TAI CHI
CONCEPTS *and* EXPERIMENTS

Hidden Strength, Natural Movement, and Timing

ROBERT CHUCKROW, PH.D.

Praise for *Tai Chi Concepts and Experiments …*

"With a lifetime of commitment to deep study and practice, diligent teaching, and the promotion of the martial arts, Robert Chuckrow, Ph.D., sets an example of how to grow your personal practice through contributing to the greater martial arts community. Now, through this book, he has demonstrated a determination and commitment to understanding the depth of martial arts practice."

— Grandmaster Sam F.S. Chin, Founder of Zhong Xin Dao, Gatekeeper of I Liq Chuan, Author of *I Liq Chuan—Martial Art of Awareness, I Liq Chuan System Guide* and nearly 30 DVDs, Honorary Professor Emeritus.

"It's my great pleasure to recommend this latest book on Tai Chi by my friend and Tai Chi classmate, Dr. Chuckrow, a Tai Chi devotee who never stops studying and learning. As a Western scientist, he delves deeply into the esoteric jargon, principles, and teachings of Tai Chi and reinterprets them for Westerners."

— Lawrence Galante, Ph.D., author of *Tai Chi: the Supreme Ultimate, Energy Healing*; Director of The Center for Holistic Arts, NYC; Professor at State University of New York.

"Author Robert Chuckrow offers his enlightening wisdom and educated perspective on the paradoxes of Tai Chi in his latest work. Through [his] brilliant research, Chuckrow resolves so many nagging questions that all beginners have and offers many new tools for instructors to share this venerated art. It's a must-read work for Tai Chi practitioners of every level, not to be missed."

— Gene Ching, 32nd generation disciple of the Shaolin Temple, author of *Shaolin Trips*, publisher of *Kung Fu Magazine*, former publisher of *Kung Fu Tai Chi*, weapons expert for El Rey Network's original TV show, *Man at Arms: Art of War*.

"Robert Chuckrow is a teacher and scientist who comprehends and synthesizes what he learns and then shares it for the benefit of others. He couples his knowledge of physics with his Tai-Chi skills, and the result enables the reader to understand this art more clearly than they could from studying translations of ancient cryptic Chinese sayings.

"People learn Tai Chi for different reasons—some for health, some for self-defense, and others for philosophical or spiritual reasons. And some do Tai Chi for years

without understanding much of what they do, which will still make them healthier and more sensitive to the world around them. But they will miss the wondrous benefits that a deeper study will offer. This book will take you further along this path."

— Ken Van Sickle, Professor Emeritus at NYU, Tai Chi master in the lineage of Cheng Man-ch'ing, third-dan black belt in karate under Peter Urban, author of *Ken Van Sickle Photography*.

"Robert Chuckrow's new book offers tremendous insights into the physical, spiritual, and healing aspects of Tai Chi. His discussion of natural movement and expansive strength is enlightening and well-referenced. Dr. Chuckrow encourages readers to perform the experiments he sets forth in order to experience for themselves the sensations and therapeutic benefits of expansive strength. He promotes critical thinking, reviews historical perspectives, and clarifies classical teachings. This book will enhance the practice of any student of this ancient and powerful art."

— Dr. Catherine Kurosu, MD, L.Ac. Co-author of the *True Wellness* book series.

"I was immediately impressed with Robert Chuckrow's approach to the soft-style arts. In the beginning of the book, Dr. Chuckrow's discussion of expansive strength versus contractive strength was immediately useful to me in my daily practice. Every chapter that followed presented new insights and ideas that I had not considered before, as well as exercises and experiments that helped me experience them directly."

— Master Joe Varady, M.Ed., Rokudan, author of *The Art and Science of Staff Fighting* and *The Art and Science of Stick Fighting*.

"With chapters on expansive strength, swimming on land, rooting and redirecting, natural movement, relaxation and timing, plus many more, this book is a guide to learning, practicing and better understanding Tai Chi. Dr. Chuckrow, an experienced Tai Chi practitioner and teacher, writes with the same attention to detail as when he teaches physics. In this book, he turns difficult, archaic Chinese sayings into clear and easy-to-understand English by using simple and practical exercises to get his meaning across."

— Mario Napoli, Tai Chi practitioner since 1988, black belt in karate and judo, All-China National Push-Hands Champion in Chen Village competition, 1988.

"As a physicist, Chuckrow offers the unique perspective of a scientific analysis of the practice of Tai Chi. As a student of Cheng Man-ching, his years of explorations and discoveries have yielded deep insights into this extraordinary art."

— Barry Strugatz, filmmaker, director of the documentary *The Professor: Tai Chi's Journey West*.

"This book is an excellent interpretation of Tai Chi Classics, which has been written through the centuries by the highest-level Tai Chi masters. Dr. Chuckrow has put forth these ideas and concepts in simple, easy-to-understand English. He explains these concepts using modern scientific principles of physics and the mechanics of human movement. He gives many examples and experiments to help students understand the principles of Tai Chi in a new light. This book is a must-read for all serious students of Tai Chi."

— Leonard Antonucci, taekwondo fifth-degree black belt, professor of health sciences, Long Island University, NY (retired).

"Reading Professor Chuckrow's book proves that efficient movement is efficient movement, no matter if it's done in Tai Chi or Kodokan Judo. One comment that Professor Chuckrow made was '. . . wasteful movement is unnatural.' This, in a nutshell, also describes what we do in judo. Another nugget of practical wisdom is, …moving efficiently, using the smallest possible movements, provides an advantage.' One would think that this came out of a judo book—again, proving that efficient movement is efficient movement, no matter the context."

— Steve Scott, author of *The Judo Advantage*, *The Juji Gatame Encyclopedia*, *The Sambo Encyclopedia*, and other books.

"This book has reignited my passion to further explore the art [of Tai Chi]."

— Peter Doherty, Master Trainer of Corrective Exercise, twenty-eight years studying martial arts, black belt in Karate.

"Brilliant! A high-level teacher of both Tai Chi Chuan and physics takes us along on his own fifty-year exploration into the very heart of China's most respected 'internal martial art,' challenging us each step of the way to deepen our own understanding of this marvelous practice. [This] is a book that every Tai Chi practitioner—and beyond that, every martial artist—should read, cogitate upon, and keep for life-long reference."

— Myles Angus MacVane, Tai Chi Chuan expert.

"The mysteries of the Chinese martial art Tai Chi are illuminated with the help of science in this primer.

