, including one who had been given only three weeks to live, I

realized that there must be a physiological and measurable response that would explain these results. My research revealed a link between hypoxia (reduction of oxygen reaching various tissues or areas of the body) and enhanced blood oxygen saturation, diffusion, and metabolic function—a mechanism of health distinctly different from that of aerobic and anaerobic exercise.

I then realized that this meant that a third and new school of fitness needed to be developed, one that could explain why and how exercises that are neither aerobic nor strength-based were having such specific health benefits. Indeed, it has been noted in an extensive review of tai chi studies¹ that tai chi has no aerobic-specific effects. Yet tai chi has been found to have benefits for a wide range of chronic conditions. So if tai chi and related exercises are not aerobic exercises, then what are they? Since measurements suggest an effect on oxygen-based metabolism, I coined the word “Metarobics.”

Metarobic exercise is a good fit with aerobic and anaerobic categories of exercise. As detailed in chapter 1, aerobic exercise results in either no change or a drop in blood oxygen saturation and diffusion, depending on intensity. Measurements during tai chi and related exercises show a significant effect on enhanced blood oxygen saturation, diffusion, and oxygen-based metabolism. As a new theory, Metarobics explains how and why exercises such as tai chi can benefit such a wide range of chronic conditions. It turns out that relaxing the body in conjunction with slow abdominal breathing is not just good for your health, but fantastic!

Mindful Exercise is a unique book from many perspectives. Aside from documenting and presenting theories and research for a new category of exercise, I have included excerpts of life-changing testimonials and stories. These stories are dramatic, and many more are posted on the Metarobics Facebook page. Some are accounts that were personally related to me; others are paraphrased from various books and websites (listed in the references). However, as inspirational as many of these stories can be, always consult with your doctor regarding any changes to your health care.

Chapters 1 and 2 present research supporting my observations that exercises such as tai chi enhance blood oxygen saturation, diffusion, and oxygen-based metabolism as an effect unique from other forms of exercise. Chapter 3 covers research specific to cancer, which is what prompted many of my original observations. Chapters 4, 5, and 6 document research and theoretical effects for a wide range of other conditions, including heart and lung disease, stroke, kidney disease, asthma, diabetes, diseases of the immune system, and chronic pain.

Although the stories and research presented in this book affirm the life-giving benefits people have derived from forms of tai chi and related exercises, it should be noted that there are many styles and methods of teaching. Before choosing a school or a teacher, you are encouraged to read chapter 7, “Essential Elements of Metarobics and Tai Chi for Therapy.” It is also important to discuss any changes in health routines with your doctor.

The conclusion summarizes the current state of Metarobics as a new field of exercise. The conclusion also presents psychological benefits of tai chi as a form of moving meditation and mindfulness-based practice. Mindfulness-based practices are becoming increasingly used to address various forms of addiction, as well as for dealing with trauma. Implications are also discussed for exercises that do not necessarily fit into the typical aerobic or anaerobic categories, such as walking and yoga. Over time, Metarobics may come to include a wide variety of exercises.

Many people already practice some form of these exercises in various parts of the world, including the United States. It is my hope that this book will help an even greater number of people understand and benefit from these exercises. People ran, swam, and bicycled before Dr. Ken Cooper came out with his book *Aerobics*² in 1968, but it took his work to document the unique physiological effects of these exercises, leading to the diversity and growth of aerobic exercises that we have today. Metarobics does the same thing for tai chi and forms of qigong, and may come to embrace a wide variety of exercises that

do not quite fit conventional categories. Enjoy the book, and with a greater understanding of Metarobics, I encourage you to research your local opportunities and check out the resources available at Metarobics.org.

Dr. Pete Anthony Gryffin

Note: Blood oxygen saturation for the studies described in this book was measured with medical quality pulse oximeters. Lower quality oximeters may not give reliable readings, particularly during the brief drop in blood oxygen saturation following tai chi and other Metarobic practice.

Metarobics and Tai Chi: A New Paradigm of Fitness

How a Student with Cancer Changed My Understanding of Exercise

MY AWARENESS OF HOW the body responds to certain kinds of movement occurred over a period of several years, and quite by accident. It was a gradual process, which is detailed in the following chapters. It began with the first student who came to me convinced that tai chi had cured her cancer. Over time, I came to realize that a large variety of chronic diseases shared a common element—an element directly affected by tai chi and similar exercises, which have unique and measurable effects on blood oxygen saturation and diffusion. It is worth noting that hypoxia (reduction of oxygen reaching various tissues or areas of the body) underlies the majority of chronic diseases plaguing society, including cancer, heart, lung, and kidney disease, stroke, and diabetes. Hypoxia is also implicated in asthma, chronic pain, and immune disorders.

My research and experiences consistently supported that many of the health benefits of tai chi and forms of qigong (breathing exercises) had to be the result of a physiological response related to enhanced blood oxygen saturation and diffusion, a mechanism that was distinctly different from aerobic and anaerobic forms exercise in that it had direct and beneficial effects on hypoxia. By default, this meant

At Death's Door

"The doctors had tried everything—chemotherapy, radiation, nothing seemed to work. All that happened was that my hair fell out, and I was in constant pain. I was taking five of the maximum doses of pain pills daily, but with little effect. Then a friend told me they read about a guy with brain cancer being cured by an exercise called tai chi. By the time I learned about tai chi, my doctor told me I had about three weeks left to live. Not ready to give up, I looked for a class and found one at the community college. The teacher made me a video that night, which would talk me through the form. A little over a week later, I was completely off of pain pills. If nothing else, that was worth it. And although I am still battling cancer, three weeks has come and gone, and two years later I am still alive."

—Kathy (Personal account)

that a third “new” category of exercise must exist. My research and observations pointed to a dynamic state of relaxation and enhanced respiration as underlying the primary mechanism of action. This “third school of fitness,” which I call Metarobics, for reasons described below, is being developed out of the slow movements of tai chi, as well as forms of yoga and qigong when focused on relaxation and the breath.

Everyone knows that exercise is good for one’s health. It can enhance strength, cardiovascular health, and even mental health. Yet even highly fit people still get sick, experience degenerative diseases of the bones, joints, and organs, and are subject to cancer and many other ills, albeit less frequently than their sedentary counterparts. Based on a growing body of research and testimonies from those who have benefited from tai chi, Metarobic exercises may add another component. Metarobic exercises enhance fitness at the cellular level, which, in conjunction with a healthy diet and other forms of exercise, could supply the missing element in total health and immunity to make a person as free from illness, degenerative disease, and cancer as possible.

These exercises have profound health effects for many conditions, yet they are not fast-paced enough to be considered truly aerobic. Indeed, some qigong movements and standing yoga poses are stationary, with a focus on slow, relaxed breathing. Nor do these practices work the large muscle groups the way strength training does. Tai chi is sometimes categorized as a “low to moderate” aerobic exercise, particularly if you “up” the intensity. However, focusing on speeding up the movements of tai chi in an attempt to make it a form of aerobic exercise may negate some of the benefits unique to totally relaxing the body through slow movement.

From an intuitive perspective, because such a wide range of health benefits are being attributed to these forms of exercise, it seems likely that something unique is going on in the body. My research supports this and sheds light on what will become a whole new field of exercise. Fifty or so years ago running was almost the sole domain of track and field, and the concept of running for your health was considered unusual. I can recall stories of people running along city streets who would be asked jokingly, “What are you running from?” The rapid

A Miracle, or Tai Chi?

“After I retired, I ended up getting rheumatoid arthritis which developed rapidly. The doctor said before long I would be unable to walk, and would need a wheelchair. By the time I heard about tai chi, I could barely stand on my own. I began practicing every day, doing tai chi in my wheel chair, and soon I could do it standing. The doctor was surprised at how much progress I made in less than six months after starting tai chi. He was dubious about tai chi, but said to keep with it. I am glad I did, because before two years had passed, I was pain free and able to walk on my own. I completely recovered my former health and mobility, maybe even more so. Seeing the changes in my body, the rheumatologist was calling it a miracle. Maybe it was—the miracle of tai chi.”

—Elisa Morella (From *Tai Chi for Health Institute Newsletter*)

gyrations of modern aerobic programs could have gotten one committed to an asylum. It wasn't until 1968, with the release of the groundbreaking book *Aerobics*¹ by Dr. Kenneth Cooper, that the concept of aerobic health was popularized, along with a new word for a new form of exercise.

Dr. Cooper noted that those with large developed muscles from body building exhibited poor performance in running, swimming, and cycling. Based on these observations of differences between runners and weightlifters, he coined the term *aerobics* and founded a new field of health. Now there are few who are not aware of how important it is to perform some form of aerobic exercise at least a few days every week. It would be easy to assume that our current understanding of aerobics is fairly well established—it is now a multibillion-dollar industry and is a well-established field of study within the health and kinesiology departments of many universities. It is easy to assume that we now know everything there is to know about the body and how it works, so much so that it is equally easy to make the assumption that movement is movement is movement.

But as far as alternative forms of exercise go, there are still new frontiers and ways of moving for health and fitness. Current research on alternative forms of health and fitness such as tai chi and forms of qigong is primarily oriented around the benefits of these exercises, and there is little research into how or why these exercises provide benefits. In research studies on the health benefits of tai chi and qigong, often no reason is given for the benefits for various conditions. Alternatively, benefits may be attributed to a vague concept of “qi” as “vital energy,” or as a mystical force. This is further discussed in chapter 2, “Qi: Science or Magic?” As long as these exercises result in measurable benefits, it may seem to matter little why or how their benefits are derived. But a greater understanding of the physiological mechanisms involved will help to better research, promote, and understand a growing field of health and fitness.

In a collaborative overview of the unique differences between tai chi and similar exercises, Drs. Linda Larkey, Roger Jahnke, Jennifer

Etnier, and Julie Gonzalez² noted that what differentiates tai chi and related exercises from conventional forms of exercise is a focus of the mind on the body while using breathing as a vehicle for deep relaxation. The authors note that based on differences from aerobic exercises, a new category of exercise needs to be defined, one involving meditative movement.

This brings us to Metarobics (sometimes spelled Metaerobics) as forms of movement distinct from aerobic and anaerobic modes of exercise. The theory of Metarobics is centered on the unique way the body responds in relationship to oxygen use during slow, relaxed movements. I use the word “Metarobics” for two primary reasons. The first is that blood oxygen measurements show that slow, relaxed movements, coupled with deep abdominal breathing, maximize blood oxygen saturation and diffusion to every cell of the body. With the root “meta” (meaning “above”), Metarobics thus becomes “above aerobics,” as an enhanced way of using oxygen in the body.

Neither strength training nor cardiovascular exercise in the traditional sense, Metarobics is a very different way of moving distinct from traditional exercise, affecting the body in ways as novel as those in which aerobics differs from strength training. This is not to discount the benefits of aerobic exercise and strength training, which are still necessary for a healthy life. But it may point to an additional medium of exercise that can enhance current activities and total health, or provide a form of exercise for those unable to participate in more vigorous activities.

The second reason Metarobics is a good term for these exercises relates to preliminary research that indicates that higher levels of blood oxygen saturation and diffusion enhance metabolic function, to optimize cellular functioning and health. In this case, the word “Metarobics” relates to enhanced oxygen-based metabolism. When you engage in aerobic or anaerobic exercise, the large muscle groups command the supply of oxygen in the body. This is considered the primary reason you get stomach cramps if you eat before intense exercise, as the blood is drawn from the organs and is redirected to the

From Immobility to Freedom

"I was diagnosed with peripheral neuropathy and told that there was nothing to be done... just inevitable immobility. I was barely able to walk, and had difficulty getting in and out of a chair, was chronically fatigued, depressed, and despite pain meds, continued to have intense cramping in my arms and legs at night. I found it impossible to do much of anything. Then I was introduced to tai chi, and began practicing regularly. One year later I was able to walk completely unaided, except for a walking stick. My blood pressure and cholesterol/triglyceride levels were within normal limits. My blood pressure medicine was cut in half by my physician four months after starting tai chi. I have no more chronic fatigue, and sleep well at night with little or no cramping. My balance has improved; I walk faster and more evenly... I no longer use a cane. I can get up from most chairs easily. A year into practicing tai chi and I am a much healthier and yes, a much happier person."

—Saundra (Posted on the Tai Chi for Everyone website)

muscles. The effect of redirected blood flow is felt as cramps in the stomach, but also affects every organ in the body, including the brain. This is why it can be hard to think after intense exercise. This momentary redirection of blood flow is worth the long-term aerobic benefits, and further stresses the benefit of Metarobic exercise. It is worth noting that cancer is almost unknown in the oxygen-rich environment of the large muscle groups³ (see chapter 3, "Metarobics and Cancer").

Research indicates that the following two factors lie behind many if not most of the remarkable benefits of tai chi and similar exercises. Research supports that the following two factors may affect a wide variety of physiological responses in the body, including the production of proteins and amino acids involved in metabolic function.⁴

- 1) Reduced muscle tension, combined with slow, full breaths, results in greater blood flow and oxygen distribution throughout the entire body (including the organs), as opposed to more vigorous

forms of exercise that result in blood flow being redirected to the large muscle groups.

- 2) Increased blood oxygen saturation, oxygen use, and diffusion result in, or are an indication of, enhanced metabolic function, with a resultant increase in the disease-fighting and healing abilities of the body.

Measurable differences indicate that if enhanced blood oxygen saturation, diffusion, and oxygen use are not the direct causes of the many benefits attributed to these exercises, they are at least an indication that something unique is going on in the body—something different from conventional exercise, which results in no change or even a drop in blood oxygen saturation, depending on intensity.

The research presented in this book supports the observation that exercises such as tai chi, and forms of yoga and qigong that focus on relaxation and the breath, have distinct mechanisms of benefit unique from conventional exercise. The many studies presented that implicate hypoxia (the reduction of oxygen reaching various tissues or areas of the body) in a wide range of chronic conditions indicate that Metarobics is on the right track.

Results of Measurements during Tai Chi and Other Exercises

In a series of studies documenting the effects of tai chi on blood oxygen saturation, compared to conventional exercise, tai chi practice was shown to result in a significant increase of one to three percentage points. Walking resulted in no significant change, while vigorous forms of exercise resulted in a drop in blood oxygen saturation of up to six percentage points or more.⁵ The more vigorous the exercise, the greater the drop was shown to be. An increase of one to three percentage points may not sound like much, but considering that a typical range for blood oxygen saturation is 95 to 99 percent, even one percentage point is a 25 percent increase in this range.

Blood oxygen saturation refers to the amount of oxygen carried by arterial blood, and can be measured using a pulse oximeter. Blood is oxygenated in the lungs, as oxygen molecules are transferred into the bloodstream. According to the Mayo Clinic,⁶ if blood oxygen levels are low (below 90 to 95 percent), the body cannot function properly, resulting in hypoxemia, shortness of breath, and high blood pressure. Chronically low levels of blood oxygen saturation below 90 percent can result in death. Blood oxygen saturation level is one of the standard measures taken in emergency rooms, along with pulse and blood pressure.

Ongoing hypoxemia can result in shortness of breath and high blood pressure. It also has a higher association with the development of cancer, according to a growing body of research discussed in chapter 3. Hypoxemia, or low blood oxygen saturation, can affect a number of conditions. Dr. Chenchen Wang, a researcher at Tufts Medical Center, and colleagues conducted a review of fifty-seven studies and thirty-four case series on the use of hyperbaric oxygen for wound treatment.⁷

Breath-Focused Yoga for a Drug-Free Life

"I was active, running, weight lifting and [engaging in] another yoga practice, but still had chronic issues with asthma and high blood pressure. I thought I'd gotten all the benefits I could from exercise. Then I began a form of yoga with a focus on breathing exercises. At that time I was using 2 medications for my blood pressure and 4 daily medications just to control my asthma (6 during bad periods). As I've very slowly progressed in my practice, I've been able to drop medications gradually, with the supervision of my physician of course. First one blood pressure medication, then the second. Now I'm off all my asthma drugs, including the rescue inhaler. This morning I ran with no asthma medication for the first time ever. I can't tell you how good that felt. I'm feeling great, minus the thousands of dollars of drugs I needed just six months ago."

—Margaret (From the Bikram Yoga St. Louis website)

Hyperbaric oxygen therapy is based on the premise that raising tissue oxygen levels will enhance the natural wound-healing ability of the body. Dr. Wang and colleagues noted that wounds tend to have a reduced oxygen supply (hypoxia), which makes it difficult for the body to heal them. Aside from wound treatment, hyperbaric oxygen therapy has also been used to treat gangrene, infections, and radiation injuries. This may account for why tai chi may have helped Kathy with her radiation therapy. Studies on the effects of hypoxia and hypoxemia support that slow-moving exercises such as tai chi, as well as forms of qigong and yoga that focus on relaxation and the breath, may be a vital element in health as well as in the prevention of disease. Relaxation and a focus on the breath may be key components, as indicated by the case story above. Forms of tai chi, yoga, and qigong that involve faster paces or a focus on strength may not yield the same benefits.

Research related to blood oxygen saturation is but the first step—possibly an important one, based on the implications of hypoxia in many chronic conditions, presented in the following chapters, and the central role of *qi* (or “air,” as literally translated)⁸ in the attributions of health benefits from a traditional Chinese perspective. The importance of this will be discussed in chapter 2.

Studies on the Effects of Tai Chi on Blood Oxygen Saturation

As mentioned above, aerobic forms of exercise consistently result in a drop of blood oxygen saturation ranging from one to six points, depending on intensity. In a study on the effects of walking on blood oxygen saturation, over 200 individuals were tested during a six-minute walk. No significant changes were found in either direction.⁹ Another study on the effects of high-intensity exercise found an average drop of 2.9 percentage points during cycling and a 4.9 percentage point drop during running in endurance athletes.¹⁰

But what of the effects on blood oxygen saturation of exercises such as tai chi, which focus specifically on relaxation, the breath, and enhancing oxygen use in the body? The next step was to measure those who practiced tai chi. The blood oxygen saturation of thirty-one practitioners was measured during the practice of tai chi using a fingertip pulse oximeter, a small electronic device that measures blood oxygen saturation.⁵ Measurements were taken during the grasp the bird's tail, brush knee, and part the horse's mane sections of the Yang-style tai chi form. Yang style is considered one of the most representative as a slow-paced style of tai chi.

These three sections of the form were chosen due to their focus on relaxation. Later measurements confirmed that the kicking section and repulse the monkey, which involves lifting one leg into the air, and movements that include sinking down to the ground, such as snake creeps down, do not result in the same degree of increase in blood oxygen saturation. The differences and implications related to variance of movements are discussed later in this book.

The study included students with a mix of experience ranging from less than two months to a period of several years, as well as three participants who had been practicing tai chi for five to fifteen years. The average increase in blood oxygen saturation in the thirty-one participants was 1.29 points, with a zero to three point range. The three participants who showed no increase had been practicing for less than two months and were focused on learning the form.⁵ I later had the opportunity to measure eight practitioners in an ongoing senior tai chi class. All participants in this class had been practicing tai chi between ten and forty years. This group exhibited a 1.92 average increase during tai chi, with scores ranging from a one to three point increase from resting levels.

The above findings prompted the question, Would a person who had never practiced tai chi get similar benefits from following a simplified section of the tai chi form? What would happen if a person with no experience followed simplified movements, with a focus on

No Bones about It, Tai Chi Restored My Health

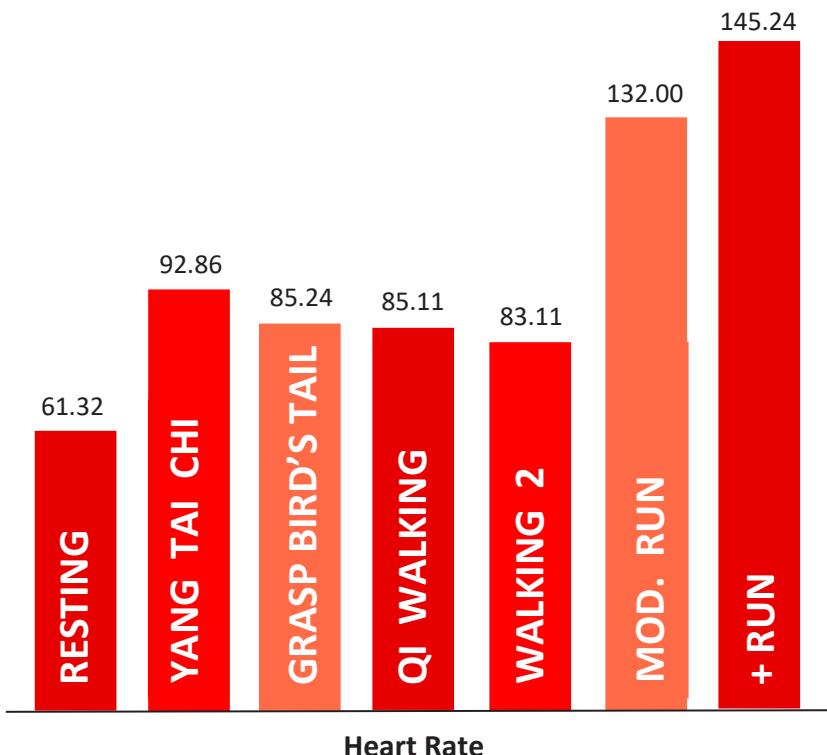
"I began tai chi six years ago due to osteoporosis. I swam regularly, but using weights was out of the question, and my walking was limited. Then I started tai chi. My bone density is back to normal, and I can now do so much more, thanks to tai chi."