"Chuckrow—the author of *Tai Chi Dynamics* (2008), a physicist, and a Tai Chi instructor— addresses the seemingly contradictory teachings of the masters of this martial art, like the admonition to use "no strength" in practicing it, and interprets them in light of Western physics and biology. His main idea is the concept of "expansive strength," a kind of "hydraulic pressure" in which "bodily tissues can actively expand under the action of bioelectrical stimulation." Expansive strength, he contends, is better than ordinary strength through muscle contractions because it doesn't create metabolic waste products or telegraph one's intentions to attackers. He goes on to apply more physics—explained in plain English, with the math tucked away in the appendix—to Tai Chi problems, like the niceties of maintaining one's balance in a pushing match. ("If an opponent A exerts a force F on me, according to Newton's third law, I automatically exert the same force F on A in the opposite direction....In order to remain in balance, A must arrange things so that the total frictional force of the floor on his feet exerts a force that is opposite to the force I am exerting on him.") Much of the intricate book explores Tai Chi's preoccupation with an exhaustive, even eye-glazing analysis of rudimentary bodily acts, such as taking a step—"As the knee k starts to arc forward, the lower leg lags behind, swinging backward relative to the upper leg; (b) the knee stops, and the lower leg swings forward past (c) to (d); (d) the lower leg has freely swung forward into a position with the heel just touching the ground"—or sitting down. ("True Tai-Chi practitioners lower themselves slowly and first contact the chair without any commitment. Then, they mindfully transfer weight until it is safe to commit it fully.") Physiologists may scratch their heads at Chuckrow's notion of expansive strength, but otherwise his explications of the fundamental laws of natural motion, complete with diagrams, are written in reasonably clear, if involved, prose. Tai chi students will gain from the author a deep theoretical grounding in the discipline's basic approach to movement along with a wealth of useful exercises to help them practice it.

"This informative introduction to Tai Chi combines extensive discussions of principles with hands-on techniques."

— KIRKUS Reviews

Tai Chi Concepts and Experiments

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INTRODUCTION

Why I Wrote This Book

Over the half-century that I have studied Taiji, I have found that explanations of certain essential elements of the art are either insufficiently clear or absent. Two such elements are (1) the cultivation of expansive strength, which does not originate from nerve impulses producing contraction of muscle fibers but from a different action, and (2) the optimal timing of movement from the legs, to the hips, and out to the arms. I am concerned that these two essential elements will be forever lost to the majority of Taiji practitioners, especially those of the Yang style.

The writings of the highest-level masters over centuries are contained in the Taiji Classics. These writings emphasize the importance of releasing ordinary strength until it is at a minimum but also emphasize cultivating a kind of strength described as "iron wrapped in cotton." On the one hand, the body must be so free of tension that the slightest touch will set the body into motion. On the other hand, the whole body must be able to manifest substantial strength in all directions—even while doing the Taiji form. These two ideas seem contradictory.

Over the decades, I have come to understand that there is no contradiction and that there are two different kinds of strength, contractive and expansive. It now makes perfect sense that relinquishing contractive strength is essential to achieving expansive strength. That idea is confirmed by what I have observed in my teachers and what is expressed in the Taiji Classics.

A main goal in writing this book is to resolve the seeming strength/no-strength contradiction and enable the reader to achieve expansive strength. Another goal is to clarify the optimal timing of the turning of the trunk of the body relative to that of the arms to maximize the transfer of movement from the feet, to the body, to the arms, and to provide ways of recognizing and then achieving this timing.

Whereas some of my analysis involves the application of basic physics, the reader need not know any physics to gain the desired understanding—the final conclusions are simply and clearly stated, intuitive examples are given, and various experiments are provided for the reader to try. Readers who are interested in the rigorous physics derivations will find them in the appendices.

Contents Overview

The first chapter addresses the concept of relaxation. The next two chapters explore the idea of expansive strength. Experiments that the reader can apply for experiencing such strength are provided, and physiological arguments are advanced. We then show the advantages of expansive strength, its healing aspects and protocols, and how it enters into the Taiji movements.

Two other chapters cover balance and rooting. Several chapters address and clarify how to achieve the most relaxed and natural timing of movement regardless of speed. A chapter is provided on clarifying Cheng Man-ch'ing's treatise on the physics of Taiji. Other chapters will address self-cultivation and maximizing progress in studying Taiji.

Who Should Read This Book

Teachers and advanced practitioners of Taiji will find that this book contains clear explanations and perspectives of essential elements infrequently—if ever—available. Exposure to ideas that might conflict with or are absent from their Taiji or other training will provide much food for thought and accelerate their progress.

Practitioners with some experience should find that the ideas presented herein will enhance their understanding.

Finally, beginners will struggle to understand some of the ideas presented, but for many the exposure should pay off in the future.

Chapter 1

"Relax"

Cheng Man-ch'ing

I started my study of Taiji in 1970 with Professor Cheng Man-ch'ing (1902–1975) at the T'ai-Chi Ch'uan Association at 211 Canal Street, New York City. I was then thirty-three years of age and am now eighty-four.

At that time, I had almost no idea what Taiji was. All I knew was that I was very high-strung and uncoordinated, and after my initial skepticism, Taiji appeared to be a solution to these issues.

Professor Cheng spoke and understood only Mandarin, of which I knew not even one word. So everything I asked him was translated into Mandarin, and then Professor Cheng's answers in Mandarin were translated back into English. Professor Cheng also communicated silently, using various gestures.

One of the first things I was repeatedly told in class was to relax. In fact, "relax" was the reply to most questions my classmates and I asked.

As I learned to relax, I saw how doing so helped everything I did. I started to recognize all of the unnecessary tension I was applying to using a table saw, practicing the harpsichord, washing dishes, driving my car, and even getting out of bed in the morning.

Yang Cheng-fu

Cheng Man-ch'ing was an inner student of Yang Cheng-fu (1883–1936), who was considered to be one of the top-ten Chinese martial artists of the 20th century—quite an accomplishment considering the millions of high-level martial artists in China during that century.

In class, Professor Cheng said that *relax* (*song*) was the main word used by Yang. Here are Professor Cheng's words to that effect:

Chapter 2

Expansive Strength

Is there one kind of strength that in Taiji is used in a minimal, highly trained manner? Or are there two distinctly different kinds of strength, one type being ordinary muscular contraction and the other kind not involving muscular contraction but something quite different? And if there are two kinds, are they perhaps used alternately or in unison?

We will explore the hypothesis that bodily tissues can actively expand under the action of bioelectrical stimulation. I have thought about and experimented with this hypothesis since the mid-1970s and have continued to be increasingly convinced of its truth. Until recently, the evidence was based on what I (and others) have been experiencing. Now the experiential evidence is supported by ongoing scientific research at Washington State University, led by Dr. Gerald Pollack. That research on water and its effect on cellular action identified a mechanism by which tissues can actively expand, a mechanism that corresponds closely to what I have been experiencing and describing for decades—and what others can experience if so taught.

Intention is involved in such expansion, so it might seem that electrical nerve impulses play a part. But there might also be a different, more evolutionary, and primitive biological mechanism of electrical transmission. If you watch videos of protists (single-celled, microscopic animals) moving, they devour microscopic prey, dart around as if having the intention to do so, and seem to avoid obstacles deliberately.[1] Yet they have no muscles, eyes, or known nervous systems. As we have evolved from such life forms grouping together, perhaps we retain primordial mechanisms of sensing and of changing cellular states that involve some sort of electrical transmission beyond a neurological one. Thus, the more-general term *bioelectricity* will be used hereinafter to refer

1. See videos of protists: https://www.youtube.com/watch?v=4aZneo5Qu4Q and https://www.youtube.com/watch?v=-8rpGbHC2Jo.

to electric potentials and currents produced by or occurring within living organisms.

First, I will explain how I was introduced to the concept of expansive strength. Next, I will provide some experiments that readers can try for exploring expansive strength. Finally, I will summarize a promising mechanism for expansive strength.

Background

I started my study of Kinetic Awareness® (KA) in 1974 under Elaine Summers (1925–2014).[2] KA is a system of natural movement and self-discovery that she originated. KA® includes the concept that muscles can actively extend. Summers called this phenomenon *extension tension*. Much of her work in analyzing bodily movement and helping injured dancers recover was based on this concept. There is great therapeutic benefit in relinquishing the contractive strength to which most of us are habituated and slowly, mindfully, and painlessly extending the tissues that are in trauma.

The reason for the therapeutic effectiveness of relaxed, mindful movement is that it promotes the flow of *qi* and blood, both of which are otherwise restricted by the contraction of muscles. Blood transports oxygen and nutrients to and waste products away from the traumatized region. Moreover, the bioelectricity resulting from such relaxed movement stimulates the absorption of beneficial substances and the release of waste products.

Decades ago, I began to realize that expansive strength was the key to what in Taiji is called *nei jin*. *Nei* means *internal*, and *jin* means *strength*. This realization greatly enhanced my progress in Taiji.

In 2008, I stated in *Tai Chi Dynamics* the hypothesis that muscles can actively extend.[3] I utilized that concept to explain natural and reverse breathing and also the important distinction between *nei jin* (strength arising from internal training) and *li* (untrained strength). Moreover, I applied that concept to a number of other often-elusive Taiji applications. The concept of expansive strength also served to clarify otherwise mysterious passages of the Taiji Classics. I stated then that I experienced muscular extension as hydraulic pressure wherein a change in pressure at any part of the body is transmitted to every other part of the body (bodily unification).

The Current View of Muscular Action

The following are the current views:

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2. http://en.wikipedia.org/wiki/Elaine_Summers.

3. Robert Chuckrow, *Tai Chi Dynamics* (Wolfeboro, NH: YMAA Publication Center, 2008), 1–23.

a. Muscular action results *solely* from the contraction of muscle fibers along their length.
b. The contraction of muscle fibers is activated by neural impulses from the brain, spinal cord, or other muscles.
c. Muscles are arranged in opposing pairs.
d. The contraction of a muscle on one side causes the muscle(s) on the other side to elongate (extend).

The discussion that follows in the next section agrees with the above views except for the word *solely* in (a). Namely, we advance the hypothesis that there is an additional way in which muscles (or other tissues) elongate (or expand) other than solely by the contraction of opposing muscles. That is, we hypothesize that contraction is not the only feature of muscular action, and muscles and possibly other bodily tissues can actively produce movement through expansion.

Differences between Contractive and Expansive Strength

Expansive strength is better for sensitively doing short-range, precise excursions and for sustaining a position against an opposing force or neutralizing an incoming attack. Short-range movement is consistent with the Taiji principle that neutralizing and striking originates in the legs and "waist" and not in the arms.

> The motion should be rooted in the feet, released through the legs, controlled by the waist, and manifested through the fingers.[4]
>
> —Chang San-feng

So expansion excels for Taiji movements, which involve small excursions of all body parts in a unified manner.

> Remember, when moving, there is no place that doesn't move. When still, there is no place that isn't still.[5]
>
> —Wu Yu-hsiang (1812–1880)

The above saying can be interpreted to mean that every part of the body *actively* participates in and fully contributes to the movement of all parts. In expansive movement, the contribution of any localized part is relatively small when all parts participate in a unified manner. So the whole body can have a moderately large movement.

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4. Benjamin Pang Jeng Lo, Martin Inn, Robert Amacker, and Susan Foe, eds., *The Essence of T'ai Chi Ch'uan, The Literary Tradition* (Berkeley, CA: North Atlantic Books, 1985), 21.
5. Lo et al., *The Essence of T'ai Chi Ch'uan*, 57.

Chapter 3

"Swimming on Land"

Professor Cheng's Advice

Cheng Man-ch'ing wrote about the importance of what is described as "swimming on land,"[1] "swimming in air,"[2] and "dry swimming."[3] We are advised in these writings to imagine the air as having the resistance and consistency of water when doing Taiji movement.

> Man lives on land. His long familiarity with air often makes him forget about its existence. Since it lacks solidity and shape, it eludes attention or easy mental grasp by the beginner. To liken air to water aids the imagination. It is like water in the sense that if one pretends to swim while out of water, his movements automatically conform to the principles of Taiji. By this practice, the novice will ultimately "feel" the air to be heavy in the sense that he feels water to be heavy. At this stage his body has become lighter and more pliable than that of the average man. This feeling of buoyancy and suppleness derives from firmly rooting the feet and using the body in "dry swimming." Functionally, this slow movement against an imagined resistance will ultimately create great speed in responding to a fighting situation.[4]

Professor Cheng considered "swimming on land" to be so important that he devoted a whole chapter to it in his *Thirteen Treatises*. In that chapter, Professor Cheng says:

> As you make progress the air will not only feel heavier than water, it will feel like iron.[5]

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1. Cheng Man-ch'ing, *Cheng Tzu's Thirteen Treatises on T'ai Chi Ch'uan*, trans. Benjamin Pang Jen Lo and Martin Inn (Berkeley, CA: North Atlantic Books, 1981), 36–39.
2. Cheng Man-ch'ing and Robert W. Smith, *T'ai Chi: The "Supreme Ultimate" Exercise for Health, Sport, and Self Defense* (Rutland, VT: Charles E. Tuttle Co.,1967), 10.
3. Cheng Man-ch'ing, *Tai Chi Chuan: A Simplified Method of Calisthenics for Health and Self Defense*, North Atlantic (Berkeley, CA: North Atlantic Books, 1985), 12.
4. Cheng and Smith, *T'ai-Chi,* 10.
5. Cheng, *Cheng Tzu's Thirteen Treatises*, 39.