—Carol (From *Tai Chi for Health Institute Newsletter*)

relaxation and the breath? A participant who was a regular runner was recruited to compare oxygen saturation during running and tai chi. He had no experience with tai chi. A repeated measures study was conducted to determine effects. A repeated measure study is the equivalent of measuring one person thirty times, or thirty people once. This format has the benefit of controlling for differences between individuals.

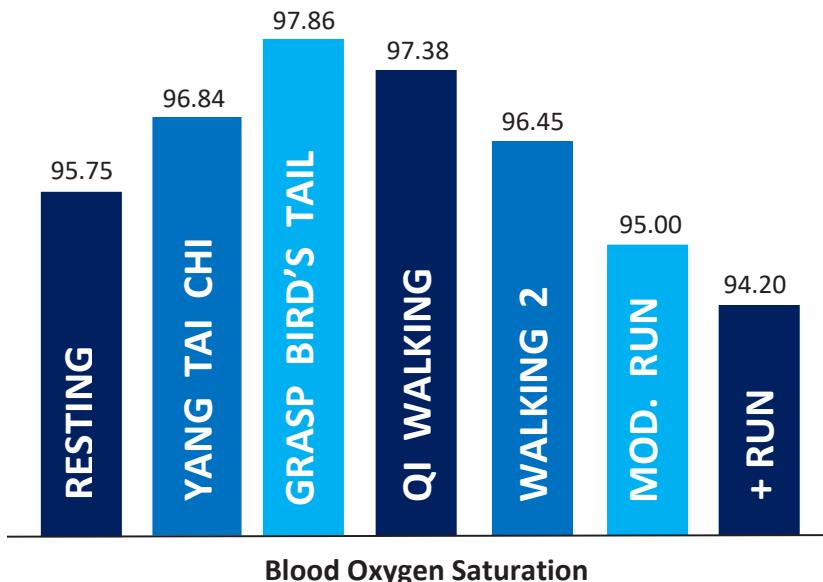
His average resting blood oxygen saturation level was 96.25, with a resting heart rate of 68 beats per minute. Running on a treadmill at a moderate aerobic intensity increased his heart rate to an average of 133 beats per minute and resulted in a drop in blood oxygen saturation to an average of 95.83 percent. However, when following the grasp the bird's tail section of the tai chi form, with verbal cues and a focus on relaxation and the breath, his blood oxygen saturation level increased to an average of 97.22 percent.

I then conducted a series of measurements in a healthy fifty-year-old male using a variety of exercises, including "qi walking," which incorporates tai chi principles of relaxation and abdominal breathing during walking.¹¹ This individual had practiced tai chi and qigong for approximately forty-five minutes almost daily for over twenty years, and had been running one to two miles, three or four times a week, for about three years. During these measurements, I was able to continuously monitor blood oxygen saturation throughout the entire 108-step Yang form to get an overall average for heart rate and blood oxygen saturation.



Heart rate for fifty-year-old subject. Heart rate for Yang tai chi is the average heart rate across all movements, including kicking and sinking down on one leg (such as snake creeps down). Grasp the bird's tail is a stationary series of movements in tai chi involving shifting of weight, but no stepping. Walking 2 is regular walking, as opposed to qi walking, which involves focus on relaxation, deeper coordinated breathing, and maximizing body dynamics during walking.

Measurements showed that the highest increase in oxygen saturation occurred during the grasp the bird's tail section. In over a hundred measurements during tai chi practice, results were the same. Average blood oxygen saturation increased by one to three points, depending on the movement. During more strenuous movements, such as the kicking section and snake creeps down, there was either no increase in blood oxygen saturation or only a mild increase.

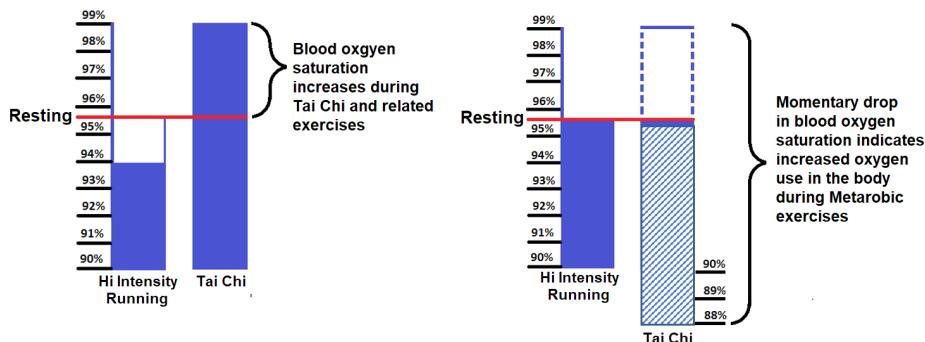


Blood oxygen saturation (SpO_2) for fifty-year-old subject.

Normal walking resulted in a mild but statistically nonsignificant increase, with a range of readings both below and above the subject's resting blood oxygen saturation levels. But when the principles of relaxation, efficiency of movement, and deep breathing were applied while walking, the effects experienced were similar to those from tai chi and qigong exercises, with an increase during all measurements. The two graphs present heart rate and blood oxygen saturation during various exercises, including tai chi movements, qi walking, regular walking, moderate and high-intensity running, and comparison to resting levels.

However, during these measurements, I noticed that if the fingertip pulse oximeter was left on after the completion of tai chi, something remarkable happened within the minute or so following. Blood oxygen saturation returned to resting levels, but then continued to drop for a brief moment, to levels well below normal (88–92 percent). Oxygen levels would then return to resting levels. Such a drop for an extended period of time would be a cause for concern in the medical

community, but in these measurements, such a brief drop indicates not only that blood oxygen saturation levels are enhanced during tai chi but also that the body is using oxygen at a much higher rate. On occasion, when the blood oxygen saturation did not drop, the participant would yawn. One reason for yawning can be a drop in blood oxygen saturation levels. This higher rate of oxygen use in the body during Metarobic exercises would explain why these exercises have demonstrated significant effects for such a wide range of chronic conditions for which hypoxia is a complicating factor. The research on these conditions and the implications of hypoxia, as well as the benefits of tai chi and related exercises, are presented in chapters 3 through 6.



Blood oxygen saturation during and after high-intensity running (85 percent of maximum heart rate) and during and after tai chi.

Maximizing Metarobic Effects

Those forms of exercise that focus on relaxation, efficient movement, and slow, deep breathing yield consistently higher blood oxygen saturation levels, as well as feelings of enhanced oxygen diffusion. This includes relaxation- and breath-focused forms of qigong and yoga. Since one of the drawbacks of traditional formats of tai chi is the long learning curve, I developed an easy-to-follow format. This format consisted of shifting the feet back and forth in place through the range of movements found in tai chi, focusing on movements that

maximize Metarobic effects. My teacher mentioned that a similar format was used by political prisoners, when space was limited, by switching steps in place. He jokingly called this jail cell-style tai chi. This format maximizes relaxation and movement to the point that blood oxygen saturation remains elevated throughout the form. With a focus on being single-weighted (which is described more fully in chapter 7), balance can also be enhanced. Death from falls is the leading cause of accidental death and injury in older adults.¹² So aside from Metarobic benefits resulting from slow, relaxed movements with a focus on the breath, it should also be kept in mind that there are many auxiliary benefits, including psychological benefits related to mindfulness, addiction treatment, and stress reduction (discussed in the conclusion).

Drugs for Life, or Tai Chi?

"I suffered from a lot of pain as a result of various sports injuries over the years. I was suffering from shoulder and neck pain, as well as pain in my right hip. I was also suffering from bone problems and inflammation. My doctor had told me that I had osteoarthritis in my neck, and that I would have to take anti-inflammatory drugs for the rest of my life. Since doing tai chi, I do not have pain anymore, and do not need to take those drugs. After practicing tai chi for six years everything has gotten better."

—Solange (From the Sing Ong Tai Chi website)

Understanding of the physiological mechanisms behind the benefits of tai chi, qigong, forms of yoga, and other Metarobic exercises does not invalidate the efforts of anyone looking for the mysterious, but it does offer a scientific explanation of benefits, and can help to maximize practice for optimal effect. Practitioners of forms of tai chi, yoga, and qigong have reported benefits similar to those of many medications taken to relieve chronic pain and inflammation,¹³⁻¹⁶ but without the severe side effects. These side effects can include heart attack, stroke, skin and allergic reactions, ulcers, and death. However,

you should never stop taking or alter medications without first talking with your doctor on how to best integrate tai chi or other Metarobic exercise as a complementary practice.

According to the Centers for Disease Control and Prevention (CDC), seven out of ten causes of early death are preventable through lifestyle changes.¹² Metarobics offers a simple avenue to add a new dimension to life—a dimension that can reduce stress, enhance sleep, and help your body to function more efficiently to combat a wide variety of ills. Although Metarobics is no substitute for a balanced diet and a complete exercise regimen that also benefits from cardiovascular, strength, and stretching exercises, it does add a new dimension and a way to enhance health, particularly for those who are limited in their ability to exercise.

Metarobic exercises can cover a wide spectrum of mindfulness-based practices, exercises that focus on unifying the mind and body through the breath. Although the focus of this book is on tai chi, Metarobic principles, as noted earlier, can apply to a wide range of mindful practices, including qigong, yoga, and even sitting meditation. All of these practices share the common characteristic of a focus on relaxation, full, deep breaths, and body alignment. Although sitting meditation may not be seen as an exercise per se, new research on meditation supports findings that Metarobic benefits for health, aging, and longevity may be tied to effects of enhanced oxygen-based metabolism and diffusion on telomerase production. Telomerase is an enzyme that can have a protective effect on telomeres. Telomeres are end caps on our chromosomes that affect health and the aging process. Longer end caps are associated with longer life spans and improved health.

Over the course of our lives, telomeres are lost every time cells divide. And cells have a limited number of times they can divide. When they lose this ability through the course of aging they can no longer replicate and become enlarged. Prematurely shortened telomeres lead to cell death and aging. Modern medicine is looking at drugs and medication that can preserve telomere length. But aside from medication, there is also evidence that Metarobic effects gener-

ated by a relaxed physiological state, and the focus on the breath in tai chi, qigong, yoga, and even in seated meditation, may also affect telomere length.¹⁷

So what does this have to do with tai chi, Metarobic theory, and health? Put simply, studies have found that stress can result in the shortening of telomeres.¹⁷ Meditation, including moving forms of meditation such as tai chi, can help offset hypoxia, in addition to reducing stress. Stress results in a highly reactive physiological state as well as tense muscles. This further impacts oxygen levels in the body, inhibiting the body's ability to heal itself.¹⁸ Since Metarobic theory supports that mindfulness-based practices enhance blood oxygen saturation and diffusion and oxygen-based metabolism, benefits may extend to optimal telomerase activation and maximized telomere length.

Dr. Elizabeth Blackburn, who has done research on telomeres and meditation, shared the 2009 Nobel Prize in Physiology or Medicine for discovering how chromosomes are protected by telomeres and the enzyme telomerase. In a *Scientific American* interview, she discussed the effects of telomerase on telomeres and aging.¹⁹ Dr. Blackburn notes that telomerase helps prevent the shortening of the telomeres, and thus acts as an anti-aging enzyme. However, she also notes that too much telomerase can help confer immortality on cancer cells and actually increases the likelihood of cancer. She further notes that too little telomerase can also increase cancer risk by affecting the healthy regenerative potential of the body.

To reduce cancer risk and enhance optimal health, the body needs an ideal level of telomerase. Complementary exercises such as tai chi, qigong, meditation, and related exercises can help achieve this naturally, theoretically maximizing optimal effects through a Metarobic response. This is important to consider, in that trying to affect telomerase levels artificially through drugs is not yet a precise science, in an area in which Dr. Blackburn states does not have a whole lot of room for error.

Further support for a Metarobic approach relates to factors listed by Dr. Blackburn, one of which is oxidative stress. Prolonged elevation

of stress hormones or prolonged inflammation can increase oxidative stress, which relates to Metabolic theory. She notes that higher levels of psychological stress (which increases oxidative stress) result in premature cell aging. The end effect is that even persons in their thirties or forties exposed to high levels of oxidative stress may show signs of aging in their cells.

Dr. Blackburn also participated in a review of literature relevant to using meditative- or mindfulness-based practices to reduce the effects of stress, and the relationship to telomere length and the aging process.¹⁷ The review concluded that there is considerable support that mindfulness-based practices (including tai chi) may have beneficial effects on telomere length. The primary mechanisms identified included reduction of cognitive stress and stress arousal, as well as increased positive states of mind and hormonal factors that may promote telomere maintenance (such as through optimal levels of telomerase).

All of these factors would relate to Metabolic theory, optimal oxygen-based metabolism and cell functioning, and potential effects on hypoxia, as noted above. Tai chi and related exercises are reputed in China to be exercises of immortality and longevity. Science is proving that the “immortals” of China may have the right idea—relax, breathe, and let your body function at its optimal level, uninhibited by stress and tension.

CHAPTER 2

Qi: Science or Magic?

Experiences with Language and the Mysteries of Qi

TAI CHI AND SIMILAR EXERCISES are yielding phenomenal results for a large variety of health concerns. When I began collecting case stories for this book, I was amazed at the number of people who have benefited from these exercises, often in dramatic ways. That tai chi and various qigong exercises increase blood oxygen saturation indicates that it is no coincidence that the Chinese word “qi” (pronounced “chi”) is so strongly associated with these exercises. Despite qi’s common association with the metaphysical and energy work, at its most basic level qi is best understood from its literal translation as “air.”

Pacemaker-Free through Tai Chi

“I had to have a pacemaker due to bradycardia. I was told that I would need a pacemaker the rest of my life. I became depressed, gave up running, and began using antidepressants. A year later I decided to try tai chi. Initially I could barely finish a class, but within two months I noticed improvements. I returned to my cardiologist, and was told that my heart was now regulating normally, and that I no longer needed the pacemaker. I am now off of all medications for depression and hypertension as well. I am also now running again.”

—Ted (Personal account)

In most Chinese-English dictionaries (such as the *Oxford Chinese Dictionary*¹) the Chinese word “qi” is directly translated as “air.” Some Chinese-English dictionaries take into account cultural aspects of the language. One dictionary even states that the concept of qi is unique to Chinese culture and cannot be translated.² This brings us back to the question of qi, which is the basic attribution behind the benefits of exercises such as tai chi and qigong. In traditional Chinese medicine, and in much of the tai chi community, the word “qi” is typically translated as “vital energy.”³ Vital energy is a rather vague term but does, however, reflect the role of oxygen-based metabolism in all of the functions of the body, including thinking, digesting, and movement, and even in healing and physical repair of the body. Tai chi is considered a form of qigong due to its slow movements and the deep-breathing component. Qigong, with “air” as the root of qi, and “gong” as “cultivation” or “work,” can be translated as “breath cultivation,” “breath work,” or even “breathing exercise.” As such, qigong can include a wide variety of exercises.

The realization of the literal translation of “qi” was one of the occurrences that prompted my understanding that efficient oxygen use was important for the health of the body. Despite its literal translation, over the years the word “qi” has come to be used for everything from “vital energy,” as mentioned above, to being described as a “mystical force which permeates the universe.”⁴ Qi is frequently relegated to the same mystical realm as the “force” of *Star Wars* fame. It wasn’t until my experience teaching English at a Chinese school that I realized that the basic Chinese view of qi is entirely different from common perceptions, one that has profound implications for a new field of health and fitness.

While teaching English at the Chinese school, I used the word “qi” as an example for something relating to the spirit. The class met my comments with confused looks, so I asked what confused them. It turned out to be the word “qi,” which to the class simply meant “air” or “oxygen.” It would be like mistaking oxygen for the word “spirit,” and saying to a group of young Catholics, “In the name of the Father, the Son, and the Holy Oxygen.”

Tai Chi—A “Mind-Body Prescription for Cancer”

“I had been diagnosed with a very aggressive form of thyroid cancer two years earlier, and had just received very bad news. The cancer had come back and my prognosis was not a good one. Thyroid cancer has the reputation of being the “good cancer” because it is often curable. Something like 93 percent of all thyroid cancers are cured with surgery and a radioactive iodine pill. Unfortunately, this leaves 7 percent of us without a cure and with a lot of anxiety. After my fourth surgery I was told that I would need aggressive beam radiation to my neck, and would need chemotherapy to make the radiation more effective. I don’t think I was ever as nervous or scared in my life. Wandering the halls of the Dana-Farber Cancer Institute, I saw a flyer that mentioned a tai chi/qigong class. I knew that most things related to the cancer were out of my control, but I had the feeling that doing something that I did have control over might be helpful. All through my difficult treatments I looked forward to doing the “Mind-Body Prescription” daily. I know that it helped me deal with fatigue, pain, muscle atrophy, and much, much more.”

—Rick (From *Tai Chi and Qigong for Health and Wellness*)

The students in the class elaborated on the word “qi,” including a point that I had been dimly aware of but only now realized was particularly significant. The Chinese character for “qi” represents steam, or air, rising from cooked rice. I looked in a Chinese-English dictionary, and sure enough, the first definition of “qi” was “air.”

The next time I met with my Chinese tai chi teacher, I asked about this concept of qi as simply “air” or “oxygen.” He explained that in most cases, qi does simply mean the air we breathe, but occasionally it can refer to other things pertaining to spiritual elements, or the nature of energy. In much the same way, the word “pneuma” was used by the ancient Greeks to describe the spirit, yet is also the root for “air” in many English words, including the pneumatic (air) pump. Ironically, in Chinese history, according to Zhang Yu Huan and Ken



The symbol for qi (chi), represented by steam rising from cooked rice.⁵

Rose in their book *A Brief History of Qi*,⁶ the word “qi” was historically used to describe air, clouds, and the atmosphere. It was not until more modern times that it became associated with more esoteric aspects.

The second incident that further prompted my realization that qi- or oxygen-based exercises may be considerably more involved than just blood pumping through the cardiovascular system came from an article I read in the *Los Angeles Times* over fifteen years ago. The article detailed the use of a “vibrating machine” by researchers at the Rehabilitation Institute of Michigan to enhance circulation, increase bone density, and reduce muscle spasms.

Feeling the Qi (Oxygen)

“Following a mild stroke, I suffered nerve damage, loss of feeling on my left side, and I had difficulty with my balance. I had been doing therapy and had seen some improvement, but it was not until I tried tai chi that something remarkable began to occur. I began to feel a tingling sensation in the fingers of both of my hands, including my left side. The class also helped with my balance and overall physical and mental health.”

—Ted (From *Tai Chi for Health Newsletter*)

Quadriplegics, being bedridden, often suffer from bedsores and poor blood circulation, and need to be turned, massaged, and manipulated on a regular basis. This is another clue that movement is a necessary requirement for proper blood and oxygen circulation. To prevent the problems associated with being bedridden, the researchers placed the patients on a large platform that would vibrate and shake up the body, similar to the way a can of paint is shaken in a paint mixer at a hardware store.

The idea was that the vibrations would distribute blood and oxygen throughout all of the cells and capillaries in the body, similar to the way color is distributed throughout a can of paint. And it worked, with some surprising results. Not only did the treatment help eliminate bedsores and poor circulation, but the patients reported what had previously been considered an impossibility—feelings in the extremities of their arms and legs, an indication of nerve regrowth. This study indicated to me that enhanced blood diffusion can result in significant health gains.

The vibrating machine has a parallel in various Chinese health exercises, forms of qigong that involve shaking the body. Many qigong exercises are based on “vibrating” the body through various exercises. As a preliminary to tai chi, one common exercise is to vibrate the body through a variety of methods, such as shaking the body up and down very rapidly, or rising up on the toes and then dropping the body so that it “jiggles,” or vibrates.

As the body is vibrated, a tingling is felt in the fingers, hands, and arms, and sometimes throughout the body, which is seen as enhanced qi flow. This tingling is also felt during tai chi and various qigong practices. Thinking about this brought me to the realization that slow movements of the body in exercises such as tai chi and qigong may be a health exercise as important in its own right as aerobics and strength conditioning.

Further supporting the premise that exercises such as tai chi enhance oxygen diffusion throughout the entire body is the incidence of stomach cramps that follow vigorous exercise after a large meal.

During vigorous aerobic exercise, the large muscle groups rob the internal organs of oxygen in order to meet the muscular demands of intense exercise.

Tai Chi Saved My Life

"Dr. Roger Jahnke, author of *The Healing Promise of Qi*, recounted the story of a man with malignant brain cancer. A network of tendrils entwined the brain and made surgery impossible. The man went to China, where he learned and practiced tai chi and qigong, in conjunction with herbal and other treatments. A year later, the tumor had shrunk and became benign. Surgeons were able to remove what was left of the tumor."⁷

As a result of the battle for blood between the stomach and muscles during intense exercise, the body experiences painful cramps instead of the pleasant tingling that occurs as oxygen diffuses throughout the entire body during tai chi and qigong practice. It should be noted, however, that tai chi and qigong practitioners also recommend practicing on an empty stomach. Practicing with a full stomach won't result in stomach cramps, but doing these exercises on an empty stomach may optimize blood diffusion throughout the entire body. Aerobic exercise is beneficial in that the circulatory system responds by growing stronger, with an increase in the size and number of blood vessels. But this does not mean an increase of blood and oxygen at all levels or to all areas of the body, particularly at the cellular level within the organs.

Tai Chi and Tuberculosis

"In his late twenties Cheng Man Ch'ing contracted third-degree tuberculosis and began coughing up blood. His doctors did not expect him to live more than six months. He began to study tai chi diligently and recovered his health, going on to become one of the best-known tai chi teachers of the twentieth century."⁸



Photo courtesy of Ken Van Sickle

Cheng Man Ch'ing's "Fair Lady Hands" at age seventy.

Based on the tingling feeling in the hands and arms during tai chi practice, and in the enhanced blood oxygen saturation as measured with an oximeter, I believe that Metabolic exercises such as tai chi and qigong will prove to be particularly effective at enhancing blood oxygen diffusion and metabolic function throughout the entire body, including at the cellular level. Practitioners of forms of yoga that focus on relaxation and the breath report feeling similar sensations in the body.

The many healing benefits of tai chi are supported by a growing body of scientific research, testimonials, and news accounts. When I first started tai chi practice over thirty years ago, I read an account of an autopsy performed on an older person (whom I believe the article stated was ninety or so) who had been a lifetime tai chi practitioner. The article stated that the tai chi master's organs were more typical of those of someone in their thirties or forties. As one ages, a variety of

changes occur within the body, including stiffening of the heart as well as increased arteriosclerosis. The lungs also lose elasticity, and the prostate enlarges, while bones can become brittle.⁹

Look at the photo of the hand of Cheng Man Ch'ing when he was seventy years old. In China, tai chi is said to preserve youth, reflected in what some Chinese tai chi practitioners call "Fair Lady Hands"—soft, supple, and firm skin such as is seen in a young woman. The effects of stress and tension are a growing problem in the world, and may also indicate why slow, relaxed movements may help increase oxygen flow and thereby health. A common exercise I have beginning students perform is to stand with their hands loose and relaxed at their sides. Most if not all stand with their hands hooked like claws—the result of tension in their lives. One way to gauge the skill level of tai chi practitioners is to look at their hands to see how relaxed and "unhooked" they are.



The hand on the left is typical of most people, "clawed" as the result of a life of stress and tension. The hand on the right is more typical of long-term tai chi practitioners, the result of relaxed muscle tension.

Tension results in tight muscles, curling the hands into something that looks more like claws than hands. Tense muscles can result in back strain and frozen shoulders or other limbs, in addition to claw-like hands. It is not uncommon to see the shoulder hunched up in beginning tai chi students, or the “relaxed” arm jutting out to the back due to shoulder and back tension, rather than hanging straight down in a relaxed fashion. Cheng Man Ch’ing recommended that students visualize the arms and torso as an empty coat hanging from a coatrack in order to reduce tension in the body. Tension can constrict blood vessels and capillaries, which increases blood pressure and reduces blood flow, and with it the life- and energy-giving oxygen carried by the blood.

Qigong and the Gift of Life

“I was diagnosed with terminal cancer. The doctor gave me two months to live. I suffered a lot of pain and I was so weak that I could not stand the chemotherapy or the radiation therapy. My hair dropped out. I looked into the mirror and I saw a ninety-year-old woman, even though I was only forty-nine years old. I could not eat; I hardly drank anything. Then I heard about qigong. I registered for a class, and began practicing religiously twice a day. In three weeks, I was able to eat properly and sleep like a log. Within a year the cancer was gone. Now I am seventy-five years old.”

—Huixian (Posted on the Experience Project website)

As mentioned earlier, aerobic exercise results in the flow of blood in the body being directed to the large muscle groups that are active, by constricting the capillaries and blood vessels to the organs and dilating the blood vessels in the large muscle groups. This provides hard-working muscles with the oxygen they need. Metabolic theory, on the other hand, suggests that by relaxing the muscles, blood flow and oxygen level are enhanced in all areas of the body, at what may be a metabolic level.

This does not mean that Metarobics is the best form of exercise, but it does indicate that it may be at least as valuable as aerobic and anaerobic exercise for overall health. The heart does not have to work as hard pumping blood through relaxed muscles and an unrestricted vasculature. The result is increased blood oxygen saturation and oxygen diffusion due to a relaxed body and deep breathing. Others have also made this inference, as indicated in the case story of Helen Liang, in the next chapter.

Researchers are capitalizing on the idea of using slow diaphragmatic breathing to train those at risk for high blood pressure, to dilate or open up arteries and thereby reduce blood pressure.¹⁰ Although the method is inspired by meditation practices with a focus on the breath, in this case a device is used to help patients monitor and regulate their breathing. By following tones emitted by the device, respiration is slowed to less than ten breaths per minute. The end effect is slow, deep breathing, enhanced blood flow, and reduced blood pressure. A reduction in peripheral resistance (resistance to blood flow due to constricted arteries) and enhanced blood flow have been suggested as the mechanisms of benefit as a result of the effects of slow breathing on the sympathetic nervous system.

The sympathetic nervous system helps regulate the body, activating it in response to stress—the fight-or-flight response. Long-term activation of the sympathetic nervous system can have negative effects on the body, including increased blood pressure. Slower rates of breathing have been shown not only to reduce blood pressure, but also to result in an increase in arterial oxygen saturation compared to normal breathing.¹¹ A focus on *qi*, air, the breath—however it is termed—is a key player in health and Metarobic benefits.

Metarobics and Cancer

The Battle against Hypoxia (Oxygen Deficiency) and the Experiences of Three Students with Cancer

IT WAS THE EFFECTS of Metarobic exercises on three of my students with cancer that really prompted my curiosity as to how these exercises might be having such dramatic effects on the body. This was the final clue that oxygen use in the body was considerably more critical and comprehensive than just generating chemical energy for the large muscle groups. The first student came to me on the last day of the semester, stating simply that tai chi had cured a cancerous lump in her wrist. I am not convinced that the lump in her wrist was cancerous, since cancer is uncommon in this area, but her comments caught me by surprise. After making sure she was seeing her doctor regularly, I thought no more of it.

Two years later another student told me a similar story. He did not want to go into detail, but he said the cancer he had did not respond to chemotherapy until he started tai chi. His cancer disappeared shortly thereafter. Then a year later, during the summer session, a third student, Kathy, who was in the last stages of cancer, came to my class. White as a sheet and wearing a bandana to cover her loss of hair, she told me that she had been through all forms of chemo and radiation therapy, but to no avail. Her doctors told her she had about three weeks left to live.

As mentioned in her story in chapter 1, Kathy was not ready to give up, and decided to try alternative therapies. She had read that tai

Tai Chi and Qigong Helped Me Battle Lymphoma

"Helen Liang had a rare and aggressive form of lymphoma. Chemotherapy failed to eliminate the cancer, and her doctor felt she had only about two weeks left to live. Her father, a famous kung fu master (Liang Shou-yu) began Helen on an intensive practice of qigong, tai chi, meditation, and alternative forms of Chinese and Western medicine. Helen states: 'I was more relaxed, and I was doing qigong and tai chi with my dad every day. We'd go out and do all kinds of qigong because it's good for you to stay outside and get a lot of oxygen. That's supposed to kill cancer cells.' With all the practices she engaged in, it would be hard to single out tai chi and qigong, but for a long time it was a focus of her practice, and is still a regular part of her life seventeen years later."

—Martha Burr (From *Kung Fu Tai Chi Magazine*)

chi can help with cancer, so she came to me. That night I made her a video that talked her through the form. The next day I gave it to her, going over the form with her. Three weeks later, not only was she still alive, but she was completely off the pain pills she had been taking. Up to this point, she had been taking five maximum doses of morphine a day. Two years later she was still taking the tai chi class before moving to the Northwest to fulfill a lifelong dream.

At this point I knew there really was a possibility that tai chi could have a direct effect on cancer and other conditions. With the first two students, it could have been the radiation and chemotherapy that had made the difference. But the extreme state of this student indicated that tai chi, as well as the qigong exercise Ba Duan Jin (also known as the eight pieces of silk brocade exercise), which was also included on the video and in class, was a major influencing factor.

Following the improvement in Kathy's condition, I began researching cancer, and found that there is an extensive body of research related to hypoxia (oxygen deficiency) and cancer. Research into the literature on cancer treatment, described below, indicated that effects

on hypoxia and blood oxygen diffusion may be a primary element related to benefits of tai chi for cancer and many other conditions.

During this research, I came across the works of Nobel Prize winner Otto Warburg.¹ He found that among the primary types of cancer, affecting over 70 percent of cancer patients, oxygen restriction seemed to play a critical role. He observed that cancer grew in areas deprived of oxygen, documenting that tumor cells develop a modified sugar-based metabolism (glycolysis) rather than an oxygen-based metabolism, with hypoxic (oxygen-deficient) areas surrounding the tumor site. It is not known why cancer cells do this, but current research is offering support that beneficial effects occur from boosting oxygen levels around tumors, which may permit more efficient delivery of chemotherapy and the body's own healing agents.

Part of this research is the work being done at the Birck Nanotechnology Center at Purdue University.² Dr. Teimour Maleki and colleagues developed a device based on the idea of enhancing tumor oxygenation. The team created an ultrasonically powered micro oxygen generator (IMOG) that can be implanted at the site of the tumor. The IMOG device generates oxygen at the site of the tumor, boosting the cancer-fighting power of radiation and chemotherapy. The device has been used with significant effects in pancreatic tumors in mice, generating oxygen and shrinking tumors faster than without the device.

Tai Chi Was the Best

"A colleague's wife did some tai chi and qigong in the final stages of her cancer. She was desperate to try anything that might help. My colleague said that of all the complementary therapies she tried, the one that gave her the most relief from the pain, and helped her anxiety and stress, was tai chi."

—David (From "Tai Chi: The Energy Within," Cancer Active website)

That enhanced tumor oxygenation resulted in tumor shrinkage, even if only through assisting the effectiveness of radiation and

chemotherapy, demonstrates promise for tai chi as a cancer preventive and cancer therapy adjunct (keeping in mind that it should be used in conjunction with prescribed therapies). It is possible that tai chi may generate an effect similar to that of the IMOG device, by increasing blood oxygen saturation and diffusion and maximizing the body's own natural cancer-fighting ability.

Other studies conducted at the University of Texas's MD Anderson Cancer Center noted that the bone marrow microenvironment contains hypoxic areas that inhibit anti-leukemia drugs.³ Acute lymphoblastic leukemia cells result in marked expansion of hypoxic bone marrow areas, which results in chemo resistance. The authors noted that under conditions of normal oxygen saturation, effectiveness of various forms of chemotherapy was tied to oxygen level, and effectiveness dropped in direct relation to low oxygen levels. The researchers suggest that drugs that target hypoxia may help eliminate leukemia cells within hypoxic areas, and may significantly improve leukemia therapy.

Although Metarobic exercises may not have a target-specific effect on lymphoblastic leukemia cells, benefits for cancer care reported in the case stories in this book suggests that these exercises may have a general overall effect on the cancer-fighting ability of the body, supported by theoretical elements related to enhanced blood oxygen saturation and diffusion and enhanced oxygen-based metabolism. Metarobic exercises may enhance chemo and radiation therapy, at least at a general level. This is also supported by the uniform reports of benefits for pain management from cancer patients and others who practice tai chi.

Indeed, it has been further noted that, with the central role hypoxia plays in tumor development and resistance to therapy, tumor hypoxia may be the most valuable and most effective area to target in combating cancer.⁴ This suggests that exercises focusing on enhancing oxygen saturation and diffusion throughout the entire body may have at least some effect on combating cancer and other chronic conditions. Needless to say, extensive research would be required to vali-

date and determine exact effects. Considering the dozen people in the case stories in this book who reported significant benefits during their cancer treatment leads one to ask, If 100 patients with the same form of cancer all practiced specific user-friendly forms of tai chi, qigong, or other Metarobic exercises, what percentage would benefit, and to what degree?

The Amazing Results of Qigong

"Five years ago, I was found to have cancer. I had a tumor on my larynx and throughout the five weeks of super-voltage radiation, I practiced the Eight Precious Sets of Exercises known to the Chinese as Ba Duan Jin. This was not only a great source of physical and mental well-being, but it produced tangible and somewhat amazing results. Exposure to intense radiation is expected to have its negative side effects . . . weight loss, loss of appetite, loss of sleep and a general downturn in spirit are the most typical. I am glad to say that at no time did I experience any of these. Even case hardened doctors and nurses were impressed and asked me to demonstrate the Precious Set of Eight. Today at fifty I am fit, healthy and a great believer in these exercises. I have no way of proving how much their daily practice had to do with my recovery, but I do know that they have given me a new outlook and renewed vitality."

—Geoff Pike (From *The Power of Chi*)

The literature on cancer research abounds with studies related to the effects, impact, or implications of hypoxia and cancer. Research has documented that tumors result in hypoxic areas, due to growth distancing tumor cells from the surrounding capillaries.^{5,6} Solid tumors often have large areas of acute and chronic hypoxia, which is associated with aggressive tumor expansion and poor outcomes for radiotherapy and chemotherapy. Reoxygenation is an important aspect of tumor therapy and positive response to therapy.⁵ Metarobic theory suggests that enhanced oxygen diffusion may decrease levels of hypoxia around tumor sites and increase oxygen levels in hypoxic areas.

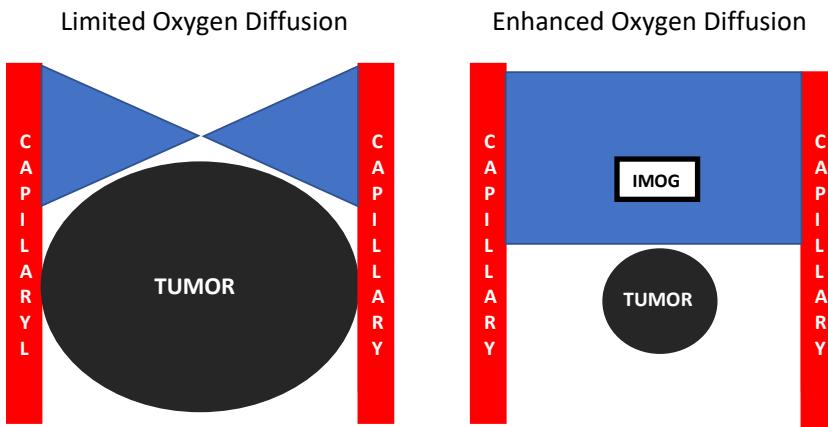


Illustration of hypoxic tumor mass (adapted from "Hypoxia and Cancer" by Brahimi-Horn and colleagues).⁵ Enhanced oxygen diffusion from the IMOG device resulted in tumor shrinkage. Metabolic effects of tai chi and related exercises may have a similar effect, through enhanced oxygen saturation and diffusion.²

As mentioned earlier, it is common when performing tai chi to feel a pleasant tingling in the hands and arms, indicating increased oxygen diffusion. By enhancing blood oxygen saturation and diffusion, it may be possible to boost oxygen delivery to hypoxic areas. One drug that is rendered ineffective by hypoxia is salicylic acid (the active ingredient in aspirin). Salicylic acid is noted to reduce the risk of colon cancer, but it has been found to be ineffective under hypoxic conditions.⁷ In a study by Karina Zitta and colleagues,⁷ the effects of salicylic acid on colon cancer cells were found to be dependent on the availability of oxygen. Greater hypoxia is directly related to the stage of cancer and treatment resistance.

Tai Chi Gives Me the Strength to Deal with Cancer

"Tai chi really gives my body strength to put up with the pains of my breast cancer and back problems. Tai chi is 'sneaky.' You don't think it's helping, but eventually you realize it's helping you."

—Unknown (From the Faulk Tai Chi website)

Remarkable Progress through Qigong

"I have gone through sixteen chemotherapy treatments and twenty sessions of radiation. I also had twenty-two blood transfusions in about five months. The medical doctors did not know what to do with me. After doing qigong, my bleeding has completely stopped after eleven weeks, which is a miracle. The doctors had given up and referred me to end of life care, and they expected me to die. A CAT scan taken five months later shows remarkable progress. I have not let a day go by without practicing my qigong."

—Cristela Gutierrez (From the Seventh Happiness School of Chi Gong website)

Dyspnea, or shortness of breath, is common in patients with cancer.⁸ The cause of dyspnea in cancer patients is not currently known. Patients with cancer were found to have reduced diffusing capacity of the lungs for carbon monoxide, as well as reduced skeletal muscle strength, resulting in shortness of breath as the body struggles to bring in more oxygen. Researchers suggest that muscle weakness in the chest and diaphragm may be one possible explanation for increased shortness of breath. Tai chi and similar Metarobic exercises may provide a method to reduce shortness of breath, either through enhancing the diffusing capacity of the lungs or by increasing skeletal muscle strength and capacity through the deep-breathing aspect, or possibly in combination.

Researchers have also noted that intermittent hypoxia can promote cancer tumor growth.⁹ In a study of 1,522 people with sleep-disordered breathing, such as sleep apnea, repeated hypoxemia (low oxygen) was found to be associated with profound metabolic disruption. Even with adjustments for age, sex, body mass, and smoking, sleep-disordered breathing resulted in a significant increase in cancer deaths of up to 4.8 times the number of deaths from cancer in the normal population.

Another indication that oxygen levels in the body may directly affect cancer development is the rare occurrence of cancer in red muscle tissue. Cancer rarely occurs in striated muscles, which are the large muscle groups that connect the skeleton, such as the leg and arm muscles.¹⁰ This may be due to the oxygen-rich environment of skeletal muscles. As observed from stomach cramps that may occur when exercising strenuously after a full meal, the major muscle groups have the ability to command the oxygen supply and blood flow in the body during exercise.

Tai chi and similar Metarobic exercises may have the benefit of enhancing blood flow to all areas of the body. Such exercises may provide a means to boost cellular health and functioning throughout the body, in ways unique from conventional exercises, impacting a wide range of health issues, including cancer prevention and treatment. And although the vote may be out in the medical community regarding a direct effect on cancer, as a whole, tai chi and similar Metarobic exercises have been found to reduce negative side effects of cancer treatment and to provide a low-impact method of enhancing health.

Studies on Tai Chi and Cancer

In a recent review of thirteen randomized controlled trials investigating the benefits of tai chi and qigong as an adjunct to cancer care, positive effects were found for cancer-specific improved quality of life, reduction of fatigue, enhanced immune function, and reduced cortisol levels.¹¹ Cortisol acts to increase blood sugar by gluconeogenesis. It also suppresses the immune system and can decrease bone formation. Researchers at the Wilmot Cancer Center at the University of Rochester in New York suggest direct effects on the regulation of inflammatory responses related to cancer treatment, and effects on overall quality of life during cancer care and treatment.¹²

A systematic inflammatory response has been observed to be associated with consistently worse outcomes in early- and late-stage cancers.¹³ Aside from anti-inflammatory effects of tai chi, benefits

Doctors Call Me a “Walking Miracle”

“Conventional cancer treatment didn’t work the first time. I was resolved to find alternative measures to find healing. After six, seven months of both medical treatments and qigong I am completely healed. My cancer’s gone. My doctors call me a ‘walking miracle.’”

—Karyn (From the Spring Forest Qigong website)

have also been reported for bone density. Tai chi can also have an effect on antioxidant capacity, which can affect cancer development. Following eight weeks of tai chi classes four times a week, participants in another study experienced an increase in aerobic responsive anti-oxidant enzymes and plasma total antioxidant status.¹⁴ Antioxidants are important for fighting oxidative stress-related metabolic diseases, which can result in toxic effects damaging all components of a cell, including proteins, lipids, and DNA.

Oxidative stress is considered a primary factor in the development of cancer, as well as in Parkinson’s disease, Alzheimer’s, heart disease, and many other conditions. Oxidative stress is the result of activated oxygen molecules (reactive oxygen), which can cause cell damage. In short, and in plain English, oxygen-based metabolism results in harmful by-products, in much the way burning gasoline in a car results in harmful pollution to the environment. Tai chi and other Metarobic exercise, based on these and other studies, may reduce or reverse oxidative stress by enhancing the process of oxygen-based metabolism, reducing harmful by-products.

Current studies strongly indicate that tai chi and related exercises enhance metabolic processes. This would account at least in part for many of the benefits of Metarobic-based exercises. By enhancing efficient use of oxygen throughout the entire body, Metarobic exercises may impact everything from the metabolic process to the manufacture of proteins and other molecules, as noted in the discussion of a study by Dr. Kuender Yang¹⁵ in chapter 6, “Metarobics for Immunity,

Diabetes, and Pain.” Metabolic exercises, from tai chi to forms of yoga and qigong, and new exercises yet to be developed, may be a major missing link for total health and disease prevention.