My Initial Skepticism

For a long time, I had difficulty in reconciling this concept with Professor Cheng's frequent admonitions to relax completely and surrender to gravity (*song*). I reasoned that using any muscular force against an imaginary resistance would also require generating a counter force by the opposing muscles and that pitting one muscle group against another would lock the body and prevent free movement. Such a condition also seems antithetical to the principle of non-action.

In addition, some classmates of mine who tried practicing against resistance appeared to be using a substantial amount of brute strength. I considered that way to be wrong and abstained from practicing swimming on land.

My Eventual Realization

I later saw that Professor Cheng used the words *imagination* and *imagined*. At no point did he suggest exerting any actual strength. Then I remembered that it is known that the mere thought of doing a physical action is accompanied by production of minute bioelectrical impulses that would ordinarily initiate that action. But such impulses are below the threshold for producing any outward exertion of strength. So imagining resistance need not involve pitting muscles against each other. Therefore, taking Professor Cheng's advice to mean imagining the air as having the resistance of water does not at all contradict his advice to relax.

More recently it occurred to me that when you relax completely (thereby subduing use of contractive strength) and imagine using strength, you are then more apt to produce the bioelectricity associated with expansive rather than contractive strength.

So imagining resistance can be thought of as an activity for training the bioelectrical system to stimulate expansive strength. Because doing so results in a perception of using strength without outwardly exerting it, it provides an effective feedback system for learning to achieve expansive strength and then increasing its intensity. That idea explains Professor Cheng's statement about the air feeling as though it has the resistance of iron.

It is evident that in promoting "swimming on land," Professor Cheng was revealing a tool for recognizing and then cultivating the internal state of strength called *nei jin* (internal strength), essential for both the health and self-defense aspects of Taiji. Cultivating such a state requires ferreting out and then relinquishing contractive muscular action.

As this new bioelectrical action becomes increasingly intense, more-widely distributed, and more under conscious volition, the movements are then increasingly done by using that kind of strength. Now there is a feeling of exertion but without any sensation that muscles are contracting. In my view,

what you are feeling is the bioelectricity produced and its resulting expansion of the water in your tissues.

To see a truly impressive use of expansion in doing Taiji movement, please watch the first five minutes of this YouTube video of Wang Shu-chin (1904–1981).[6]

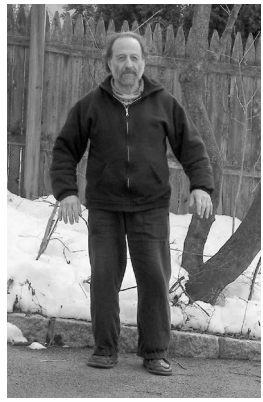

Fig. 3-1. The author standing in the "Beginning" Taiji posture, imagining water pushing his hands and arms from behind.

Experiment 3-1. On more than one occasion, one of my teachers, Harvey Sober, had us try this experiment: stand in a 50-50 stance, with feet parallel and shoulder-width apart ("Beginning" posture) (Figs. 3-1 and 3-2). Attain a state of *song*. Slowly rotate your elbows forward and out sideways. Then rotate your palms to face the rear. These three modifications should be independently fine-tuned experimentally to maximize the feeling of *qi* (swelling and tingling of the palms and forearms). Then imagine water coming from behind, pushing your hands forward. Imagine pushing back on the water without tensing muscles. You should feel the *qi* increase. After a while, the resistance will appear to be very great even though you are not tensing anything. If all goes well, you should now be in a state of expansion. Capture that expanded feeling and lock it in so you can recreate it later.

Next, try to intensify the expansion and spread it everywhere in your body. When you are in that expanded state, someone who tries to move your arm should not feel resistance resulting from contractive strength but, instead, feel that your arm is connected to every part of your body.

6. https://www.youtube.com/watch?v=JnhEwTAQr7Q&t=177s.

Chapter 4

Elucidation of Famous Masters' Sayings on Mind, Qi, and Strength

This chapter will attempt to shed light on the various sayings and writings of famous Taiji masters concerning the relationships of mind, *qi*, and internal and external strength.

Li, *Jin*, and *Nei Jin*

In everyday Chinese speech, *li* and *jin* are used interchangeably for *strength* (see Fig. 4-1 for their characters). Also, Chinese-English dictionaries translate these words as having almost the same meaning. However, in martial arts, where specialized words are used, *li* refers to untrained physical strength, and *jin* implies a trained, sophisticated strength.

A further source for confusion is that martial *jin* can refer to *any* sophisticated strength, including that of hard styles. Technically, *nei jin* (*nei* means *internal*) is more appropriate to use for the expansive strength of Taiji and other internal styles. However, those who speak or write about Taiji often omit the adjective *nei*, and *jin* is simply used to mean *nei jin*.[1]

In English translations of the Taiji Classics to which we will next refer, the distinction between *li* and *jin* is sometimes unclear, and *jin* and *nei jin* are often used interchangeably. In what follows, the reader will need to keep in mind the above distinctions and pitfalls.

1. See http://www.ycgf.org/Articles/TJ_Jin/TJ_Jin1.html for a clear discussion of *jin*, *li,* and other specialized words.

Fig. 4-1. The characters for *li* (left) and *jin* (right). In everyday discourse, *li* and *jin* are usually used interchangeably to mean strength. But when used in Taiji, *li* refers to untrained physical strength, and *jin* implies a trained, sophisticated strength.

Qi, Breath, and Internal and External Strength

Whereas Qigong has flourished as both a theory and as a practice for thousands of years, *qi* is still not adequately explained nor is its existence even accepted by Western science. But for anyone who has practiced Qigong or Neigong[2] sufficiently to experience *qi* and its healing effects, there is little need for science to affirm its validity. Nevertheless, in China and the United States there is currently ongoing scientific research into *qi* and the herbs of traditional Chinese medicine. Nevertheless, in China and the United States, there is currently ongoing scientific research into *qi* and the herbs of Traditional Chinese Medicine.

The Taiji Classics[3,4] frequently refer to the importance of understanding the relationships among *qi*, breath, and strength. Reading these old writings can be quite confusing—partly because they originated in old Chinese, then were translated into Modern Chinese, and were next translated into English. For example, *jin* and *li* are two frequently used Chinese words, each for a very different kind of strength. These words have no direct English counterparts, and some English translations use strength indiscriminately for both. Moreover, the word *qi* can be used for breath, a certain kind of strength, or even something not understood at that time. We now know about hydraulic pressure, and much about how bodily movement is initiated by the electrical effects of nerve impulses. Perhaps some of what the ancients called *qi* can now

2. Qigong involves movement to cultivate the flow of *qi*, and Neigong additionally involves intentionally creating an internal state that intensifies the *qi*.

3. Benjamin Pang Jeng Lo, Martin Inn, Robert Amacker, and Susan Foe, eds., *The Essence of T'ai Chi Ch'uan* (Berkeley, CA: North Atlantic Books, 1985).