Not a Hair Lost during Chemo Thanks to Yoga

“My yoga teacher told me of a woman with brain cancer who had undergone surgery, but had then been given three months to live. She then began yoga with him. He said it was four years since she has been cured. So I had my mother do yoga, since she had been diagnosed with stage three cancer of the uterus. Doctors had given my mother a 25–30 percent chance of survival. She did chemotherapy and radiotherapy sessions simultaneously with the yoga therapy, which included a diet regimen. My mother is doing absolutely fine now. She did not lose even a strand of hair despite intensive chemotherapy.”

—Bhavna (From the Health Site website)

Conclusion

From the roots of qi as “air” to my experiences with three students with cancer and a growing body of research, it became obvious to me that there are measurable mechanisms related to oxygen behind many if not all of the health benefits of tai chi and various forms of qigong and yoga. Physiological mechanisms for benefits do not necessarily discount elements related to energy work, or metaphysical and mystical elements, for those who are fascinated by the range and depth of these exercises. See the conclusion to this book for a discussion of the more esoteric elements of these exercises. Indeed, spiritual aspects have even been attributed to exercises such as running, not to mention the runner’s high.¹⁶

Use the material in this book to enhance your health if you find it meaningful to your condition. Nevertheless, readers are cautioned to keep their doctor’s advice in mind as well. If using any of these

exercises for a medical condition, use them in conjunction with your doctor's recommendations and in consultation with your doctor. Tai chi classes, styles, and teaching methodology can vary considerably as well, as elaborated on in chapter 7, "Essential Elements of Metarobics and Tai Chi for Therapy."

CHAPTER 4

Metarobics: Heart Disease, Stroke, and Kidney Disease

Dealing with the Pressures of Life

CARDIOVASCULAR DISEASE, also known as heart disease, is strongly linked to diet and inactivity, and is the number one cause of death in the United States. Plaque buildup in the arteries that supply blood to the heart is called coronary artery disease. Plaque buildup is generally the result of a diet high in saturated fats. The plaque literally clogs the arteries so that blood cannot get to the heart in sufficient quantity, much like a clog of hair creates a slow-moving drain. Atherosclerosis, or hardening of the arteries, is also caused by a buildup of plaque.

Restricted blood flow to the organs can result in hardening of the arteries due to increased pressure on the arteries. Heart attacks can result from heart disease when blood clots and is prevented from reaching the heart. According to an American Hospital Association report, currently one in three American adults have some form of cardiovascular disease.¹ The Centers for Disease Control and Prevention (CDC) states that heart disease accounts for almost 700,000 deaths each year in the United States.² Heart disease is also almost entirely preventable.

The key element in relation to Metarobic theory is restricted blood flow to various areas of the body, in this case the heart or brain, which can also increase blood pressure. Metarobic exercises such as tai chi relax muscle tension in the body and have a direct effect on

Tai Chi Prevented a Heart Attack

"Maggie told me that she had been a longtime tai chi practitioner but did not do other exercises. She went in for a stress test, and the doctors were surprised to find that her arteries were over 90 percent blocked. Maggie was rushed in for a bypass, but following the operation her heart would not resume a regular heartbeat. She was told that she would need a pacemaker. The doctors were about to send her back into the operating room. But for some reason, Maggie felt that if she could just do tai chi, her heart would be okay. She asked to be left alone for an hour and did tai chi. When the doctors came back, her heart had stabilized. The doctors were surprised, and told her, 'Whatever you are doing, keep doing it.' Maggie stated, 'The moral of the story is that even with tai chi, a good diet and cardio exercise are still necessary, but tai chi did keep me going until I got the bypass, and got my heart back to beating normally. So now I do both (cardio and tai chi).'"

—Personal story related at a tai chi workshop

blood pressure, documented in numerous studies (highlighted below). It is also possible that enhanced metabolic function via tai chi may even affect cholesterol metabolism. More efficient cholesterol metabolism may help moderate the balance of HDL cholesterol, which carries away deposits from the arteries, and LDL cholesterol, which leaves deposits and can lead to a heart attack or stroke. Hypoxia can underlie problems with managing cholesterol. According to a study conducted at Johns Hopkins University, intermittent hypoxia is associated with hypercholesterolemia (extreme levels of cholesterol in the blood) as a result of obstructive sleep apnea, which can occur as a result of intermittent or partial blockage of the airways during sleep.³

Beneficial effects of tai chi on blood pressure are related to the slow pace of the exercise and its focus on relaxation. Blood pressure is the force or pressure of blood inside the arteries. If you did not have any blood pressure, the pumping of the heart would have little effect

on moving blood throughout the body. It would be like the anemic trickle of water that comes from a shower that has low water pressure. Higher water pressure means more water moving through the pipes. Too much water pressure and the pipes could burst. The same is true for blood vessels as well as for the heart—if there is too much pressure in the heart, it becomes enlarged, and pumping efficiency is reduced.

Tai Chi Lowered My Chronic High Blood Pressure

“I had chronic high blood pressure, and suffered from tense neck and shoulder muscles from the stress at work. I was on the verge of burnout and at risk for cardiovascular disease, when I started tai chi. Since I learned tai chi, my blood pressure is back to normal, and I have a feeling of peacefulness and well-being that I carry into my work and family life. I would recommend tai chi to everyone—you have nothing to lose and so much to gain!”

—Natalie (Posted on *Tai Chi for Life Online Magazine*)

The dynamic state of relaxation generated from tai chi and similar Metabolic exercises may relax not just the large muscle groups, but also the arteries. Researchers at the University of North Texas noted a relationship between flexibility and arterial health as determined by the sit-and-reach test (sitting on the floor and seeing how far you can reach toward your toes).⁴ Supple arterial walls require the heart to work less to pump blood throughout the body, while stiff arteries require the heart to work harder, and can contribute to a greater risk for heart attack and stroke. The researchers found a significant relationship between flexibility and arterial stiffness—the stiffer and less flexible the participants were, the higher the readings they had in arterial stiffness.

Before I started tai chi, I could barely reach past my knees in the sit-and-reach test. After several years of tai chi and qigong, my flexibility increased to where I could bend over and place the palms of my hands flat on the floor. This was before I began any kind of stretching regimen. As I got older I realized the importance of stretching, par-

ticularly after exercising, so I now also stretch after vigorous exercise. However, although tai chi and related exercises may result in more efficient blood flow, and possibly even greater arterial flexibility, there is no evidence to date that it can reverse or prevent plaque buildup.

Ultimately, it may be important to develop a multifaceted exercise program, one involving aerobic, anaerobic, *and* Metarobic exercise, as well as stretching. Although tai chi is not classified as a vigorous exercise, the relaxation and breath aspects are a valuable addition to an aerobic program, as highlighted throughout this book. In my own practice, I also engage in various forms of cardiovascular exercise and strength training, using exercises based on traditional kung fu aimed at the total health of the mind and body, thus working to enhance health from a Metarobic, aerobic, and anaerobic perspective.

Metarobic exercises are important for the relaxation aspect, for promoting an unrestricted pliable vasculature and lowering blood pressure, which research supports as helping to prevent heart attacks, stroke, and kidney disease. Although we tend to think of muscle tension as affecting just the large muscle groups, arteries are composed of sheaths of smooth muscles, which can also be affected by muscle tension. Even mental tension, in the form of various stressors, can result in constriction of blood vessels, raising blood pressure.⁵

Tai Chi Controls My Blood Pressure

"My blood pressure was edging toward an unhealthy high, but I did not want to take drugs. I was fortunate in that my doctor supported trying tai chi first. As I continued with tai chi my blood pressure gradually dropped. After several months, my blood pressure had dropped from 150/90 mmHg to 134/82. Every time I do tai chi I feel so much better. I have even learned to control my blood pressure when I get stressed. When I begin to feel stressed, I can practice tai chi's open-close breathing, and it lowers my blood pressure almost immediately."

—Marilyn (Posted on the Heart Healthy Living website)

Calcium channel blockers are prescribed for people with high blood pressure to chemically reduce muscle tension in arteries, as well as to relax blood vessels, to create a greater capacity for blood flow. These drugs also slightly relax the heart muscle, resulting in a slower heartbeat, which also reduces blood pressure. Calcium channel blockers are used to control blood pressure to help prevent strokes, heart attacks, and kidney disease. But like many medications, calcium channel blockers also carry a risk, sometimes fatal.⁶

Tai chi practice and the theories involved in Metarobics are new enough that exact mechanisms have not been scientifically verified. But it is worth investigating if the dynamic state of physical relaxation extends not just to the large muscle groups but also to tension in all of the muscles of the body, including the artery walls and heart. The existence of a mechanism related to the relaxation component of tai chi seems probable from an intuitive perspective, and is worth future research to determine the exact mechanism. The rest of this chapter details studies on the benefits of Metarobics exercises on blood pressure and relevant conditions.

Strokes and Tai Chi

Strokes can also result from cardiovascular disease, and are the third leading cause of death in the United States, following cancer. A stroke can be considered a “brain attack,” the blocking of an artery to the brain by a blood clot, or the rupturing of a blood vessel in the brain. According to the National Stroke Association, 80 percent of strokes are preventable.⁷ Strokes and heart attacks can both result from high blood pressure, which is considered one of the most important modifiable risk factors.

Smoking, alcohol use, and being overweight can increase your risk for stroke as well as the risk of heart attack and kidney disease. Surprisingly, tai chi may also help to control addiction to nicotine, alcohol, and other substances as a form of mindfulness-based meditation. Mindfulness-based practices have been used to target addiction to

Tai Chi Helped Me Recover My Life after a Stroke

“Four years ago I had a minor stroke which affected my left side. I experienced weakness, loss of balance, and I was inclined to throw my left foot when walking. After three weeks of therapy at a local hospital there was some improvement, but I was very stressed about it. Then my doctor suggested I try tai chi. I attended that class for two years. I am happy to say that my balance has improved 80 percent, my strength 70 percent, and I no longer throw my left foot. I can once again enjoy long walks.”

—James (Posted on the Tai Chi Fitness for Health website)

destructive behaviors for over a millennium. Research indicates that mindfulness-based practices have applications for physical addictions as well, a subject discussed in the conclusion of this book.

Returning to increased risk factors for stroke, people with high cholesterol can experience higher blood pressure during stressful situations than those with lower levels of cholesterol.⁸ This also supports the benefits of exercises such as tai chi, as meditative exercises for dealing with stress, as well as for relaxing muscle tension. As noted earlier, research indicates that high cholesterol may reduce the ability of blood vessels to relax and constrict normally, since blood vessel constriction results in an increase in blood pressure.⁸ Tai chi has been demonstrated in numerous studies to be effective in lowering blood pressure. Tai chi may also help maintain or restore a normal heartbeat, as noted by the case story of Maggie presented at the beginning of this chapter. Atrial fibrillation is an abnormal heartbeat, which can increase the risk of stroke by 500 percent, causing blood to pool in the heart, which may form a clot and result in a stroke. Although approximately 87 percent of strokes result from blocked arteries as a result of blood clots or buildup of plaque and other fatty deposits (called ischemic strokes),⁹ blood vessels in the brain can rupture due to weak spots in the walls of blood vessels, resulting in hemorrhagic strokes.¹⁰

Tai Chi, Tension, and the Gift of Life

"Bill, a longtime tai chi practitioner, went in for a complete physical, including a stress test. Fairly shortly into the test, the doctors stopped it and scheduled an emergency quadruple bypass. Doctors were amazed that Bill had not had a heart attack up to this point—his arteries were 95 percent occluded. Bill attributed not being short of breath or experiencing other signs of coronary blockage to his tai chi practice. He felt that the relaxed state of his body permitted maximum blood flow through the blocked arteries. Following the bypass, Bill began a vigorous walking program in conjunction with his tai chi, to reap the benefits of both a relaxed body as well as a stronger cardiovascular system."

—Personal account related at a tai chi practice

Some qigong (breathing) exercises may act in other ways to reduce the risk of stroke as well, by momentarily increasing blood pressure to strengthen artery walls. This would need to be confirmed through research, but it is a premise worth investigating. Ba Duan Jin (also known as the eight treasures or eight pieces of silk brocade exercise) may strengthen blood vessel walls in healthy adults as a result of brief momentary spikes in blood pressure during poses that are performed inverted or while holding the breath. During the movement known as press the earth, touch the sky, the hands touch the toes, or as low as you can reach. When you bend over, the blood pressure in the head spikes only momentarily, since the body is well designed to respond quickly to changes in body position. This movement may help strengthen the blood vessels of the brain, again by momentarily stressing them so that they respond by growing stronger.

There are also two poses performed with a momentary holding of the breath that may increase internal pressure during the range of movement. Needless to say, scientific studies would need to be conducted to verify the exact benefits of these poses. But from a theoretical viewpoint, increasing internal pressure for brief moments, in addition to strengthening the blood vessel walls, may also enhance

diffusion of life-giving blood and the elements it carries, including oxygen molecules, by enhancing osmosis through the cells of the body.

Needless to say, inverted poses may not be beneficial for those who have uncontrolled high blood pressure or other risk factors for stroke, which stresses the importance of discussing any new health routine with your doctor. The same may be true for those poses in which the body is momentarily “pressurized” by holding the breath while going through a pose. These movements, performed for only a few seconds, may provide benefits for healthy adults, but should be discussed with your doctor if you are in doubt. Those with uncontrolled high blood pressure or other conditions may be advised to avoid anything that may cause blood pressure to rise, even if only momentarily.

It should be noted that some forms of martial arts, including qigong, use unorthodox methods of breathing for prolonged periods to “pressurize” the body, to make it more resistant to blows. These forms of breathing may actually cause dangerous increases in blood pressure, and over time may lead to severe health problems, including heart failure. In ancient times, when a person’s life may have depended on surviving various battles, such a practice may have been worth the trade-off for a shorter life expectancy, but for modern practice it is generally better to stay away from more esoteric forms of breathing.

Diaphragmatic or abdominal breathing has been shown to be safe and effective, and a much healthier way of breathing than shallow chest breathing. For most qigong exercises this is the best form to use. More details on breathing for tai chi and qigong are given in chapter 7, “Essential Elements of Metarobics and Tai Chi for Therapy.”

Tai Chi and Kidney Disease

High blood pressure is also a major risk factor for kidney disease, which is another leading cause of early death in the United States.

Kidney disease, also known as renal disease, is the result of conditions that can damage the kidneys. Damaged kidneys can result in the buildup of wastes in your blood, which can result in a wide range of health concerns. Diabetes can also cause kidney disease.

Tai Chi Saved My Life from Kidney Disease

"Luo Ji-Hong got kidney disease sometime in his thirties and ended up needing surgery, during which his left kidney was removed. It was also discovered that his right kidney was deteriorating as well. The doctors said there was nothing they could do. Luo's kidney was failing, and he was given five months left to live. A friend suggested he try tai chi. Luo decided to try it, and from then on he left the hospital every morning to practice tai chi at a local school. Luo and the doctors were amazed, when he began to feel better after just a month of practice. After an examination, the doctor found that his remaining kidney had stopped deteriorating. The internal bleeding had also stopped. Six months later Luo was back to a healthy weight, to the amazement of his doctors. Thirty years later he was still practicing tai chi, knowing it had saved his life."

—Luo Ji-Hong (From "Luo Ji-Hong: A Life through Tai Chi")

According to the American Heart Association, high blood pressure can seriously affect kidneys due to the dense supply of blood vessels in the kidneys and the high volume of blood flow.¹¹ Kidneys filter blood through small finger-like nephrons. Damaged arteries result in a reduction of blood flow and the ability to filter blood, and lessen the supply of essential oxygen and nutrients to the kidneys.

It is interesting to note that hypoxia and lack of oxygen are also mentioned in the various studies related to the development of kidney disease reviewed below. Since Metarobics is new as a theory of health and exercise, a good deal of scientific testing needs to be conducted to verify and document exactly how Metarobic-based exercises may affect kidney and other diseases, but the trend and observations indicate an important area for future research. As for the relaxation

factor in reducing blood pressure and possible effects on kidney disease, it is worth noting that the American Heart Association states that managing blood pressure is an important part of prolonging kidney health.¹¹

Kidney hypoxia has a pivotal role in the development and outcome of acute and chronic kidney disease, according to a growing body of research.¹²⁻¹⁶ Chronic hypoxia has been identified as a probable central mechanism of and a final pathway to chronic kidney disease involving a loss of renal function. When local metabolism is disturbed by an imbalance between oxygen supply and consumption, hypoxia can result.¹²

Researchers have observed that the body can respond to hypoxia through a protein called hypoxia-inducible factor, which can help the body to fight hypoxia by causing cells to regress to a less differentiated cell type.¹³ However, hypoxia-inducible factor is also implicated in cancer under negative conditions, and overall can result in the synthesis of fibrous tissues interfering with the kidney's normal filtering functions. In light of the fact that a discrepancy between oxygen demand and availability is common to most chronic kidney diseases,¹³ Metarobic exercises may enhance positive conditions. Evidence suggests that this may be a result of negative effects of a hypoxia-inducible factor, and the restoration of oxygen supply, resulting in the support of healthy metabolic function.

The kidney is particularly sensitive to oxygen delivery,¹⁴ supporting the premise that benefits for kidney disease resulting from exercises such as tai chi may be due to enhanced oxygen delivery and diffusion. Since kidney hypoxia has a pivotal role in the development and outcome of acute and chronic kidney disease, hypoxia has been viewed as a prime target for therapeutic interventions.¹²⁻¹⁵ Hypoxia can also result in inflammation with the progression of kidney disease, since hypoxia signals injury to the body. This signal results in an increase of immune cells, leading to inflammation.¹⁵ Therapies targeting hypoxia have the potential to reduce the progression of kidney disease. Tai chi therapy may be one viable option.

Even more relevant to the theory of Metarobics is a study conducted at Lariboisière Hospital in Paris.¹⁶ Researchers noted that microvascular dysfunction may result from an imbalance from a variety of factors, such as mitochondrial dysfunction and activity of alternative oxygen-consuming pathways. This can lead to decreased kidney oxygen supply. It was noted that a reduction in microcirculatory oxygen supply may contribute to kidney dysfunction. Kidneys have lower oxygen reserves than other organs and are even more susceptible to reduced capillary blood flow. Future studies on the effects of Metarobic exercises on capillary blood flow and kidney oxygen supply may yield some promising benefits as a means to enhance blood flow throughout the muscles *and* the organs.

Scientific Studies on the Effects of Tai Chi on Blood Pressure, Heart Disease, and Stroke

The effect of tai chi on blood pressure is one of the most studied areas in tai chi research. Dr. Gloria Yeh, a researcher at Harvard Medical School, along with three colleagues, conducted an extensive review of studies examining the effects of tai chi on cardiovascular disease, associated risk factors, and blood pressure.^{17,18}

Clear Speech and New Feeling through Tai Chi

"I started tai chi because of my stroke. My body is different now, and not only has it helped me with balance, my friends have noticed improvements too! My speech has become clearer and my step is more sure-footed. I can navigate steps that once intimidated me. I am also noticing new feelings in my left arm and leg."

—Bob (From "Tai Chi Chih: What Others Are Saying")

One study reviewed consisted of an eight-week program for patients recovering from an acute heart attack (myocardial infarction). This program resulted in a significant reduction in systolic and diastolic blood pressure in the tai chi group. Participants were randomly assigned to either a tai chi group or an aerobic exercise group. The aerobic group exhibited a decrease in systolic blood pressure, but not in diastolic blood pressure. Tai chi reduced both factors. The tai chi group also experienced a decrease in resting heart rate. Participants in this group also had a higher rate of class attendance compared to those in the aerobic exercise group.

Two studies in Dr. Yeh's review examined the effect of tai chi on heart failure. Tai chi resulted in a significant increase in exercise capacity, as measured by a six-minute walk test. Participants also experienced improved disease-specific quality of life and had a significant reduction in the blood level of the polypeptide BNP B-type natriuretic peptide, which when high is an indicator of excessive stretching of heart muscle cells. In another study comparing tai chi, moderate-intensity walking, and low-impact aerobics, all three groups experienced a similar reduction in blood pressure. The tai chi group had the highest attendance and regular practice in this study as well.

Regular exercise has long been advocated as a way to reduce or prevent high blood pressure, and Metarobic-based exercises provide one more option. Dr. Yeh also noted a study that reported significant reductions compared to normal hospital care in total cholesterol, low-density lipoprotein, and triglycerides using a twelve-week tai chi program for patients with hypertension. Overall, it was suggested that tai chi may be particularly valuable for those who cannot participate in more vigorous forms of exercise.

Studies conducted since Dr. Yeh's reviews continue to support the benefits of tai chi for lowering blood pressure. Tai chi has been shown to have a direct effect on baroreflex sensitivity in those with coronary heart disease.¹⁹ The baroreflex is a physical mechanism for maintaining blood pressure. High blood pressure triggers a decrease in heart

rate, which results in lowered blood pressure. In a comparison of a conventional cardiac rehabilitation program to a program that also included tai chi, the conventional care group showed no significant changes in baroreflex sensitivity, while those in the tai chi group demonstrated statistically significant improvement.