4. Douglas Wile, comp. and trans., *T'ai Chi Touchstones: Yang Family Secret Transmissions* (Brooklyn, NY: Sweet Ch'i Press, 1983).

Chapter 5

Advantages of Expansion over Contraction in Taiji

Much of the analysis of this chapter is an amplification of parts of my book, *Tai Chi Dynamics*.[1]

Briskness of Regulation of Strength Compared for Both Types of Strength

Use of Contractive Strength

When contractive muscular strength is employed, nerve impulses from the brain and spinal cord cause muscle units to contract. The contracting muscles pull bones by means of their associated tendons, thereby producing external force and movement. When external conditions require a change in the contraction produced, that change requires a succession of events to occur: 1) Afferent nerve impulses arising from sensory stimuli (sense data) are transmitted to the central nervous system and brain for analysis. 2) The analytical part of the brain then perceives the need to regulate external force and movement in accordance with what is perceived. 3) Based on the perceived need, the analytical mind then generates a course of action. 4) Efferent (motor) neural impulses are then sent to muscles, causing force and movement for the required change. The time taken for this succession of neurological events can be long compared to the time in which external conditions can change, especially in a self-protection situation.

1. Robert Chuckrow, *Tai Chi Dynamics* (Wolfeboro, NH: YMAA Publication Center, 2008), 47–54.

Use of Expansive Strength

When you achieve a deep state of *song*, allowing the body to liquefy, contractive strength is then incompatible with that state and thereby minimized. So when strength is required while sustaining this liquefied state, instead of nerve impulses that are normally generated to cause muscles to contract, now bioelectricity is generated to expand and, thereby, pressurize and change the state of the water in the muscle cells and possibly other tissues.[2] This pressure extends to every relaxed region of the body. A principle in physics, mentioned earlier, called Pascal's principle, states:

> Any change in the pressure at any point in a confined liquid is accompanied by the same change in pressure at every other point.

During the exertion of external force, if any increase or decrease is required by external conditions, there is no need for any neurological activity or analytical processing. Because of Pascal's principle, as soon as there is a sudden increase or decrease in external force, the hydraulic pressure within the body automatically adjusts, virtually instantaneously.

Stability

One important distinction between contractive and expansive strength applies to the exertion of force on you by an opponent (or vice versa). A basic principle in physics that governs situations involving the application of force of one body on another is Newton's third law, which states:

> If object *A* exerts a force on object *B*, then *B* exerts an equal-and-opposite force on *A*.

This law applies to all bodies—sentient or not, stationary or moving. A corollary of Newton's third law is that it is impossible for you to exert a force on another person or object without that person or object exerting the same force back on you. It is a consequence of Newton's third law that, when a person exerts a force, say on a door, the door exerts an equal-and-opposite force on the person (the reaction) (see Fig. 5-1). This result holds whether the door moves or not![3]

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2. The possibility exists that bioelectrical impulses beyond those from nerves are involved.
3. Not all equal-and-opposite forces are action/reaction. For example, equal-and-opposite forces that are on the same object are never action/reaction—as in the case of the downward force of gravity and the upward force of the floor on a stationary person.

Chapter 6

Health Protocols Using Expansion

Expansion for Reeducating Upper-Back Alignment

Kyphosis

Kyphosis (hunchbacked) is the medical term for an excessive rearward convexity of the thoracic spine. Having taught Taiji to seniors—some in their upper nineties—for the past two decades, I can say that there are few beyond seventy years of age who are exempt from kyphosis. Actually, many much-younger people suffer from varying degrees of this condition without even realizing it.

Causative factors are inadequate nutrients, improper bodily usage, and insufficient exercise, hydration, sleep, and exposure to sunlight.

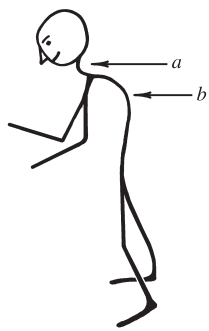

Fig. 6-1. A depiction of an excessive curvature of the upper back: (*a*) the cervical spine is excessively curved to reduce the downward aspect of the head, and (*b*) the excessive curve of the upper back. Hunching forward to this degree requires the use of a walker to support the body.

Those with severe kyphosis compensate for having their heads dipped forward by lifting their chins, thereby accentuating the curves in their necks

(Fig. 6-1). If this compensation is insufficient, the next way of compensating is to thrust their pelvises forward (Fig. 6-2).

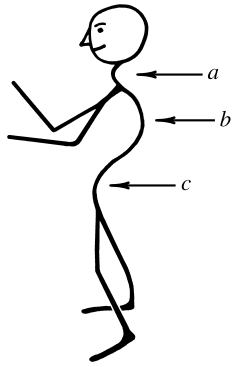

Fig. 6-2. A depiction of the results of compensating for an excessive curvature of the upper back: (*a*) the cervical spine is excessively curved to reduce the downward aspect of the head, and (*c*) the pelvis is thrust forward, allowing the body to be more balanced and upright at the expense of an excessively curved lower back.

My Struggle with Kyphosis

I started to develop a serious kyphosis when in my teens, possibly from practicing the piano while hunched forward for hours on a daily basis. When I was in my twenties, my kyphosis had progressed to the point where I experienced severe pain that was relieved only by lying on my back for a while.

One day in the 1970s, when I was lying on my back on the floor of an empty classroom to relieve my pain, one of my high school students, Kate Antrobus, noticed and asked me what was wrong. When I told her, she said, "You should go to my teacher, Elaine Summers. She is a genius. She can help you." Whereas massage, chiropractic, meditation, and Taiji reduced the pain, their benefit to my excessive back curvature was minimal. So I was somewhat skeptical but decided to keep an open mind and contact Summers.

The progress I made under Summers's system, Kinetic Awareness® (KA), was substantial. My excessive spinal curvature and the resulting pain were lessened, and the changes I made during each weekly session with her were evident.

In recent years, I have been delving deeper into the problem of forward spinal curvature and have found that applying Summers's concept of frontal expansion has had impressive effects, not only for myself but for a number of the students in their eighties and nineties to whom I teach Taiji.

Causes of Kyphosis

Consider young people whose spinal alignment hasn't been corrupted by doing repeated, lengthy tasks wherein their bodies are leaning forward. For them, all vertebrae are balanced without any need for muscular tension to maintain the natural spinal curves in a relaxed alignment.

Chapter 7

Balance

Balance depends on many elements, some of which are herein discussed: 1) gravity; 2) leg strength; 3) an awareness of the pressure distribution on the soles of the feet; 4) knee, ankle, arch alignment; 5) center of mass; 6) range of motion throughout the body; 7) vision; 8) awareness of your surroundings and limitations; and 9) a brief mention of the semicircular canals.