High blood pressure is such a concern for cardiovascular health that it is one of the most studied areas, yielding a number of reviews. An extensive review conducted in 2012 further supported benefits from tai chi, which included a significant increase in quality of life as measured by the Minnesota Living with Heart Failure Questionnaire, as well as a decrease in the polypeptide BNP, which, as mentioned above, is an indicator of excessive stretching of heart muscle cells and is a marker used to diagnose heart failure.²⁰ Benefits were also reported for better sleep quality and improvement in left ventricular ejection fraction, a measurement of how much blood is pumped out of the main chamber of the heart. Other benefits reported included a significant improvement in peak rate pressure product, which is an indirect measure of myocardial work. These results were in comparison to standard care, which led to no change. Tai chi also resulted in an increase in peak oxygen uptake and exercise intensity compared to a slight decrease in a walking group.

The reviewers concluded that tai chi may improve cardiac function, modify risk factors, enhance quality of life, and improve heart rate, heart rate response, blood pressure, baroreflex sensitivity, blood volume ejection, peak oxygen uptake, and exercise intensity.²⁰ Overall, tai chi practice improved a large variety of factors important for controlling or preventing high blood pressure. It is also important to note that no adverse effects were reported, unlike with some forms of blood pressure medication, which can result in a variety of unintended effects, including death if too high doses of medication are taken. This again indicates the importance of following any regimen closely with your doctor.

Another study conducted at the University of Liverpool compared an older adult group of sedentary women to a comparable group en-

rolled in a tai chi class.²¹ At the end of the twelve-week period, the tai chi group experienced an average decrease in systolic pressure of 9.71 and an average decrease in diastolic pressure of 7.53. The women in the tai chi group experienced significant improvements not just in blood pressure but also in balance. It is worth noting that falling is a major risk factor in older adults, being the leading cause of accidental death and injury.

From a Metarobic perspective, it is particularly worth noting the increase in peak oxygen uptake. In this case, researchers believe the mechanism of action may be related to the improvement of microcirculatory function. One of the basic premises of Metarobics is that it positively affects microcirculation and enhances blood diffusion. It is also important to not overlook the mind/body connection of these exercises, particularly in relation to stress. Research suggests that tai chi has an effect on the physiological stress management mechanisms as well, which is discussed in the conclusion of this book. Tai chi has also been used successfully for survivors of stroke in order to enhance balance, quality of life, and mental health.²² Chapter 7 presents the structural and practical aspects of tai chi that enhance balance.

The Medical World Needs to Know about Tai Chi

"Following a stroke, I was unable to walk more than fifty feet or so, and ended up confined to a wheelchair. I heard about a program for wheelchair tai chi, and began going twice a week. Two months later I could walk and even climb stairs without help, and got back some use of my left arm. I feel like I have accomplished something, and it's easy and fun. The medical world should be aware that people need something like this."

—Mrs. B. (From "Tai Chi as Medicine," Kungfumagazine.com)

From a Metarobic perspective, tai chi may also benefit those suffering from heart disease by bringing in extra oxygen through the deep breathing aspect and through enhanced blood flow and microcirculation,

by creating a relaxed body and unrestricted vasculature. Preliminary evidence suggests that tai chi may result in more efficient function of the autonomic nervous system and overall physiological function of the body and relevant hormones, to moderate blood pressure through a variety of mechanisms. The above research supports that tai chi and related low-impact exercises are a particularly valuable adjunct for cardiac rehabilitation, under a physician's supervision and in conjunction with conventional care.

Other Considerations

Although tai chi aids in relaxing muscle tension and directly impacts blood pressure, it is not vigorous enough to have the same benefits for cardiovascular health that aerobic exercise does. A complete health regimen may need to incorporate all elements of fitness, including improved diet, aerobic exercise, anaerobic exercise, and stretching, as well as Metarobics. Tai chi does have the potential to have a positive effect on all of these categories, including an impact on diet through the development of mindfulness, as discussed in the conclusion. In addition to regular slow practice for Metarobic benefits, by also performing tai chi at full speed, similar to kung fu and karate forms, the heart rate can be elevated to aerobic levels. The traditional 108 Yang long form, which traditionally takes between twenty and forty minutes to perform when done slowly, can also be completed in under two minutes when done at full speed. This results in a fast-paced aerobic exercise that can get you as out of breath as any cycling class. Of course, it would mean doing ten to twenty repetitions of the form to get your thirty minutes of exercise. An alternative for aerobic conditioning is to repeat individual movements at a fast pace, similar to the way Billy Blanks adapted kickboxing in his popular Tae Bo exercises. I have used this method in college classes with great success to demonstrate the versatility of tai chi. Traditional martial training using tai chi includes a “fast set” of tai chi exercises.

The need for some basic form of strength training, valuable for enhancing functionality into old age, can be met by using wrist or hand weights to increase muscle tone in the upper body. The knees and legs are strengthened through the bent knees and lowered stance used when performing tai chi. Incorporating tai chi weapon sets can also add an element of strength training, as well as aerobic exercise when the weapon sets are performed at higher speeds. Traditional forms of tai chi, originating as a martial art, also included various weapons practice, such as use of the straight sword and the broadsword. Systematically rotating the way you practice tai chi can provide cardiovascular and strength benefits as well as Metarobic benefits from slow, relaxed practice.

CHAPTER 5

Metarobics, Lung Disease, and Asthma

Better Breathing through Tai Chi and Qigong

METAROBIC EXERCISES such as tai chi and various forms of qigong, having been developed to maximize efficient use of oxygen and respiration, can have positive effects on the many conditions associated with forms of chronic respiratory diseases. Chronic lower respiratory disease is the third leading cause of death in the United States. It can result from a variety of factors and is an umbrella term for a variety of conditions. Essentially, chronic respiratory disease can be seen as an ongoing difficulty with breathing. The two primary forms of chronic respiratory disease are asthma and chronic obstructive pulmonary disease (COPD).^{1,2}

The Centers for Disease Control and Prevention (CDC) states that approximately 25 million people in the United States have asthma, or about one out of every twelve people, and that this number is growing every year.² Another 13.1 million Americans have been diagnosed with COPD, with 24 million more adults living with impaired lung function, which is an indication and precursor of COPD.¹

COPD is an umbrella term for two lung diseases, emphysema and chronic bronchitis, characterized by obstruction to airflow that interferes with normal breathing.¹ This chapter also looks at the promising elements of Metarobic exercises for asthma, since asthma shares some elements in common with COPD, as a chronic long-term respiratory

Tai Chi Helped My Asthma, and Cured My Back Pain Too!

"I developed asthma more than twenty years ago. For the last fifteen years, I have had to use an inhaler several times a day. After starting tai chi, my posture improved and in seven to eight months there was dramatic improvement. I no longer feared not having my inhaler with me, and over time stopped carrying it. As I write this, I realize that except for one setback, I have not had an episode in two to three months. And my back pain has disappeared too."

—Kenneth G. (Posted on ChiArts website)

disease that inflames and narrows the airways and interferes with breathing.

Cigarette smoking is the primary risk factor in the development of COPD. It is worth noting that 85–90 percent of COPD deaths are caused by smoking.¹ COPD and other conditions such as asthma are a result of damaged or inflamed airways restricting air intake. Emphysema and chronic bronchitis tend to coexist, having a further negative impact on quality of life, the end result of which can be living with oxygen bottles and mechanical respiratory assistance.¹ A growing number of studies, reviewed below, support the benefits of tai chi for alleviating symptoms of chronic respiratory disease and indicate that its practice may help compensate for damaged airways.

Tai chi and forms of qigong may also benefit upper respiratory conditions. If my sinuses are congested when I begin my own practice, by the end of tai chi or the eight treasures breathing exercise they open up completely and any congestion disappears. This may be due to enhanced blood flow through the sinus passages, which can reduce swollen sinuses. Auxiliary qigong exercises that involve pounding the chest can also bring up congestive matter from the lungs, which allows the body to expel it more easily.

Note: Despite the affirmation of how tai chi helped Kenneth G.'s asthma, it is not recommended to discontinue carrying an inhaler unless approved by your doctor.

Tai Chi More than Doubled My Lung Function

"I was diagnosed with emphysema in 1994. Like many people, I was a shallow breather. Tai chi breathing taught me how to exercise unused portions of my lungs and strengthen them. In 2000, a lung function test showed an increase from 17 percent to 47 percent."

—Walter (From Energy Arts website)

Essentially, tai chi and many forms of qigong, by maximizing optimal use of oxygen in the body, are beneficial for any condition, but particularly for chronic breathing diseases and conditions. An added benefit for smokers, aside from permitting more efficient oxygen exchange, may be effects on smoking cessation efforts as a result of enhanced states of mindfulness. Mindfulness of smoking cues and triggers can short-circuit unconscious habitual behaviors and lead to smoking cessation, which is discussed more in the conclusion. Smoking cessation is the single most effective means of reducing the risk of COPD or slowing its development.¹

Meditative practices have long been used to create greater levels of awareness toward the cessation of addiction. Although meditation and mindfulness are often geared toward a more general behavioral perspective, such as addiction to negative thoughts, behaviors, and relationships, such practices can be valuable for all forms of self-destructive behaviors. Tai chi was used with great success in a smoking cessation program at the University of Miami.³ Participants experienced an overall smoking cessation rate of 83 percent.

I have had three of my own students tell me they quit smoking due to tai chi, as a result of becoming more aware and in control of their smoking habits. One student even stated that until he took the tai chi class, he had never before contemplated quitting smoking. Tai chi as a mindfulness-based practice is described further in the conclusion, which explains how tai chi and other forms of moving meditation can be used to gain greater control and awareness of addictions and addictive behavior.

Studies on Tai Chi, Asthma, and COPD

Dr. Chenchen Wang and colleagues, with the Division of Rheumatology at Tufts Medical Center, conducted an extensive review on the effects of tai chi for patients with various chronic conditions.⁴ Benefits were reported for cardiovascular and respiratory functions, in addition to benefits for flexibility, immunity, strength, arthritis symptoms, and psychological effects. The main drawback identified was a lack of theoretical foundations regarding the mechanism of benefit.

Tai Chi Regulated My Lung Function

"I suffer with a chronic lung condition called cystic fibrosis. This affects the mucus membrane of the lungs and clogs the airways of the lungs, shrinking lung capacity and making breathing short or difficult. It also affects the processes of the digestive system which is not able to absorb nutrients properly. Often intravenous antibiotics are required to help maintain good lung function. When I had done my first tai chi class I felt so refreshed, vitalized and happy that I decided to come along and join in on a regular basis. The following week I returned to the class and have continued to do so since right up to the present day. The benefits of attending a tai chi class are many. My lung function has increased by 200ml and my weight has increased. My overall health is fantastic, considering I have cystic fibrosis. I use tai chi daily to help with coping with cystic fibrosis, regulating my lung function. All in all tai chi has saved my life."

—Karl (From "Testimonials," Mindful Tai Chi website)

The theory of Metarobics may present the missing link, as a mechanism related to a state of dynamic physiological relaxation combined with slow, deep breathing, as exercises that enhance blood oxygen saturation and diffusion, through an unrestricted vasculature. Enhanced physiological functioning benefits all mechanisms of the

body, including a beneficial increase in associated T lymphocytes and the various chemicals and hormones within the body. See chapter 6 for more on the role of tai chi in immunity.

Other studies have supported the benefits of tai chi for COPD through improved lung function and tolerance for activity. One particularly large study involved 206 COPD patients who were randomly assigned to one of three groups—a tai chi group, a walking group (combined with a focus on breathing), and a nonexercise control group.⁵ The tai chi group experienced significant improvements on the six-minute walk test and in breathing capacity, as well as for COPD condition. The walking group had no change in condition or measurements, while the nonexercise control group experienced a decline in function on all measures.

A smaller-scale study investigated the effects of tai chi on pulmonary function (lung volume and lung capacity) in asthmatic children.⁶ Fifteen children were enrolled in a twelve-week tai chi program and compared to fifteen who did not do tai chi. All children in both groups had comparable levels of pulmonary function and severity of asthmatic symptoms before the start of the program. At the conclusion of the program, the children in the tai chi group experienced significant improvement in pulmonary function, compared to no change in the children who did not do tai chi. The tai chi group also reported benefits for asthmatic symptoms.

Tai chi practice has been documented to result in significant improvements in peak flow, which is the amount of air that can be pushed from the lungs, as well as asthma control and quality of life measurements.⁷ Asthma patients were also able to increase maximum oxygen consumption. Tai chi was noted as a potential effective non-drug adjunct therapy for those with persistent asthma, based on research findings. A growing body of research supports a variety of benefits for people with breathing disorders.

From a more purely Metabolic perspective, related to reversing hypoxia, it should be noted that even as early as 1967, researchers observed that hypoxia may play a role in asthma symptoms as a result of

narrowing airways.⁸ Acute attacks can result in uneven ratios in the amount of air reaching the alveoli (small balloon-like structures in the lungs where oxygen exchange takes place), compared to the perfusion of blood reaching the alveoli. The researchers believe that this may result in arterial hypoxia more often than had been previously noted. It is interesting to note that oxygen is administered to asthmatics to alleviate hypoxia if blood oxygen saturation falls below 92 percent.

It would be worth studying any effects Metarobic exercises may have on the ventilation-perfusion ratios of oxygen in the alveoli and the reversal of hypoxia. A recent overview of hypoxemia (an abnormally low concentration of oxygen in the blood) in patients with COPD notes that as symptom severity increases, so do hypoxia and hypoxemia.⁹ Long-term oxygen therapy has been shown to improve conditions in patients with severe hypoxic respiratory failure, but the authors of the study state that optimal treatment for patients is uncertain. It is hoped that tai chi therapy may prove to be one such optimal treatment, pending further research.

Tai Chi Helps My Asthma Attacks

"As an asthma sufferer for many years, I find tai chi helpful in many ways. While concentrating on relaxed abdominal breathing with open and closing hands, slowing my breathing down, and using imagery to relax my mind, along with relaxing shoulders, I find I can reduce an attack in most situations."

—Chris (From the Tai Chi for Health Institute website)

Yangsheng qigong¹⁰ has been used in China as a form of therapy for bronchial asthma. A six-month study of thirty asthma patients found significant benefits from these exercises on the amount of air that can be expelled from the lungs. Lower levels of peak airflow are an indication of constricted airways. Benefits were also found for reduced rates of hospitalization, fewer sick days from work, and reduced

antibiotic use, as well as lower rates of emergency treatment compared to a control group that received standard care. Since inflammation is also prevalent with these diseases, Metarobic exercises, as a potential anti-inflammatory, may also help provide relief from inflammation associated with asthma and other chronic lower respiratory diseases. See chapter 6, “Metarobics for Immunity, Diabetes, and Pain,” for more details on the anti-inflammatory effects of tai chi.

Metarobics for Immunity, Diabetes, and Pain

Enhancing Quality of Life

AS NOTED EARLIER, the Metarobic response resulting from exercises such as tai chi and various forms of qigong has been shown to have a direct effect on the immune system beyond what is experienced with conventional exercise. Influenza (the flu) is the eighth leading cause of death in the United States. Influenza results in deaths primarily among older adults due to a compromised immune system. According to the Centers for Disease Control and Prevention (CDC), 90 percent of deaths from influenza occur in those sixty-five years of age or older.¹

As people age, the thymus, located in front of the heart, shrinks and can become nonfunctional in their sixties or seventies. The thymus is a gland that, aside from producing various hormones, also plays a vital role in the development of T lymphocytes (or T cells). T cells are a type of white blood cell that protects the body from bacteria and viruses.

Hypoxia has been identified as one possible cause for age-related decline in the immune system.² Researchers believe that the immune system can be manipulated with drugs to influence oxygen and hypoxia, to assist those with poor immune systems, or possibly in some circumstances help with autoimmune diseases and conditions. Since tai chi enhances blood oxygen saturation and diffusion, Metarobic exercises may have a similar effect without the need to resort to medications,

Tai Chi—Less Sickness and Better Sleep

Paul, a student at Fullerton College, was very dedicated to the practice of tai chi. Realizing the benefits of tai chi and the Eight Treasures, he religiously performed these exercises daily. Ten years after he began practicing them, he stated that since he began practicing tai chi, he has never been sick, even when in continual contact with those who had whatever cold or flu was going around. He did mention that on days when he had been overly busy and missed doing the exercises for a few days when around friends or family who were sick, he would feel the beginnings of a cold coming on. This would prompt Paul back to daily practice—and the cold would disappear. This happened often enough that he realized that there did indeed seem to be something behind the rumored benefits of tai chi and qigong for enhanced immunity. Paul finally came to the point that even when he retired at a late hour (even 2:00 or 3:00 at night), he would do at least some tai chi or qigong. Even when exhausted, he could feel energy returning. He also found that tai chi helped him fall asleep faster. Paul stated that it was almost as if his mind began entering a sleep-like state during his tai chi practice.

—Paul (Personal account)

which can have dangerous side effects. It is important, however, to keep in mind that you should never change your medications without consulting with your doctor.

Studies on the effects of tai chi practice on immunity provide support for this. A study done by researchers at the University of Illinois noted that high-intensity exercises such as high-impact aerobics can result in short-term immune suppression despite long-term benefits for cardiovascular health.³ The study showed that in comparison, tai chi practice enhanced immunity with short- and long-term beneficial effects.

Dr. Jennifer Robbins, with the Department of Internal Medicine at the University of Cincinnati, cites numerous studies that demon-

strate that hypoxia has a negative effect on proliferation and release of T cells.⁴ T cells are important for mucosal defense, for immunity, and for fighting inflammation. Dr. Robbins notes that hypoxic areas have been measured in lymph nodes, areas of inflammation, wounds, solid tumors, and bone fractures, as well as in joints with rheumatoid arthritis. The author and her colleagues state that hypoxia inhibits channels in T cells that are required for normal lymphocyte activation.

Tai Chi for a Disease-Free, Pain-Free Life

"I am convinced that tai chi has helped me with the hepatitis C virus in my body, and has helped with my immune system to prevent damage. I had been losing hope until I started tai chi. I have also been migraine free and headaches are a thing of the past. It is wonderful to be free of that chronic pain, and my energy levels and outlook on life are up. I feel that tai chi and my more holistic lifestyle are helping my immune system. I am able to do more after a year of tai chi, and I end class with a wonderful sense of well-being (I used to fall into a deep sleep, exhausted). By making tai chi a priority, I hope to decrease the hepatitis C symptoms as much as possible. Years after starting tai chi, and doing it daily, I have benefited in ways I could not imagine. Medical tests have improved, liver pain is gone, as are muscle and joint discomfort. It has given me my life back!"

—Wendy (From Wendy's Weight and Wellness website)

Tai chi practice has been shown to have beneficial effects on T cells.⁵ In a study on the effects of twelve weeks of tai chi practice, the number of regulatory T cells had significantly increased. Monocytes (large white blood cells) also decreased significantly. Lower monocyte counts are an indication of good health, since the number of monocytes increases in response to infection and chronic inflammation, indicating poor health.

Overall, the research on tai chi supports specific benefits for improved mucosal defense and a lower risk of autoimmune and inflammatory disorders.⁵ The reasons for this have not been determined,

although researchers have suggested that the benefits may be due to the overall health benefits of exercise. The theory of Metarobics suggests that beyond the general benefits of exercise, Metarobic-based exercises such as tai chi may have specific effects related to enhanced blood oxygen saturation and diffusion, effects on oxygen-based metabolism, and reversal of hypoxia.

It is worth noting that vigorous exercise for ninety minutes or more can result in adverse changes to the immune system, whereas there have been mixed reports as to the benefits of moderate aerobic exercise on antibody production.⁵ This may be a result of the body's oxygen supply being commanded by the large muscle groups during aerobic exercise, and a resulting oxygen deficit during prolonged exercise in the other organs of the body. This is often experienced as stomach cramps when exercising after eating, as muscle demand prioritizes blood supply.

Researchers have also looked at the effects of tai chi practice on virus-specific lymphocytes. A study examining the effects of tai chi on varicella zoster (shingles) virus-specific lymphocytes found a significant increase in the number of these lymphocytes in a group of older adults after fifteen weeks of tai chi training.⁶ The tai chi group experienced an almost 50 percent increase in cell-mediated immunity to the varicella zoster virus despite not receiving the vaccine, compared to no change in a comparison group. A third group received the shingles vaccine, which resulted in a 75 percent increase in the number of virus-specific lymphocytes.

Another study found that when the shingles vaccine was given to a tai chi group, they experienced a 173 percent increase in antibodies at the three-week measure, compared to a 58 percent increase in a control group that did not do tai chi but also received the vaccine.³ At the six-week postvaccine measure, the tai chi group had a 130 percent increase in antibodies compared to 54 percent in the non-tai chi group, and a 109 percent increase at the twenty-week follow-up compared to 10 percent in the non-tai chi group. This indicates the importance of

vaccination, but also demonstrates the benefits of tai chi for enhancing overall immunity. The researchers noted that tai chi may be particularly valuable in preventing or ameliorating diseases for which there is no vaccine.

It Took Two Heart Attacks and a Tai Chi Class to Be Disease-Free

"In 2002 I had a heart attack. This was followed with four years of flu, bronchitis, and pneumonia. Then I had a second heart attack. I then started tai chi, and for the last two years I have not had a cold, flu, pneumonia, or bronchitis, and less occurrence of angina. I am convinced that my health will continue to improve as I practice tai chi."

—Bruce (From *Tai Chi for Health Institute Newsletter*)

The risk and severity of shingles increase with age as the result of a decline in immunity to the varicella zoster virus. The amount of decline in immunity varies considerably from one older adult to the next, which may be due to differences in physical and emotional functioning. Psychological stress in older adults can lower resistance to herpes zoster, and depression can result in a reduction in immunity to shingles.⁶ Aside from direct physiological benefits on immunity, tai chi can also have direct effects on stress and depression (discussed briefly in the conclusion) through its mindfulness-based component as a form of moving mediation.

One last area to consider related to the practice of qigong (breathing exercises) and Metarobic effects relates to an exercise called the marrow washing exercise. Stem cells develop in the bone marrow, which can develop into the red blood cells that carry life-giving oxygen throughout the body. Scientists are coming to realize that the bone marrow may play a large role in the body's healing abilities.⁷ Scientists at King's College in London have been investigating the powerful effect on healing of a protein called HMGB1, which is secreted

in the body by immune cells.⁷ Researchers used this protein as a catalyst to activate stem cells in the bone marrow.

Dr. John McGrath, one of the researchers, noted that HMGB1 acts as a catalyst, awakening stem cells lying dormant in the body's bone marrow, and may have a dramatic impact on treating everything from rare genetic illnesses to burns and ulcers. Tai chi and other Metarobic exercises may activate HMGB1 and other healing proteins, supporting the "marrow-washing" reputation of these exercises.

Tai Chi for Mental and Physical Health

"I have had unstable emotions for more than thirty years. Now, since tai chi class, I am about 80 percent better. I am able to feel emotions without feeling as overwhelmed. In the past, I have also had symptoms of chronic fatigue syndrome. This has gone on for many years, and I felt ill more often than I felt well. Now I have much better energy and stamina, and I am sick much less often."

—Steve (From "What Our Tai Chi Students Say,"
Orange County Tai Chi Studio website)

The theory of Metarobics adds to a better understanding of how and why tai chi benefits immunity. Current understanding of benefits in research on tai chi is primarily limited to relaxation and stress reduction and to the effects of stress on the body.⁶ Research on the effects of enhanced blood oxygen saturation and diffusion, the impact on hypoxia (oxygen deficiency), and enhanced metabolic function takes this understanding one step further.

A compromised immune system can leave one vulnerable to autoimmune diseases, illness, and infection, as well as putting one at an increased risk for cancer. Based on the wide diversity of conditions that exercises such as tai chi and forms of qigong have been documented to benefit, it may be possible that these exercises boost every system of the body, including the immune system.

Metarobics and Diabetes

Diabetes, a complex condition affected by many variables, consists of a group of metabolic diseases that affect blood sugar. It can occur as a result of the pancreas not producing enough insulin or as a result of cells not responding to the insulin that is produced. The main forms are type 1 diabetes, in which the body cannot produce insulin, and type 2 diabetes, in which the body becomes resistant to insulin. Type 2 diabetes is almost always preceded by prediabetes, in which blood glucose levels are higher than normal but not high enough to be diagnosed as diabetes. However, prediabetes can still be damaging to the heart and circulatory system, and puts one at risk for type 2 diabetes.⁸

Diabetes is considered a metabolic disorder, resulting from the way the body uses digested food for energy.⁹ Because it is a metabolic disorder, it is hoped that exercises such as tai chi may indeed have a true metabolic effect via the Metarobic action described in chapters 1 and 2, with hope of either ameliorating or preventing diabetes. However, there are many complications to the disease, as well as underlying factors that will necessitate a larger body of research to truly understand the effects of these exercises on diabetic conditions.

Tai Chi Helped Control My Diabetes and Glaucoma

"I felt depressed, unhappy and stressed. I could not seem to get good control of my type 2 diabetes. Then a friend introduced me to tai chi, and it was a perfect fit. I loved to move, and it made me feel peaceful. Then a pleasant surprise came. My A1C test for glucose control came back as high normal, less than 6 percent compared to my past results which were over the target level of 7 percent. I also had been having a problem with glaucoma, but it is now under control and my vision has improved. I feel it is all because of tai chi."

—Sharon (From "What Tai Chi Means to Me,"
Dr. Lam's Tai Chi, Health and Lifestyle Newsletter)

The theory of Metarobics indicates potential avenues of investigation that may at least show promise for helping those with diabetes. It should be kept in mind that type 1 and type 2 diabetes can occur for a variety of reasons, including genetic defects, pancreatic diseases, side effects of certain drugs (such as beta-blockers) and chemicals (such as BPA), as well as infections and other conditions. As such, tai chi and other Metarobic-type exercises may have limited direct effects on at least some forms of diabetes.

Some scientists are researching possible links between certain viruses and diabetes.^{8,10} Investigating whether tai chi can help the body combat viruses may support some preventive effect via a secondary approach. Also, type 2 diabetes has been primarily linked to physical inactivity, obesity, and being overweight. Physical activity, including exercises such as walking or tai chi, and losing body weight are identified by the American Diabetes Association as two of the best ways of lowering risk for type 2 diabetes.⁹ As a mindfulness-based exercise, tai chi may have an added benefit for weight loss by enhancing conscious awareness of eating habits and triggers.

Potential benefits of tai chi related to hypoxia (oxygen deficiency) and diabetes may relate to the interactions between hyperglycemia (high blood sugar) and hypoxia, and may also affect diabetic retinopathy, which causes damage to the retina that can lead to blindness. Hyperglycemia and hypoxia can affect cytosolic and mitochondrial free NADH, an enzyme involved with metabolic pathways and linked to diabetic complications.¹¹ Combined, these two risk factors for blindness accelerate diabetic retinopathy and other complications of diabetes by augmenting metabolic pathways fueled by free NADH.

Vascular disease can affect retinal blood flow and associated delivery of glucose and oxygen. Poor glycemic control can result in worsening of diabetic eye disease as a result of an interaction between hyperglycemia and hypoxia.¹¹ The main point of interest is that hypoxia, or oxygen deficiency, is once more a culprit in poor health outcomes. This indicates the importance of investigating potential effects of Metarobic-type exercises such as tai chi on hypoxic conditions.

I Lost Weight and My Prediabetic Condition

"I was diagnosed as pre diabetic, and was told by my doctor that I needed to lose a lot of weight. I was so obese I could not walk unaided. I started tai chi, and over time was able to walk without aids, and began losing weight. I was retested and was no longer pre diabetic. I have been doing tai chi for over four years now, and have lost so much weight and increased my fitness that I am now swimming and working out at the gym as well."

—Cheryl (From "What Inspired Me to Start Tai Chi,"
Tai Chi for Health Institute website)

Further support, suggesting a need for investigating Metarobic exercises for enhanced oxygen use in the body, relates to metabolic changes resulting from diabetes. These metabolic changes can decrease cardiac efficiency and result in reduced tolerance to oxygen-limited conditions.¹² Metarobic exercises may or may not prevent these metabolic changes as a result of diabetes, but it would be worth investigating whether Metarobic exercises enhance cardiac efficiency and tolerance to oxygen-limited conditions, and any differences from conventional exercise.

Another factor to consider is the death of insulin-producing pancreatic cells, which is directly tied to the development of diabetes. Can tai chi and similar Metarobic exercises prevent or halt pancreatic cell death? There is no research on the effects of tai chi or related exercises on pancreatic cell death to date, but research has been conducted showing that reduced oxygenation (hypoxia) is an important cause of cell loss and transplant failure in pancreas transplants in diabetic patients.¹³

Aside from further suggesting that oxygen deficiency may play a role in a wide range of illnesses and physiological malfunction, including diabetes, these findings also indicate that Metarobic exercises may help reduce risk of transplant organ rejection. Organs are particularly sensitive to hypoxia. Metabolic support is provided for donor

organs in order to enhance oxygen-carrying capacity.¹³ By enhancing blood oxygen diffusion and saturation, Metarobic exercises may help combat the risk of hypoxia following organ transplant.

Metarobics for Pain and Inflammation

One of the constants that has run throughout the personal stories on the benefits of tai chi that I have come across is the impact of tai chi and forms of qigong on pain. From a Metarobic perspective, this seems logical, since it makes sense that a more efficiently operating body can deal better with pain and illness, and would be able to more effectively generate natural pain relievers such as cannabinoids, so called due to their effects on the body, which are similar to those of marijuana or cannabis.

Four Classes and the Pain Was Gone

“Since being diagnosed with rheumatoid arthritis I struggled with performing any type of physical activity. Even something as simple as a leisurely stroll would leave me in a great amount of pain. Then I read that the Arthritis Foundation recommended tai chi as a “natural answer to exercise for those with arthritis.” I tried a tai chi class and after an hour I was hooked. After only four classes I began to notice an improvement in my joints. On a whim I decided to go for a walk one day, and to my surprise, I ended up walking four miles. Even more surprising was that I experienced no joint pain the following day.”

—Heather (From “Testimonials,” Roswell Tai Chi website)

Cannabinoids, a natural chemical the body secretes, account for the “runner’s high,” as do endorphins, which are the body’s version of morphine. Cannabinoids help regulate the systems in the body, ranging from the immune and nervous systems to the digestive system.¹⁴

Since there is evidence that tai chi boosts the various healing agents in the body, as supported by the studies mentioned throughout this book, it is no surprise that these exercises would have similar effects on the generation of natural pain-relieving chemicals in the body—benefits that do not carry the risk of death and addiction that their illegal counterparts carry.

Research conducted at the Proteomic Core Laboratory is among the first to examine effects of tai chi on a molecular level, including effects on proteins affecting inflammation.¹⁵ Proteins are large molecules consisting of one or more chains of amino acids that perform many functions within the body, including catalyzing metabolic functions. It is estimated that there are as many as 50,000 different types of proteins in the human body.

In the Proteomic Core Laboratory study, the effects of tai chi practice on eighteen proteins following tai chi were examined. Significant differences were found following tai chi practice, including a decrease in complement factor B, indicating low levels of inflammation in the body. Levels of complement factor B are high when there is inflammation in the body. An increase in complement factor H, a protein associated with the prevention of vascular damage and degeneration of the macula, was also found. The macula is the part of the eye responsible for detailed central vision.¹⁵

Hypoxia is also implicated in pain and inflammation. Low blood oxygen saturation levels can increase feelings of pain. Nurses can confirm a patient's pain intensity by measuring blood oxygen saturation with an oximeter. Lower levels of oxygen tend to correspond with increased pain. One form of pain caused by too little blood flow is called claudication.¹⁶ Claudication generally affects the legs, but can also affect the arms.

Claudication is generally a result of peripheral artery disease, due to clogging of the arteries and reduced blood flow in the arms or legs. Tai chi and other Metarobic exercises may ameliorate claudication by gently increasing blood flow in the affected areas. Again, it would be important to document not only unique physiological mechanisms of

Before Tai Chi I Couldn't Walk

"Before taking the tai chi class, I couldn't walk a half mile, it hurt so much just to put my hands over my head. Sleeping was difficult, and there was no joy to life. I was an entire mess from head to foot. Medication, physical therapy, and swimming did not help. Then I heard about the tai chi study. I didn't know tai chi from a sneeze, but I figured I would get to meet people and it would get me out of the house. I didn't believe any of it. I thought this is so minimal, it's stupid. But after a few weeks, I began to feel better, and after twelve weeks the pain had diminished 90 percent. I have kept with tai chi, have lost fifty pounds, and can now walk three to seven miles a day. I wouldn't say it's a cure. I will say it's an effective method for controlling pain."

—Mary (one of the participants in Dr. Chenchen Wang's study)

action, but also differences, if any, from other forms of exercise in these benefits.

Another area of research related to hypoxia is the effect of high-altitude, low-oxygen environments on pain.¹⁷ Experiments conducted with an expedition group of mountaineers yielded some interesting results. Under normal conditions, the expedition group had high pain thresholds, but at higher altitudes their pain thresholds decreased. Hypoxia was noted as the main cause.¹⁷

Dr. Chenchen Wang, a researcher at Tufts Medical Center, conducted a study on the effects of tai chi on fibromyalgia, a chronic pain condition.¹⁸ After twelve weeks participants in the tai chi group experienced significant improvements in physical functioning and lower levels of pain, fatigue, sleeplessness, and depression compared to a group that performed stretching exercises and received classes in wellness education. Pain-relieving effects were so significant that one-third of the participants in the tai chi group stopped using any form of pain medication.

Tai chi has also been found to have a positive effect in relieving tension headaches.¹⁹ Researchers theorized that the effects of tai chi

on pain levels might be the result of tai chi reducing stress. But based on the theories and research discussed in this book, it also seems possible that the physiological effects on pain are related to enhanced circulation as well as enhanced blood oxygen saturation and diffusion, which may boost the body's natural painkillers, such as the cannabinoids and endorphins mentioned above, either through more effective diffusion or increased production.

This is supported by a comparison study in Korea in which participants reported significantly less pain and less body stiffness after twelve weeks of tai chi practice, as well as an improvement in balance.²⁰ The control group, which did not do tai chi, experienced no improvement. Some participants in the non-tai chi group actually deteriorated in physical functioning.

Tai chi has also been found to have an effect on rheumatoid arthritis. Rheumatoid arthritis is a chronic inflammatory disease that affects the musculoskeletal system and can have different effects on different people, including chronic pain. It can come and go, and in its most severe form can lead to serious joint damage and disability. It can even affect other parts of the body. Inflammation occurs as the result of white blood cells attacking the body's own joint tissue.²¹ As such, rheumatoid arthritis is an autoimmune disease, where the immune system attacks the body.

No one knows why this happens, but many studies on the effects of tai chi have demonstrated significant improvement in various symptoms, including pain. One of these studies recruited fifteen patients from a rheumatology department to practice tai chi twice a week for twelve weeks. Participants experienced significant improvements in lower limb muscle function, as well as less pain, fewer swollen joints, improved balance, and more confidence in moving.²²

Multiple sclerosis (MS) is another condition that can result in chronic pain. MS is a chronic disease that attacks the central nervous system, which includes the brain, spinal cord, and optic nerves. Symptoms can range from numbness of the limbs to complete paralysis or loss of vision. MS is also thought to be an autoimmune disease, in this

case attacking the nervous system. The exact cause is unknown, but it is suspected to be related to environmental factors and a genetic predisposition. MS results in damaged myelin, the fatty substance that surrounds and protects the nerve fibers, and it can also damage the nerves themselves.²³

MS Could Not Stand Up to My Tai Chi

"On my last visit to my doctor, she wanted to know what I was doing to have so much improvement in my MS. I told her I was doing tai chi. She said to keep up the good 'chi.'"

—Neva (From the Tai Chi for Everyone website)

The research into tai chi and multiple sclerosis has been limited primarily to benefits for balance, improvement in walking speed, flexibility, vitality, and social and psychological factors,²⁴ but if tai chi and other Metarobic exercises enhance the body's systems, there may be benefits for relief of pain and other symptoms of multiple sclerosis as well, as indicated by Neva's story.

One small-scale pilot study enrolled eight secondary progressive multiple sclerosis patients in a tai chi/qigong class that also included self-massage. Benefits increased with the amount of time tai chi was practiced at home.²⁵ One participant who practiced little (about 50 minutes

Yoga Helped with Muscle Control for MS

"I have multiple sclerosis, an autoimmune disorder. Around twenty years ago I began losing the use of my muscles. Many rounds of doctors and hospitals later, and with no hope left, I tried a yoga class. I am now starting to get some control over my muscles. Currently I cannot walk without help. My teacher is confident that I will be able to walk on my own in three years."

—Priya (From the Health Site website)

per week) experienced almost no benefits. Those who practiced for approximately 200 to 400 minutes per week reported benefits including improvement in balance and reduction in feelings of “pins and needles,” pain, fatigue, depression, and joint stiffness, as well as reduced numbness in fingers and feet. Improvements were also noted in some participants for increase in walking distance, balance, general well-being, concentration, ability to move legs, and fine motor control.

The researchers noted that typical expectations of medical interventions are to slow the progression of the disease; this contrasted to reported benefits from doing tai chi, which actually showed improvements in functioning on several points. An over 31 percent improvement in symptoms was reported. Replication of the study on a larger scale was recommended to better understand potential benefits, particularly considering the wide variety of symptoms associated with MS.²⁵

Essential Elements of Metarobics and Tai Chi for Therapy

Teaching, Learning, and Researching
Tai Chi and Qigong for Health

TAI CHI IS FAST BECOMING a popular exercise, resulting in a wide range of teaching methods. Some changes are beneficial, but others may reduce or even eliminate the unique benefits of tai chi. This chapter provides a brief overview of the development of tai chi for health and discusses what to look for when choosing a class to maximize the benefits of tai chi from a Metarobic and structural perspective. The chapter closes with recommendations for effective research on tai chi and related exercises.

Tai Chi for Health

“Dr. Paul Lam is one of the pioneers who has worked hard to make tai chi user friendly for health. Dr. Lam started tai chi over thirty years ago after graduating from medical school. As a teen he suffered from osteoarthritis, and by the time he graduated medical school his condition was so debilitating that he could not even carry a briefcase. Since then tai chi has changed his life. His arthritis became well controlled, and he attributes his good health and positive attitude to his dedicated tai chi practice.”

—Tai Chi for Health Institute website

As with most of the research presented in this book, tai chi is the main focus of this chapter, since it is more common and more familiar to people in the United States than qigong. But both forms of these exercises share many commonalities, including slow, relaxed movements, gentle stretching of the limbs, and focus on deep breathing and good postural alignment. Since some forms of qigong, particularly those developed for martial purposes, do not necessarily follow this format, elements of other forms of qigong that can be detrimental to health will also be touched on.

There are many colorful histories and legends regarding the origins of tai chi,^{1,2} but the essence behind the slow, spiraling movements lies in its origin as a martial art. The slow movements permitted a level of mastery over muscle tension and body structure that allowed more efficient use of muscular power, as well as increased sensitivity in controlling the movements of a “stiffer” opponent. The person who was more relaxed could feel the tension in the other person, allowing anticipation of movements and an ability to redirect attacks. Once a tai chi master made contact with another person, he had total control over his opponent. Tai chi chuan literally translates as “grand ultimate fist,” describing its effectiveness in combat when practiced as a martial art.

Over time people came to realize that tai chi was a valuable health exercise as well, since deep breathing and removing tension from the body have many health benefits. Because this is also the goal of many qigong exercises, tai chi has become classified as a form of qigong, and has since been popularized primarily as a health exercise.

The Breath and Pace in Tai Chi

The breath is at the core of many of the health benefits of tai chi. Many people tend to breathe shallowly, expanding the ribs in what is called chest breathing, as opposed to diaphragmatic breathing, which involves expanding the stomach and activating the rib muscles and diaphragm. Most books on running or aerobic exercise are quick to point

out the benefits of diaphragmatic breathing for increasing oxygen intake.¹ Diaphragmatic breathing is a hallmark of tai chi, which focuses on expanding the chest and abdomen to maximize inhalation of air. Indeed, some tai chi instructors also say to expand the back as well, which can result in expansion of the posterior ribs. During these exercises, breathing is done through the nose rather than the mouth, assuming the nasal passages are clear. Nose breathing is considered healthier, since it prewarms and moistens the air as it comes through the nasal passages and helps the body to trap and eliminate contaminants from the air before it reaches the lungs. Breathing through the mouth can result in more frequent respiratory infections. The Chinese have an interesting saying on this: “You would not try to stuff food up your nose, so why would you breathe through your mouth?”

Shallow breathing moves only a small fraction (approximately 0.5 liters) of the lungs’ total air volume into and out of the body with each breath. Deep breathing can increase lung capacity and can increase air volume to three to five liters, depending on the lung capacity of the individual.³ Being in its infancy, the field of Metarobics is ripe for research to determine exact effects. But in the meantime, the observations presented in this book provide a good start. If you find yourself completing several movements with one breath, slow down each movement to match the breath.

The goal is to completely fill the lungs during the first half of each movement and to completely empty the lungs by the end of each movement as slowly as possible without feeling short of breath. You do not need to try to consciously match the breath to the movement—with time the breath will correspond naturally, without trying to force it. There is also some variation between movements.

Moving slowly, while focusing on being relaxed and breathing fully from the abdomen and chest, without overdoing it, will result in a natural rhythm without strain. If you feel you are running out of breath when going slow, speed up the movements. Alternatively, some practitioners suggest taking more than one breath during each movement, breathing in and out during the first half of a movement, and

then again during its completion. For health, the important part is being slow and relaxed, with full, comfortable breaths. Overall, I tell my students not to worry about the breath, since it tends to follow naturally with the movements. Over time your body will fall into a natural rhythm.

For martial practice, slower and faster paces may be used to train the body for specific goals for self-defense. For health, fast paces can enhance aerobic conditioning, but a slower pace enhances greater relaxation of muscle tension. A slower pace also works on a different perspective of balance. For health purposes, the guidelines for a slower pace have demonstrated the greatest increase in blood oxygen saturation and Metarobic effects.

Being “Single-Weighted”

Another key element to maximize diffusion of the blood and oxygen throughout the body, as well as to develop a greater level of relaxation in the mind and body, may relate to the way the weight is carried by the legs. During almost every movement in tai chi, the goal is to be “single-weighted,” that is, the weight of the body is essentially balanced entirely over one leg or the other, shifting back and forth as a person transitions through the movements.