Gravity

The Riddle of the Sphinx

In the Ancient Greek play, *Oedipus Rex*, by Sophocles (c. 496–c. 406 BCE), Oedipus succeeded in solving the riddle of the Sphinx: "What walks on four legs in the morning, two legs at noon, and three legs in the evening?" The answer is "Man." Humans start off crawling on all fours, then walk upright, but finally succumb to gravity later in life and must walk with a cane.

The force of gravity is our friend—without it we would float helplessly. But we must constantly contend with it. Many seniors are concerned about falling, and fatality after a fall increases with age. Practicing Taiji improves balance and reduces the chance of falling and also of being injured from falling. Of course, the probability of falling can be further reduced when a comprehension of the mechanics of balance is brought into Taiji movement and daily life.

Rooting and Balance

Rooting means being connected to the ground like a tree whose roots are deeply embedded in the earth. Two main goals in martial-arts practice are to be rooted and to be skilled in "breaking the root" of an opponent. Losing a connection to the ground can have serious consequences in martial arts as well as daily life.

Rooting and *Song*

Song (Chapter 1) is one of the most important conditions for rooting. As soon as tension develops—especially in your upper body—not only is your root undermined, but your center of mass rises, thereby increasing the chance of injury from a fall (center of mass is discussed later in this chapter).

Song is also necessary for achieving expansive strength (Chapter 2), which is important for effective power and bodily resilience. Finally, *song* results in the center of gravity being much lower, which means increased stability and less injury should a fall occur.

Leg Strength and Mobility

When you begin to lose your balance—even to a small degree—shifting your weight is often a factor in recovering stability. So a combination of mobility and leg strength is important in preventing falling. The stronger your legs and the greater their range of motion, the greater the ability to correct for a loss of balance.

There have been a number of studies reporting that seniors and those with health issues such as Parkinson's disease fall less frequently as a result of studying Taiji. This conclusion agrees with the experience of some of my students who are seniors. The question is, what is it about Taiji that reduces falls?

Many seniors—and even younger people—are susceptible to falls because they spend a lot of time sitting, which causes their leg muscles to atrophy. The increase in leg strength produced by practicing Taiji helps substantially. Taiji stepping involves having the weight on a stationary leg while it is bent much more than is required in daily life. The resulting stretch of the quadriceps and other muscles in the legs not only increases adaptive ability but also results in a substantial increase in leg strength.

Exercises for Strengthening Leg Muscles

Here are a few valuable exercises for strengthening calves and quadriceps.

Heel-Circling. This exercise was taught by Professor Cheng for helping a knee injury heal. It is also very valuable for strengthening the quadriceps muscle. This is not a balance exercise, so lightly hold onto something stable. Then start by standing on one leg (Fig. 7-1). Bend the rooted leg and lift the knee of the empty leg. Then, without lowering the knee, extend the heel outward and then down in an arc. Repeat a few times, then kick your leg to release the muscles. After resting, do the other side. Over time, as your leg strength allows, increase the number of repetitions on each side to a total of thirty-six times in a row.

Chapter 8

An Analysis of "Rooting and Redirecting"

In addition to showing their skill by doing solo movements, push-hands, and self-defense applications, Taiji practitioners also demonstrate "rooting and redirecting." That is, practitioners will stand in a 70-30 stance and pair off with one or more large, strong partners and ask them to push their body or outstretched arm as forcefully as possible. The goal is for practitioners to be so rooted that no movement or loss of balance occurs no matter how hard they are pushed.[1]

Cheng Man-ch'ing was renowned for demonstrating such rooting by standing in the "Ward Off" posture and having one or more partners push his outstretched arm (Fig. 8-1), thereby showing not only rooting but also *peng-jin* skills (*peng* is upward, outward movement or power, and *jin* is refined strength, so *peng jin* is an upward and outward manifestation of refined strength).

How can a small, elderly practitioner withstand a large incoming force without being moved? The analysis of the optimal conditions for rooting requires the use of elementary physics. The quantitative physics derivations will be located in Appendix 2 for reference for those who are interested. A review of the basics of the pertinent vector arithmetic is included in Appendix 1.

Conclusions, intuitive explanations, and experiments are provided in this chapter for those who prefer to skip the physics derivations.

1. See video of Chen Xiaowang demonstrating rooting: https://www.youtube.com/watch?v=FtCfUaL-leo.

Chapter 9

Natural Movement

Understanding Natural Movement

What Is Meant by *Natural.*

The word *natural* pertains to *nature*, and a good dictionary will have as many as a dozen definitions of each of these two words. Consider the following definition of *nature*:

> A particular order of existence or of existing things, frequently regarded as in contrast with, or as the subject matter of art. Specif[ically]: a That which is in a natural, as distinct from a developed, ordered, perfected, or man-made state: that which is, or is represented, in its original, untouched condition.[1]

The basic distinction is that *natural* is what existed for approximately 4,000,000,000 years before humans appeared and changed or corrupted it. So we are not here taking the point of view that everything in the world is natural and will not say, for example, that Grand Coulee Dam is as natural as a beaver dam. To do so might be of value in another context—but not here.

Movement in Nature

Movement seen in nature is efficient—if it were not, life forms would be at a great disadvantage. Inefficiency results in wasted time, being noticed by predators, and increased requirements for energy and thermal regulation along with lessened abilities for achieving those requirements. A life-form having these deficiencies would suffer a decreased probability of surviving long enough to reproduce, which would eventually lead to that species's extinction.

In many developed countries in which abundance and safety exist, it is possible to be wasteful of energy, consume unnecessarily, and be unaware of our surroundings safety-wise. But such disregard has health and other consequences.

1. *Webster's New International Dictionary of the English Language, 2nd Edition, Unabridged* (Springfield, MA: G. & C. Merriam Co., 1954).

Elements of Natural Movement

Proprioceptive Sense

Proprioceptive sense is the ability to perceive stimuli originating in the tissues of the body resulting from their movement or tension. A large part of learning Taiji involves training the proprioceptive sense to become very keen. Those who teach Taiji know that many beginners have little awareness of their own bodies and move one part thinking that they are moving a totally different part. Or they move the right part but are unaware of how they are moving it. Unless beginners have prior training in dance, sports, or other movement arts, their proprioceptive senses were probably never developed much or were developed at one time and have since atrophied. So studying Taiji can be of great benefit in that respect.

Unified Movement

A basic principle of Taiji is that all movement must be unified, which necessitates feeling all appropriate parts of your body participating as a whole. If you do not know the extent to which each part of your body is involved in a movement—or whether or not it is at rest or moving—it is very hard to manifest unified movement.

Independence of Movement

Practicing independent movement (isolated movement of one part) helps us to become more aware of what part of the body is involved in a particular action and whether it should or should not be involved. How can you know that you are moving in a unified manner if you are unable to move a certain part of your body all the ways it can physiologically move and don't know which parts of the body are initiating each movement? For example, when most people are asked to move a particular region of their spines, they can't do so by using only the muscles around that region and resort to using their pelvises or ribs instead.