When the weight of the body is balanced equally between the legs, a person is considered to be “double-weighted.” The reason for being single-weighted lies in the martial origins of tai chi, but the practical effect for health is that by letting the weight of the body shift entirely to one leg (for example, the right leg), the rest of the body can be allowed to relax entirely, including the left leg (the “empty” leg), hips, torso, shoulders, arms, neck, and head. As the movement transitions through to the opposite leg, for example, to the left leg, the other side relaxes. An analogy is often made to the idea of imagining one leg being full of water, and the water pouring into the “empty” leg as one shifts through to the next movement, until the full leg becomes empty, and the empty leg becomes full.

Balance and Knees, the Best of Both

"After two brain surgeries, I had constant severe headaches and suffered from loss of coordination and severe dizziness to the point of passing out. A friend told me that tai chi had improved her balance, so I decided to try it. Within two weeks the dizziness disappeared so much that I did not need to use the transderm scop patch I was dependent on. The headaches became less frequent and my coordination got better. Now I rarely experience any headaches. I also had torn the medial meniscus cartilage in both knees. I had the left knee operated on. I could not walk without knee braces, and could only walk slowly. Now I only wear the braces when I do tai chi. I can walk much faster and can get up and down the stairs to the subway with no problem or loss of balance."

—Victoria (From "Testimonials," Tai Chi Chuan Center website)

This transition between empty and full occurs throughout the entire form. Essentially, tai chi is the act of balancing on one leg and then the other while relaxing the opposite leg and the entire body. This is the reason tai chi is such a valuable exercise for enhancing balance, and why it also works to strengthen the knees, providing the knees are kept aligned with the feet and are not overextended, to prevent knee strain.⁴

Weighting one leg, with the leg bent, also increases the heart rate slightly, although not to what is considered a moderate aerobic level. Research will need to determine if the weighted leg "robs" the body of blood oxygen saturation, since levels are lower during tai chi compared to standing qigong poses with the legs straight. On the other hand, the weighted leg may enhance blood flow and diffusion throughout the body through osmotic pressure, more so than if the form were practiced in a standing position. During measurements of tai chi and those qigong exercises that are performed with a bent-kneed stance, blood oxygen saturation increases one to two points. During the standing poses of qigong, it tends to increase two to three points.

It is possible that the slightly faster heart rate from the bent-kneed stance of tai chi may have particular benefits beyond strengthening the knees and legs. Further research is needed to determine if pure qigong exercises such as the eight treasures provide even greater benefits, being focused for health as opposed to adapted from a martial routine. Try both if you have the time, since both have been proven to have benefits, and make your own observations. If you have a specific medical condition, your doctor may have recommendations for practice as well.

Extending the Spine and Strengthening the Knees

One other critical element is the positioning of the spine during tai chi. As the movements are performed, the tailbone is tucked forward and the crown of the head is extended upward, as if a string were being pulled from the top of the head and the tip of the tailbone. This releases muscle tension in the shoulders and lower back, straightens the spine, and maximizes spinal rotation and adjustment. It is important, however, not to strain or overdo the straightening of the back, particularly in the beginning. Moving too quickly beyond your usual range of movement may lead to back strain from unfamiliar positions, or to movement beyond the range of motion beneficial for your body. Over time, if tai chi is practiced daily, you will find that your back becomes more limber, less prone to back pain, and easier to straighten.⁵

Other structural elements include benefits for the knees, as well as increased leg strength. During the poses and movements of tai chi and some postures of qigong, you are essentially in a semi-crouched stance, similar to exercises prescribed by physical therapists. The bent-kneed stance during tai chi and many qigong poses helps to strengthen the muscles of the legs and knees if performed with proper knee and foot alignment, preventing the knee from extending past the foot.

Before I started tai chi, I had chronic knee problems. My knees were swollen and crackly, and it got to the point that I had to give up running. Over time, the stance training of tai chi developed the muscles around my knees, including a band of muscle at the back of the knee that wraps around and supports the knee joint. I no longer have knee pain and can now run pain-free.

Tai Chi—Better Back, Stronger Legs

“I started tai chi three years ago upon recommendations of my doctor. I suffered constant muscular pain all over my back, and it was suggested that it would be good for strengthening my lower back. I found I really enjoyed the low impact nature of the exercise, and I also found the meditation and relaxation aspects extremely beneficial. I was surprised at how disciplined I was with practice, and within one year all of my back pain was completely gone, as well as stiffness in my joints. My posture improved, my legs grew stronger, and I learned to release tension throughout my body, particularly my shoulders.”

—Joyce (From Tai Chi for Health Institute website)

An article I read when I first started tai chi over thirty years ago stated that tai chi practice can develop the knee muscles to the point that they will take about 85 percent of the weight off the knee joint. Essentially, the developed muscles of the knee can act as a natural knee brace. This is one more area in need of further research, but theoretical elements and personal accounts indicate another promising benefit for health.

Miscellaneous Elements

When practicing tai chi, in addition to slow, relaxed movements, full breaths, slightly bent knees, and a straight spine, a few other details should be kept in mind. To maximize relaxation in the arms and shoulders, let the shoulders drop and relax. The hands, except in spe-

cific instances such as crane spreads its wings, never rise above the head, nor do they extend totally straight. This can vary slightly by style, depending on the intention of the move. In most movements the active arm is curved gently. Overextending results in tension. The hands should be relaxed as well, with a slight countertension to counteract years of gripping the hands in stress and tension, by pressing the palms down as if on a table.

However, some schools of tai chi let the nonactive hand hang totally relaxed at the side. This is yet another area in need of research, to determine any differences in benefits resulting from a totally relaxed hand compared to gently pressing down. Pressing down may counter years of tension and open up the circulation in the hands. However, letting the hand hang relaxed may help generate deeper states of relaxation.

An exercise I have my tai chi students do at the beginning of the semester is to have them stand with their hands relaxed at their sides. Most students' hands curl inward like claws (as seen in the photo in chapter 2), which is the result of years of tension. As mentioned above, the tension in the hands can be stretched out and relaxed by pressing down as if on an invisible table during the form. This can also open up the capillaries in the hands, which is felt as a pleasant tingling or buzzing sensation.

The accuracy of the individual movements such as crane spreads its wings or part the horse's mane may be less critical than the general form and method of each movement. If you are practicing tai chi as a martial art, it is important to hold the hands in an exact position, but for health and relaxation, observing key elements can generate most if not all of the benefits of tai chi practice even if the hands or postures are not quite exact.

As outlined above, these key elements include relaxing the shoulders, arms, and body while tucking the hips and keeping the spine straight, standing with gently bent knees aligned with the feet, and coupling slow movements with relaxed diaphragmatic breathing. Removing tension from the body while generating a focused yet relaxed

and calm mental state is a key goal of tai chi for health. Tai chi as a martial art can take a lifetime to master, but the principles for health can be practiced immediately with an appropriate teacher or even a DVD (see my website, Metarobics.org, for resources).

As a traditional Yang-style tai chi practitioner, it took me years to accept this conclusion. From a traditional format, it can take years or even decades before one can say that one has mastered tai chi. But years of observation, research, and teaching support that the basic form of tai chi for health can be learned within a very short time. Imagine how long it would have taken running or aerobics to become popular if you were told that before you could do the full exercise, you would have to spend one to two years learning individual movements!

What to Look for in a Tai Chi Class

To learn or practice tai chi for health, teaching ability can make more difference than the years of experience a teacher has in tai chi. This was also something hard for me to admit as a longtime practitioner. There are many traditionalists with a more martial orientation who may have incredible skill in tai chi but little patience as teachers. One of the largest barriers to learning tai chi identified in a survey of major programs in the United States was lack of patience on the part of the instructor.⁶

An experienced teacher with a focus on tai chi for health often knows what to look for to enhance benefits for each person, and may be more proficient at adapting to student needs, while always keeping in mind the advice of your doctor. A third caveat is that some teachers, having learned in the old school master/disciple format, may be so invested in the way they were taught that any adaptation is impossible. In the traditional format, it can take years before one can perform the full tai chi form.

A Life of Work Left Me in Pain, until Tai Chi

"I used to work at a dry cleaner, ironing clothing all day long. Because of my job, I had developed arthritis in my hands. My fingers were swollen and in pain much of the time. After taking up tai chi, my fingers are no longer swollen or in pain, and I can move them without any problem. I now find myself doing house chores for a long period of time with ease, moving things around, picking them up, bending down and reaching up. I used to have to be careful about pushing myself because I would get muscle aches and headaches. But now I get a deeper than usual night's sleep, which feels really good. Also, recently my doctor said my bone density had increased by about 20 percent from three years ago. He was very surprised."

—Lun (From "Testimonials," Tai Chi Chuan Center website)

Due to variations in teaching styles, as well as in styles of tai chi and qigong, it is recommended that you check out *all* of the classes in your area to get an idea of what is available. Sometimes convenience is key. On the other hand, finding a group that you identify with may be more important. Find out what forms of qigong and tai chi are practiced, and then do some research on the Internet if no other resources are available. Talk with the students if you can and find out what benefits they feel they are getting. You may also wish to ask the teacher how long it takes to learn the form. A three-month to two-year learning curve is typical, but there may be auxiliary exercises or segments you can practice at home. This is why I developed the resources at Metarobics.org, to allow immediate practice of tai chi and the eight treasures exercise. If you can try out a few classes, this might allow you to find out if the instructor has the qualities that will enhance your learning.

In a national survey of tai chi programs, being patient and adaptable were two of the most important attributes students identified for a tai chi teacher, even more so than knowledge of tai chi.⁶ Use the principles outlined in this chapter as a guideline, and ask students in

the class what benefits they have received from taking tai chi. If you are looking primarily to improve your health, check to see whether the school stresses the health or martial aspects. Surprisingly, a large number of instructors still teach tai chi from a martial perspective. This *is* valuable for those interested in the martial arts, as well as to preserve the complete art, but can sometimes be a barrier to practicing tai chi for health.

One school I observed had students, even the older ones, who were in their seventies, smash their shoulders against each other to practice a technique called shoulder stroke. Another example is Chen-style tai chi. In parts of the form, one raises the leg and then stomps the foot with great impact onto the ground. This may help develop skills for throwing an opponent, but its use is questionable regarding the health of the knee. Some schools practice a two-person exercise called pushing hands, which can have some specific benefits for enhancing relaxation, but can also involve throws.

Gentle forms of push hands can be a good exercise for learning how to release tension in the body. People may not realize how much muscle tension they actually have until they practice the push hands exercise with a more relaxed and experienced tai chi practitioner. Doing push hands exercises with a more experienced practitioner can help you to feel and better understand the tension in your body. But push hands exercises can also be taken to more extreme forms, which can include joint locks and throws. So watch a class or two, talk to the students, and check out as many classes as you can. Usually students are eager to share their experiences on the benefits they have received, and this may be your best clue as to the effectiveness of the class for health.

Most tai chi and qigong teachers are willing to accommodate the needs of their students, particularly if the student is respectful. As research on tai chi and methods of teaching user-friendly classes become more established, it will become easier to find classes and resources for tai chi and qigong for health. One of the primary goals of this book is to help people rethink tai chi and associated exercises as

health exercises, ones that can be as popular and accessible as any aerobics program.

Being a master practitioner does not necessarily mean being a master teacher. Indeed, often those who have struggled the most in learning the form are the best teachers, due to the patience and focus necessary to overcome difficulties. Teachers who would like to enhance their teaching skills are encouraged to read Dr. Paul Lam's book *Teaching Tai Chi Effectively*, which is based on his more than thirty years of experience with tai chi and his experience teaching and training people to effectively lead classes for a variety of audiences.⁷

Although qigong is usually taught in association with tai chi, a growing number of classes are focusing on forms of qigong. When looking for qigong classes, remember that qigong can also include a wide range of practices. There are some unusual forms of folk qigong that may be questionable in terms of their health benefits. In one park frequented by Chinese qigong practitioners, I saw a few older adults pressing the body against playground equipment. I asked about this practice and was told it was done to absorb youthful qi, or energy.

The mind is a powerful thing, and some have suggested that visualizing energy patterns in the body may actually affect the brain and nervous system. Sometimes this visualization can result in negative consequences. Some students have reported constipation or other intestinal disorders. On the other hand, many schools of tai chi and qigong report using various visualizations to relax or direct healing in the body with beneficial effects. There are also forms of martial or hard qigong, which can include practices with a focus on toughening the body—such as repeatedly striking the head with a heavy board. Practices can also involve striking the body with iron rods, or using reverse forms of breathing to toughen and pressurize the body, to make it impervious to blows. However, this can also raise blood pressure to dangerous levels. Although this might have enhanced some form of longevity in the days of hand-to-hand combat, in more modern times such exercises can be detrimental.

I know two tai chi practitioners who attributed severe health problems, including congestive heart failure, to the practice of reverse breathing during tai chi. Reverse breathing pressurizes the body to make it resistant to blows, but doing so through an entire tai chi or qigong form may raise blood pressure to dangerous levels. Research is needed to determine if even brief moments of reverse breathing have any benefit. From a theoretical perspective, holding the breath very briefly during some qigong poses may momentarily increase blood pressure, with possible beneficial effects for strengthening blood vessel walls, based on the concept that brief moments of mild stress result in a positive response, similar to the effect of weightlifting on muscles.

Reverse breathing, conducted within certain parameters, may have similar effects, but it will take an extensive body of research to determine the relationship between time, damage, and any possible benefits. As a whole, I advocate following the natural mechanisms of the body, as well as discussing your practice with your doctor and talking with students of a proposed school regarding the benefits or effects they have experienced. Abdominal or diaphragmatic breathing is a natural form that has been demonstrated as beneficial for health, as opposed to shallow upper-chest breathing. It is the reason we have a diaphragm stretching across the bottom of our rib cage. This muscle is specifically designed to maximize inhalation of the breath.

Until research can separate myth from fact and health from harm, the general recommendation is to focus on the basic health benefits of abdominal breathing, coupled with relaxation and a gentle range of movement with good postural alignment, including the knees and feet. These basic principles underlie the most common practices and benefits of tai chi and qigong for health. It can also be helpful to talk with the instructor, other students, and your doctor if you have questions or doubts regarding any practice.

Research and experience will tell which qigong practices are beneficial and which are rooted in folklore, although it is important to

Another at Death's Door

"Before taking up tai chi, Master Jou Tsung Hwa developed a fondness for gambling. Combined with late hours at work, and playing hard afterwards, his abusive lifestyle resulted in an enlarged heart and prolapsed stomach by age forty-seven. After visiting several doctors, he became despondent. Jou was told that there was no hope for repair to his heart, and surgery would be of only minor benefit for his stomach. Then a friend who was a long time tai chi practitioner convinced Jou to try tai chi. Within two weeks he began to feel better, and three years later tests showed that his stomach had healed. His heart has also returned to normal size, and all damage seemed to have disappeared. After seeing the cure that tai chi had enacted after conventional Western medicine failed, Jou Tsung Hwa became a teacher of tai chi. At age eighty-one he was still in good health, more active than many half his age, when he died an early death, when his car was hit by an oncoming van."

—From "The Grandmaster," Taichifarm.org

keep in mind that some folk practices do have many health benefits. The West has gone through a similar evolution. There are many questionable "health" practices in Western lore and traditions, such as rubbing goose droppings on the head to cure baldness. It is doubtful that such a practice can actually cure baldness, but the folk practice of using leeches to draw blood has made a comeback in the medical community.⁸

As time progresses, further research will help differentiate effective practices from folklore, but in the meantime, it is advisable for those interested in tai chi and qigong to become as knowledgeable as possible. Learn the intent of any exercise you are considering and the evidence-based rationale behind the benefits if known, and discuss your practice with a qualified doctor. There are many who feel strongly that many of the benefits of these exercises are unexplainable and beyond the known. But unique physiological responses indicate that many if not all of the benefits of these exercises are due to

a physiological mechanism that can be measured and understood. This is the primary purpose of this book, to lay such a groundwork upon which to build.

This is not to discount the more esoteric practices and elements. As a longtime practitioner, I have seen and experienced many unusual and unexplainable things. Even conventional exercises such as running have examples of the metaphysical and the extraordinary, such as the runner's high, which, although many attribute it to increased endorphins, also has advocates who believe that something more is going on.⁹ History is full of those who, having pushed their limits, have achieved something remarkable; this is something I plan to explore further in another book.

The primary benefits of most forms of qigong and tai chi, as well as forms of yoga that focus on relaxation and the breath, lie in the similarity of practices—slow, relaxed, gentle movements, extending the range of motion without straining, coupled with deep breathing. The primary difference between tai chi and forms of qigong and yoga is that tai chi is practiced moving. However, some teachers, including myself, have developed stationary forms of tai chi to make it accessible to more people. Slow, controlled movements that involve a shifting of weight, such as during tai chi practice, do have the added benefit of developing balance. Because death from falls is the leading cause of accidental death in older adults,¹⁰ this can be a valuable aspect of tai chi practice.

Another barrier to learning tai chi for health is the long learning curve typical of most tai chi schools. Since tai chi originated as a martial art, it is often still taught from a long-term master/disciple format over a period of several years. The question I was finally forced to ask was, Is it really necessary to have such a long learning curve to be able to use tai chi for health? When I began teaching tai chi at a community college, every semester I would have twenty to thirty new students. It was not unusual for students to take two semesters or more to learn the entire twenty-four-style short form. Since many students were taking the class only one semester, and most would not

continue practice beyond the class, at least until they got older and began to feel the effects of age, it seemed important that students should have a format that would introduce them to the entire form, to generate interest and enjoyment that might encourage later practice of tai chi as they got older.

It also seemed important to have something that could be practiced from the first week. So with a little trial and error, I found that it was possible to take a few minutes to introduce students to the ways of moving in tai chi, focusing first on the lower body, then on the hands, and finally coordinating the two. Students were then able to follow through the entire form by using various verbal cues. I used this format with great success over the next ten years, permitting instant practice of tai chi and the companion exercise Ba Duan Jin (the eight pieces of silk brocade or eight treasures exercise). Looking at individual schools, I found others who have successfully adapted teaching tai chi for immediate practice, but these were few and far between. Overall, tai chi seems to face an uphill battle before it becomes truly user-friendly.

If local classes have a long learning curve and focus on traditional elements as a martial art, ask if the instructor would be open to adding a health-focused class. Consider sharing this book, as well as online resources that demonstrate more user-friendly formats for immediate practice. The Metarobics YouTube channel has examples of formats that permit or enhance instant practice of tai chi.

Tai Chi—The Breath of Life

"Five years ago I spent much of my days in bed or in a recliner. I was barely able to move without a walker. I developed asthma in my forties, and also had rheumatoid arthritis, chronic migraines, chronic back and neck pain, as well as anxiety and depression. I had to retire and my doctor told me I would soon need a wheelchair. Then I remembered an article about tai chi. I signed up for a class, and after only three months I noticed a change in my mobility. I was able to transition from my walker to a cane,

and was very excited. I was taking three ninety-minute classes a week, and before long my pain and other symptoms improved. I even stopped having to take most of my asthma medications. Five years ago, I was on a walker and could not do anything. Now here I am teaching tai chi. It is phenomenal."

—Debbie (From the *Tampa Bay Times*)

Tai Chi for Researchers

Researchers face a particular problem when it comes to conducting studies of tai chi. Methods, styles, and formats can differ so much from one instructor to the next that it makes comparison difficult. One study may show significant benefits, and another may not, purely due to the style of tai chi or the method of instruction used. Compounding this difficulty is the format of most studies, which are completed within anywhere between five weeks and six months. Considering that it can take one to two years to learn a tai chi form, what the researchers may end up measuring is the effects of learning tai chi as opposed to regular practice.

To overcome this shortcoming, researchers will need to focus either on those who already know tai chi, or on those who use a format similar to the one I used in my college classes so that participants can begin practice of tai chi from the first class. Both formats bring difficulties. Tai chi is not yet common enough in the United States for researchers to easily find a sufficient number of participants for most studies. There is also the question of style. Studies based on a fast-paced Chen-style form, as opposed to the slower Yang style, may generate very different results. Each form of tai chi may enhance health, but possibly from different perspectives.

It is critical to know the details of the form of tai chi being practiced. Many contradictory results in research studies may be the result of different forms of tai chi being used, or different forms of instruction. One study noted that most class time was spent in discussion.¹¹

As noted earlier, some forms of tai chi are more martial in format, with many fast and explosive movements, such as Chen-style tai chi. The long learning curve typical of tai chi practice may also result in conflicting results from comparable studies. The latter is the reason I developed an easy-to-follow format of tai chi, which can be led much like a group aerobics class, for instant practice.

It needs to be determined if you will get the same benefits following the verbal and physical cues of an instructor, as opposed to being able to practice it independently. Initial results from my own research indicate that physiological results may be similar, if not the same, at least in regard to blood oxygen saturation and diffusion. The three students with cancer in my college classes used the follow-along format and felt that they had benefited tremendously. But further research needs to be conducted to fully validate the benefits or differences between following verbal cues with an instructor and independent practice. My experience indicates that results will be similar, but it is also likely that as one becomes more experienced with tai chi, a greater level of benefits will be derived, as indicated by the results of measurements in longtime tai chi practitioners presented in chapter 1. Until tai chi is popular enough that researchers can easily find the number of subjects they need for their studies, or until following verbal cues can be truly validated as being as effective as independent practice, researchers need to be very specific in the description of the format used. To truly replicate and validate studies on tai chi, several factors need to be detailed, including instructor experience, tai chi style, methods of instruction, focus of the class, and amount of time spent practicing in and out of class. It is not uncommon for more time to be spent in lecturing on and discussing elements of tai chi during class than in actual practice.¹¹

But in the meantime, the growing abundance of research, even if lacking in details, still provides support for the many benefits of tai chi. The theories and understanding presented in this book will help shape a better understanding of tai chi and indicate future avenues of research. To establish an understanding of the physiological effects of

tai chi, particularly from a Metarobic perspective, it will be important to conduct studies that measure not just blood oxygen saturation and diffusion, but also effects on oxygen and blood perfusion within the internal organs, as well as possible effects on blood marrow production, protein synthesis, molecular effects, and many other factors.

Does the body respond differently when blood oxygen saturation is enhanced, or is increased saturation just an indication or a response to other actions going on in the body? As mentioned in chapter 6, one study found a change in eighteen proteins resulting from the effects of tai chi practice. What other molecular effects are going on in the body during and following Metarobic exercises, and how do the effects of these exercises differ from those of conventional exercise? The many benefits of tai chi have been well documented to various degrees. Aside from more stringent studies more carefully describing and evaluating style, pace, and practice, it is time to begin looking more thoroughly at the underlying causes of these benefits—the physiological changes that occur from Metarobic practice, and how these effects might differ from those derived from other forms of exercise.

In time, a growing body of research will determine guidelines for optimal lengths of practice, and which kinds of Metarobic movements are best for various conditions and concerns, as well as for overall health. The mix of tai chi with qigong in many scientific studies has muddied the water as to what exactly is providing the benefits. Most studies mention auxiliary exercises in addition to tai chi, usually some form of qigong. The question then needs to be asked, Are benefits primarily from tai chi, qigong, or both? Since most tai chi classes and practice include some form of qigong as well, it may not be a concern. Since both are practiced, a student would get the benefits of both.

In my own practice, I generally begin with four repetitions of the eight treasures exercise, followed by thirty minutes or so of tai chi. Those people who just do the eight treasures tend to advocate eight to twelve repetitions. When my tai chi teacher was asked which exercise would be the most important to practice for health if a person were to just pick one, he stated that the eight treasures would be most ben-

eficial. Independent study of tai chi and forms of qigong may yield some interesting results. As the field grows, adaptations and related forms of movement may come to expand the variety of exercises that fall under the category of Metarobic exercises—exercises that may come to include forms of walking, yoga, and other exercises that focus on the breath. In the long run, it may be that different forms of Metarobic exercises may yield slightly different benefits, similar to the varied benefits of low- and high-intensity aerobics.

Conclusion and Future Directions

Metarobics and Tai Chi Therapy: The Beginning of a New Field of Exercise

IT MAY SEEM ODD in this day and age to think that the categories of fitness we are so familiar with may not explain the benefits for all forms of exercise. Yet when I looked at exercises such as tai chi and qigong, I realized that there *had* to be something different going on in the body—that a new and separate field of exercise had to exist, a category that with time may come to include not just tai chi and forms of qigong, but also a variety of other exercises that do not fit into the traditional aerobic and anaerobic categories—exercises such as forms of walking and yoga, or any practice that emphasizes the breath and relaxation without accelerating the heart rate to aerobic levels.

Others have observed that walking, if it incorporates a rhythmic stride of the legs and deeper breathing, may have similarities to qigong exercise. Danny and Katherine Dreyer wrote a book about this called *Chi Walking: Fitness Walking for Lifelong Health and Energy*.¹ The way one breathes may be a key element in maximizing the health benefits of walking. The study conducted by Dr. Chetta and colleagues discussed in chapter 1 showed that normal walking had little effect on blood oxygen saturation.² But when using a pulse oximeter during my own walks, I have found that when I focus on slower diaphragmatic breathing while relaxing any tension in my body, my blood oxygen saturation will usually increase by a percentage point or more.

Tai Chi Cured a Life Dying from Drugs, Alcohol, and Sex

"T. T. Liang was a well-known teacher and author of several books on tai chi, who began learning tai chi later in life. He had been living a hard life involving drugs, alcohol and sexual activity, as a government official in Shanghai in the 1940s. Eventually his excessive lifestyle caught up with him, and Liang fell seriously ill and was hospitalized for almost two months. He had developed pneumonia, liver infection and severe gonorrhoea. At age forty-five, his doctors had little hope for his recovery, and gave him about two months to live. Not wanting to die, Liang immediately began learning tai chi. Within six months he had recovered most of his health. Reforming his ways, T. T. Liang went on to live to the age of 102 years old, which he attributed to his tai chi practice."

—From "Grandmaster T. T. Liang," Victoria Taiji Academy website

Walking is considered good for your health and is classified as a low-key and low-impact aerobic exercise. But does walking really accelerate the heart rate to levels that will have a large effect on the cardiovascular system, enough to be considered a truly aerobic exercise? In a two-year study of 3,208 men and women over the age of sixty-five, researchers found that those in the lower third of walking speed (1.5 miles per hour for men and 1.35 miles per hour for women) had a risk of death from cardiovascular disease three times higher than those in the upper third of walking speed (1.85 miles per hour or more for men and 1.5 miles or more per hour for women).³ Keep in mind, however, that although slower walkers had a higher incidence of death due to cardiovascular disease than faster walkers, the study did not examine any other benefits participants may have received, nor did it include a comparison to those who did not walk at all.

In a study discussed in chapter 5 that compared results for three groups of participants—those who practiced tai chi, walked, or did no exercise—benefits were found in the tai chi group for COPD, but no change in condition was found in the walking group. The no-exercise

group experienced a decline in health.⁴ So walking did have some benefit, but not to the same degree as tai chi—which may bring everything back to the breath. Does how one breathes while walking make a difference? And then there is yoga. How would yoga fit into the Metarobic perspective?

In my own measurements, the qigong exercise Ba Duan Jin (the eight pieces of silk brocade or eight treasures) resulted in the largest increase of blood oxygen saturation, with increases of two to three percentage points, with the highest levels during the standing poses versus the crouching poses. It may be a matter of shades of difference, with forms of qigong one step above tai chi, and tai chi one step above walking, in relation to Metarobic benefits. But even here the nature of the movements and breathing seems to be a major factor, at least in relation to blood oxygen saturation. One movement during my tai chi practice, grasp the bird's tail, a series of stationary movements, consistently results in the greatest increase in blood oxygen saturation during the tai chi form. Just as there are high- and low-impact aerobics, there may also be variations in Metarobic exercises.

Ultimately, for total health, it may be important to develop a well-rounded exercise routine, one including aerobic, strength training, stretching, *and* Metarobic exercise. But if health conditions preclude more vigorous forms of exercise at the outset, Metarobic exercises may help enhance health until one is able to engage in a larger variety of exercises. Metarobic exercise provides one more choice, opening up avenues of exercise that can alleviate boredom, match the interests of a diverse population, and provide an additional opportunity relative to current fitness level and ability.

If deeper abdominal breathing and relaxation are the key factors for Metarobic benefits, then the term may come to encompass many other exercises as well. Over time, the venues that constitute Metarobic exercise may include a surprising number of activities, just as aerobics has expanded to include everything from running to aerobic routines to cardio kickboxing and Zumba.

But as they say, variety is the spice of life, and the infant science of Metarobics should be no different. What may attract one person may

Tai Chi—A “Prescription for Pain, High Blood Pressure, and Diabetes”

“In addition to a number of physical problems (diabetes and high blood pressure), in February 2003, I had a back operation. It was only partially successful. For almost a year I tried physical therapy and medications. Even with ever-increasing dosages of pain medicine, I got little relief. I decided to try tai chi. By the third session, I could stand for more than an hour without pain. I didn’t need pain medication any longer. When my doctor saw my improvement, he stopped my physical therapy. The doctor asked me what had changed. When I told him I was doing tai chi, he said, “If I had known you had access to tai chi, I would have told you to start the exercise immediately.” He warned me, though, that if I ever stopped, I might regress. In the course of time, my other medical problems went away. I eventually stopped taking medication for my diabetes and high blood pressure. I have also learned to relax and have found some stress relief and a sense of peace—but these are issues that I’m still working on.”

—T. S. (From “Testimonials,” Everyday Tai Chi website)

be unpleasant to another. Tai chi and related exercises add one more option for health—an option that may become a necessity if one is faced with certain health conditions. As my theories and ideas are tested, some may be discarded as outright wrong, others confirmed as on the dot, and new understandings may arise beyond enhanced blood oxygen saturation, diffusion, and metabolic effects—benefits that can include the psychological.

Psychological Benefits of Tai Chi

Tai chi as a mindfulness practice carries additional benefits for physical and mental health. Mindfulness-based practices have long been

used to enhance awareness of destructive actions and habits in various Eastern traditions. Self-destructive actions can include not just addictions to nicotine, alcohol, or other drugs, but also poor eating habits as well as addiction to TV or video games. Enhanced states of mindfulness can increase awareness of how and when you engage in moments of self-sabotage in personal relationships as well as in life in general.

Over the past century, the top ten causes of early death have shifted from infectious diseases such as pneumonia and tuberculosis to diseases caused mainly by lifestyle—primarily related to diet and activity level. So aside from Metabolic benefits for physical health, Metabolic exercises such as tai chi carry an additional benefit in the form of enhanced awareness, mindfulness, and self-control over what are often unconscious behaviors, including health behavior. Deaths in the United States due to sedentary living account for approximately 33 percent of early deaths, including death from coronary heart disease, colon cancer, and diabetes. Lifestyle choices are the primary factor in 75 percent of all early deaths. These are diseases for which physical inactivity is established as a causal factor to one degree or another.⁵ Obesity is a major risk factor for the development of chronic diseases. The Centers for Disease Control and Prevention (CDC) notes that from 1960 to 2010, the prevalence of obesity in adults in the United States increased from 13 percent to 37.5 percent, and from 5 percent to 17 percent in youths nineteen and under.⁶

Mindful awareness of eating habits and what factors drive when, what, and where you eat can lead over time to a better control of diet and even exercise habits. Much overeating is driven by a stress reaction.⁷ Tai chi can have a direct effect on the stress response through the relaxation factor, as well as through a better awareness and control over stressful situations and what drives them. Tai chi has been called “moving meditation” due to mental effects similar to those of sitting or walking meditation. Focusing on the leading hand during tai chi practice is much like using a focal point in Zen meditation, which uses the breath, a mantra, a candle, or another focal point. By focus-

ing the mind on one point, the ongoing and constant mental chatter that streams through the mind becomes quieted, resulting in a clear mind. Aside from more efficient mental functioning, the calming effect of tai chi also helps to deal with stress. Enhanced insight can also help a person gain control over addictions such as smoking.

Tai Chi, Awareness, and Smoking

"First, I realized that when practicing tai chi on a regular basis, my [nicotine] cravings were lessened during the day. I'm not sure if this was a physical effect of the relaxed breathing, or if it was psychological. When I went for longer periods of not doing tai chi, my cravings increased. I have been wanting to focus on living a healthy lifestyle and maybe doing tai chi made me more aware and put my mind in a 'healthy' state, because every time I craved a cigarette, I thought to myself, 'that is not healthy.'"

—Paul (From the study on tai chi and smoking cessation
by Gryffin and Chen⁸)

Although tobacco also has physiological addictive properties, much habitual smoking is just that—habit. Over the years I have had students in my tai chi classes who have come up to me at the end of the semester and told me that they quit smoking because of tai chi. This caught me by surprise, considering that I had never talked about smoking in any of my classes. One student even told me that before the tai chi class, he had never contemplated giving up cigarettes. There was just something about tai chi that led him to stop smoking.

All of these students told me that a growing awareness of their smoking habits played a major role in their quitting. I grew curious about this, so I began researching to see if others had similar experiences. In doing so, as mentioned in chapter 5, I found a tai chi program specifically targeted at smoking cessation at the University of Miami. In that study, 83 percent of participants quit smoking as a result of the program.⁸

The responses of the students in my class, as well as a letter describing a participant's experience in the Miami study, indicated that a growing awareness of smoking habits and triggers was a major factor, possibly in conjunction with physiological responses. Enhanced awareness through meditation has been a valuable tool for behavior change for over 2,500 years, first in the East, and later in the West. In the West, meditative practices for behavior change have been popularized by Jon Kabat-Zinn as mindfulness meditation,⁹ as a behavioral intervention aimed at transforming behavior through enhanced nonjudgmental in-the-moment awareness.

Awareness (*sati* in Pali, an early Indian language still used in Zen and Buddhist studies, due to the origin of these practices) is a major component in Buddhist philosophy, as a means of eliminating destructive behavior and thoughts. Meditation is used as a tool to develop awareness of destructive habits and reactions and to enhance identification of cues triggering negative behavior. A basic premise is that the awareness and identification of cues instigating negative reactions are sufficient for creating awareness of cause and effect, and more importantly, a separation of self from behavior—essentially a mental “stepping back,” allowing space for purposeful action, as opposed to uncontrolled and unconscious reaction.

Without awareness of what needs changing and of the destructive influence of unconscious negative behaviors and reactions, change will never happen. Even something as obvious as putting a cigarette in your mouth can become an unconscious habit. Awareness of smoking-related cues and triggers can lead to developing a conscious control of smoking behavior. One of the nice things about tai chi is that as a moving form of meditation, it can be an effective and attractive tool for creating mindful awareness for breaking unconscious habits, with many ancillary health benefits.

To use tai chi as a moving form of meditation, it becomes more necessary to be able to practice the form on your own, as opposed to following along using cues provided by a teacher or a video. The primary reason for this relates to the focus of the mind during tai chi. In

sitting meditation, the meditator focuses the mind on the breath, often counting each breath to ten and then starting over again. Other focal points are also used, but this is one of the most common, particularly for beginners.

When counting the breath, it is common in the beginning stages to lose count, either continuing past ten or losing count entirely as other thoughts intrude, such as “I wonder what I will have for lunch today.” Over time, by continually bringing the focus of the mind back to the breath and the ten count, distracting and rambling thoughts disappear, leaving a calm and tranquil mind. From this calm, tranquil mind comes a new level of awareness, an enhanced ability to perceive negative actions and their sources in yourself and those around you. With enhanced awareness comes better communication, as well as self-awareness of destructive behaviors.

Tai chi acts in a similar way, but rather than counting the breath, the tai chi practitioner places the focus of the mind on the leading hand. As the hand drifts before your face, the mind follows. As the passive hand rises to take the leading hand’s place, the mind continues to follow, focused on whichever hand takes the lead. Such focus develops over time into a calm tranquility, so much so that even the sensation of time ceases to exist. Thirty minutes of practice will seem to pass in an instant.

In a tai chi class for older adults, I have participants focus on developing enhanced awareness of body movements, posture, balance, and relaxation using just one tai chi movement (grasp the bird’s tail). Class members were amazed the first few times they performed the one movement over and over again, with focus, for over thirty minutes, stating that they had no sensation of the passage of time. It felt like at most only a few minutes had passed.

Just as incessant thoughts and mental ramblings quiet under the focus of the ten count in sitting meditation, so does the mind by focusing on the movements of tai chi. And with this growing mental calm come greater self-understanding, insights, and awareness. An additional benefit is alleviation from boredom. Some people look at

tai chi and feel that moving slowly through the form would be boring. Much of boredom comes from thinking and focusing on time. Being mindful and focused on the movements result in a suspended state beyond time.

Since the focus of Metarobics is on the physiological reactions of the body during tai chi and similar exercises, I intend to go into greater detail regarding the many psychological benefits of tai chi in a later book, *Mindful Exercise: Tai Chi for Body, Mind, and Spirit*. In that book I will also touch on the more metaphysical aspects of meditative practice, as well as forms of energy work that are popular in some schools of tai chi and qigong. As my tai chi teacher stated, 90 percent of the time “qi” just means “air.” But the other 10 percent holds some fascinating implications—implications already familiar to those who have experienced the runner’s high or the spiritual awareness that comes from the many forms of contemplative practice, including forms of Christianity and Zen Buddhism.

Final Thoughts

As the growing number of tai chi practitioners age, more support for the life-giving benefits for these exercises will arise, just as the growing number of runners give testimony to the benefits of that exercise. Tai chi masters are renowned for their longevity as well as their health and vitality. Even many of the early masters, who often drank and smoked heavily as part of the culture of the time, still lived well into their seventies and eighties, active and mobile even into old age. Some lived to be over 90 or 100 years of age, including T. T. Liang, who lived to 102, and whose story is presented in this chapter. Run Run Shaw, the pioneering Hong Kong producer of kung fu movies, lived to be 107, which he attributed to a variety of factors, including the practice of qigong.¹⁰

Mindful Exercise and the theory of Metarobics help lay the groundwork for a group of exercises that have already demonstrated so much for so many. This book has highlighted research on the effects of

hypoxia and tai chi for a wide range of chronic conditions. Ultimately, the number of conditions Metabolic exercises may benefit may be limitless, since efficient oxygen use is critical for every function in the body, from thinking to healing. Parkinson's and Alzheimer's, although not covered in the preceding chapters, are but two more diseases for which there is evidence that tai chi may be of benefit.¹¹

Factors that may increase the risk of Alzheimer's include lack of exercise, smoking, high blood pressure, high cholesterol, and poorly controlled diabetes.¹² Since tai chi has been demonstrated to reduce high blood pressure and cholesterol, help control diabetes, and have an impact on smoking habits, it offers promise as an exercise that may hold off or diminish the effects of Alzheimer's. The action of increased blood diffusion may also offer benefits, since brain cells depend on efficient microcirculation to carry nutrients and other essential elements, including oxygen, throughout the brain. Vascular dementia, another type of cognitive decline that may be linked with Alzheimer's, is caused by damaged blood vessels in the brain, again stressing the importance of good blood circulation in all areas of the body, including the brain.

Two factors that may reduce your risk for these diseases have been identified as participating in mentally challenging leisure activities, such as learning more advanced forms of tai chi, and engaging in social interactions.¹² Tai chi is often performed in social groups. One recent study sought to determine potential effects of tai chi on brain size and cognition, with possible effects on Alzheimer's disease.¹³ Participants in the tai chi group were compared to those in a literature discussion group. Both groups demonstrated a significant increase in brain volume, comparable to previous studies documenting the benefit of aerobic exercise on brain volume. A control group experienced brain shrinkage over the same period typical for the sixty-to-seventy-year-old age group.

The authors of the study note that gradual cognitive deterioration that precedes dementia is associated with increased shrinkage of the brain, as nerve cells and connections are gradually lost. It is unknown

at this point if activities such as tai chi can help prevent Alzheimer's disease, but the authors state that epidemiological studies have shown that those who engage in regular physical exercise or are more socially active have a lower risk of Alzheimer's disease. People with Alzheimer's also become more susceptible to falls. As mentioned earlier, the development of enhanced balance is one of the primary hallmarks and benefits of tai chi.

Parkinson's disease, another progressive disorder of the nervous system, primarily affects movement.^{11,14} Beginning stages can include a mild tremor of the hand, slowed motion, short, shuffling steps, rigid muscles, impaired posture and balance, speech changes; in later stages, signs of dementia may appear, similar to Alzheimer's. The causes are unknown, but genetics and environmental factors, such as exposure to toxins or certain viruses, are thought to play a role.

If so, then in addition to controlling exposure to toxins, tai chi practice may help the body to better deal with viruses and other medical conditions, as discussed in chapter 6. Metabolic effects may also help by eliminating toxins through enhanced metabolism and removal of wastes. According to the Mayo Clinic, maintaining muscle strength and movement can help delay some of the progressive deterioration that occurs with Parkinson's.¹⁴ Tai chi, as a mild form of exercise that focuses on stability, balance, and movement, may be particularly suitable for those suffering from Parkinson's, and is recommended by the Mayo Clinic.

Tai Chi Made Me Walk Again

"My mom was diagnosed with Parkinson's disease. Her movements were stiff and awkward, and she dragged her feet when trying to walk. Finally she needed a walker, just to shuffle along. Then she started tai chi. A year later, my mom's movements improved so much that not only did she not need the walker, but she could walk completely unaided. Tai chi made a major difference in her symptoms and quality of life."

—Personal account related at a conference

By scientifically evaluating the actions of the body during Metarobic-based exercises, more beneficial and accurate prescription and practice of these exercises will be possible, to the point where tai chi and related exercises can be prescribed as effective forms of therapy for many conditions. As with any new theory, use these exercises in a way that makes sense to you and to your doctor. It is my hope and wish that this book will make understanding and practice a little clearer.

Metarobic exercises such as tai chi have been used by a large number of people with severe health conditions, with almost miraculous effects. Having a better understanding of the reasons for these benefits will do nothing to harm the mystique of tai chi. But over time, a greater understanding will do much for coming to know how to best maximize the desired benefits. As a new science with an old tradition, Metarobics is just the beginning.

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