By learning to move independently, we can become highly sensitized to frozen or inappropriately used muscle groups, thus providing a tool for directly working on releasing such unnecessary and harmful tension.

Finally, the more able you are to consciously move a particular part of the body independently, the more successful you will be in sending *qi* to that area for healing an injury.

Thus, practicing independent movement can play an important in cultivating proprioceptive sense, ultimately leading to the ability to do unified movement.

Chapter 10

Stepping Like a Cat[1]

Taiji Stepping

In the Taiji Classics, Wu Yu-hsiang says, "When changing position, you should move like a cat."[2] That admonition implies that you should step naturally, as a cat would. When stalking a bird or a mouse, a cat does not commit any weight onto a stepping paw before it is already touching the ground. Committing its weight prematurely would produce a discontinuity in motion that alerts its prey (in the footnote below, watch a youtube.com video of a jaguar stalking and seizing a crocodile).[3] Moreover, a cat would not stiffen its joints while walking.

However, when stepping, some Taiji practitioners lift and move their legs stiffly as rigid units instead of releasing their knee joints and allowing their lower legs to swing freely. Also, some practitioners literally fall onto a stepping foot, with the floor preventing a complete fall.

Stepping in this manner is unnatural, breaks the balance and continuity of *yin* and *yang*, and increases vulnerability to falling in daily life. It is also martially incorrect because an opponent can easily become alerted by the discontinuity and take advantage of options such as sweeping the stepping foot just as it hits the ground. The balance of *yin* and *yang* and their continuity of mutual exchange are essential to Taiji. Thus, the stepping foot, which is *yang* (active, upward, outward), must continuously evolve into *yin* (earthy, supportive, inactive) as it blends with the ground.

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1. Much of the material of this chapter was originally published as an article: Robert Chuckrow, "Stepping Like a Cat," *Qi: The Journal of Traditional Eastern Health & Fitness*. 24, no. 3 (Autumn, 2014).
2. Waysun Liao, *T'ai-Chi Classics* (Boston: Shambhala, 2000), 122.
3. https://www.youtube.com/watch?v=DBNYwxDZ_pA.

Yin and Yang

The concept of *yin* and *yang* is basic to the art of Taiji. In fact, the *yin-yang* symbol (Fig. 10-1) and the art are both called *Taiji*. Thus, it is essential to adhere to the principles expressed by the *yin-yang* symbol in doing Taiji movement.

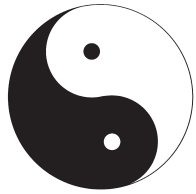

Fig. 10-1. The Taiji symbol, which portrays the balance of *yin* and *yang* and their continuous cyclic evolution. The dark part is *yin*, and the light part is *yang*.

The Taiji symbol portrays the balance and cyclic interchange of *yin* and *yang*. We see circularity, continuity, and balance. Note that in the Taiji symbol, *yin* and *yang* continuously alternate, one into the other, as do night and day. When *yang* becomes full, it starts to become *yin*, and vice versa.

Weight Transfer

The graphs below display the correct and the incorrect build-up of force on the ground during stepping into a 70-30 stance (Figs. 10-2 and 10-3, respectively). In these graphs, t_i and t_p are the times for the weight on the stepping foot to stabilize at 7 percent for proper and improper stepping, respectively.

In proper stepping (Fig. 10-2), the foot blends with the ground, and the force builds up uniformly to 70 percent. In improper stepping (Fig. 10-3), instead of the foot blending with the ground (as in Fig. 10-2), the force builds up very quickly to a level above 70 percent because of the momentum of the moving (actually falling!) body while stepping. Next, the practitioner executes a series of successively decreasing over-corrections.

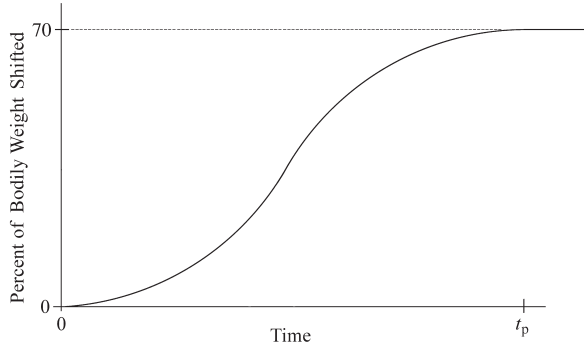

Fig. 10-2. A graph of force of the practitioner's stepping foot on the ground versus time for proper stepping. Note that the force builds up smoothly as does *yang* into *yin* in the Taiji symbol (Fig. 10-1).

Chapter 11

Periodic Movement and Its Timing

The subject matter of this chapter is of value in attaining the health, timing, efficiency, naturalness, and martial aspects of Taiji. Feeling the timing that maximizes the successive transfer of motion from your legs to all parts of your body and out to your arms is a precursor to optimally coupling your motion to that of a partner or opponent, whether that be a push or a strike.

Periodic Motion

Periodic (vibratory) motion, which is a regularly repeating, to-and-fro motion, is a common occurrence in nature. Examples are a pendulum or a mass attached to the bottom of a hanging spring. Even bridges are susceptible to vibrations that are large enough to cause them to collapse.[1] For that reason, soldiers never march when crossing bridges.

Two aspects are required for a system to undergo periodic motion: an inertial aspect and an elastic restoring force. For a spring-mass system, the spring supplies the restoring force. For a pendulum, the restoring force is the horizontal component of the tension in the string.

The spring-mass manifests one-dimensional motion (motion along a straight line), and the pendulum manifests two-dimensional motion (motion in a plane). Both of these two periodic motions frequently occur (or should occur) in Taiji movement, as will be discussed later in this chapter.

Experiment 11-1. Repeat Experiment 10-3, feeling the swing of your legs while sitting on the edge of a table.

1. Tacoma Narrows Bridge Collapse: https://www.youtube.com/watch%3Fv%3Dj-zcz JXSxnw.

In nature, vibrations can be so slow that the period, which is the time for one complete vibration of to-and-fro movement, is on the order of tens of years. An example of such a slow vibration is the nutation of the earth's axis, which is a to-and-fro wobble of the axis of the yearly rotation of the earth. The nutation of the earth's axis has a period of 18.6 years. In contrast, vibrations can occur quadrillions of times per second. An example of such a high rate of vibration is that of visible light, which has a period on the order of one-quadrillionth of a second (10^{-15} s). Vibrations whose movement can be followed with our eyes range in frequency from about a few tenths of a second to one hundred seconds.

Periodic Motion Terms

Displacement

Displacement is the distance from equilibrium. Displacements to the right and upward are usually considered to be positive, and displacements to the left and downward are usually considered to be negative.

Amplitude

Amplitude A is the maximum displacement (see Fig. 11-1). A is always positive.

Period

Period T is the time for one complete cycle of a periodic motion. The period in Figure 11-1 is $T = 4$ s.

Frequency

Frequency f is the number of complete cycles per second. The frequency in Figure 11-1 is $f = 1/4$ s.

Note: It can be seen from their definitions that the period and frequency are reciprocally related: $T = 1/f$.

Phase

Phase is the fraction of a complete cycle of a periodic occurrence (can be expressed as a fraction or as an angle). See Figure 11-1 for elucidation of the terms *lead* and *lag*.

Chapter 12

Additional Physical Concepts

Constraints

As used here, a *constraint* is a condition or set of conditions that predetermine a specific intermotion of a physical system. For example, a bead sliding on a straight wire is constrained to move only in a straight line (along the wire) and can also rotate about the wire. Another example is a ceiling-fan blade, which is constrained to rotate about a fixed vertical axis with no other movement. Figure 12-1 shows a "Yankee" screwdriver whose blade is constrained to rotate when the handle is depressed. One more example is a wheel rolling without slipping down an inclined track. The constraint here is that the center of the wheel moves along a line parallel to the incline, and as we will later show, each time the wheel rotates once, it translates a distance equal to its circumference (Fig. 12-2). Other examples of constraints abound.

Fig. 12-1. A "Yankee" screwdriver. The chuck holding the screwdriver blade is constrained to rotate clockwise as the handle is pressed inward with one hand while the other hand holds the knurled, freely rotating sleeve next to the chuck. The helical grooves on the shaft are crisscrossed so that sliding the tab on the steel body toward the handle constrains the bit to turn counterclockwise, thereby loosening a screw. The middle position of the tab prevents internal rotation.

Also, by constraining a line in the body to be unchanging except for its rotation about a fulcrum, we can create a lever in any direction in three-dimensional space that can be used in rooting, as described in Experiment 8-1.

Here is an example of a constraint in human interaction: I was at my dentist. He was holding a mirror between my cheek and a molar. Without even slightly changing the position of the mirror, he turned his body and reached for a tool with his other hand. If he hadn't constrained his hand that was holding the mirror to remain in exactly the same position, the mirror could have injuriously pushed against the soft tissue in my mouth.

Constraints in Taiji Movement

It is useful to apply the idea of a constraint to certain motions in Taiji. In such movement, a major goal is to use the least strength possible so that the movements arise maximally from natural effects, namely, alignment, gravity, momentum, angular momentum, inertia, centrifugal effect, and the compression and stretching of bodily springs (elasticity of bodily tissues). However, without the idea (*yi*) of the movement, not much would occur that resembles Taiji movement.

Because the principle of non-action is so essential to Taiji, it is important that we utilize constraints to achieve natural effects rather than contriving the movement to occur from a preconceived idea of timing and position by using contractive force. Such a preconception arises from the *yi* (the idea of the movement) superseding its role. Instead, there should be an appropriate combination of the *yi*, the principles, and awareness of the natural bodily feeling.

It is important to know just how much you are causing an action to occur, the manner in which you are doing so, and the extent to which natural forces are involved. Otherwise, how will you know how to move naturally and with maximum efficiency?

An Example of a Constraint in the Taiji Form

In "Ward Off Left," as the right hand rises and then lowers, you can imagine the wrist to be sliding upward in a vertical slot or on a vertical wire through the wrist joint as a result of the turning of the body. Then the right wrist moves downward along that same slot or wire. In a similar manner, the left arm arcs upward and outward within a circular "slot" as a result of a combination of the shifting and turning of the body and of expansive strength.

Whereas using the image of a slot or wire has value, it should be recognized that that value is limited and short-lived (see "Dangers of Overusing Images in Movement Arts" in Chapter 15).

Constraints in Self-Defense

The relationship of constraints and natural movement to self-defense is quite important. When an opponent attempts to contact your body, it is essential

Chapter 13

A Clarification of "Secret" Teachings Revealed by Cheng Man-ch'ing[1]

For quite a few years, I read and reread Professor Cheng's *Cheng Tzu's Thirteen Treatises*.[2] I consider most of this book to contain valuable information. However, even though my Ph.D. is in physics, I found Treatise 7, entitled "Strength and Physics," very hard to understand. Treatise 7 ends with Professor Cheng saying,

> This treatise reveals the secret of many generations of Taijiquan masters. I hope the practitioner will pay special attention to this!

Professor Cheng evidently considered this essay, which deals with neutralization, to be very important and chose to use physics as the main expository tool.

Interestingly, there is a similar section on the physics of Taiji in a book by Yearning K. Chen (1906–1980).[3] Because I was unable to understand that section, I decided that the only way for me to grasp the important subject matter of both writers was to recast it in my own words. That endeavor, which follows, was very fruitful and greatly expanded my understanding of neutralization.

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1. The material of this chapter was originally published as an article: Robert Chuckrow, "A Clarification of 'Secret' Teachings Revealed by Cheng Man-ch'ing," *Qi: The Journal of Traditional Eastern Health & Fitness* 20, no. 4 (Winter, 2010).
2. Cheng Man-ch'ing, *Cheng Tzu's Thirteen Treatises on T'ai Chi Ch'uan*, trans. Benjamin Pang Jen Lo and Martin Inn (Berkeley, CA: North Atlantic Books, 1981), Ch. 7.
3. Yearning K. Chen, *Tai-Chi Chuan: Its Effects and Practical Applications* (Van Nuys, CA: New Castle Publishing Co., 1979), 15–17.

Basic Concepts

Roundness and Expansiveness

Every point of the outer surface of the body (trunk and limbs) must have an expansive, round quality and feel to the opponent like the surface of an impenetrable sphere. The nature of a sphere is such that its surface at each point is perpendicular to the radius to that point. A skilled opponent will automatically try to make contact with a part of your body on a line straight to your center. It is essential that you shift and turn so that contact is made at an angle to the spherical surface. However, when any part of your body exerts force on an opponent, the direction of that force should always be radially outward from the center of your body. The reason for these conditions will be explained later in this chapter.

Triangles

To make the body into a sphere is an impossible task. However, it is important to realize that the opponent has contacted us only at certain points. It is thus sufficient to simulate a spherical shape only at the points of contact. As mentioned, any force you exert at a point of contact must be outward from your center to that point, and the surface of your body at each point of contact must be perpendicular to the line joining your center and that point (see Fig. 13-1). For two points of contact, there will be two lines, each joining your center with a point of contact. For three points, there will be three lines, and so on. If a line is drawn joining any two points of contact, a triangle is formed with its apex at the body's center. As the body rotates about its center, so does the triangle.

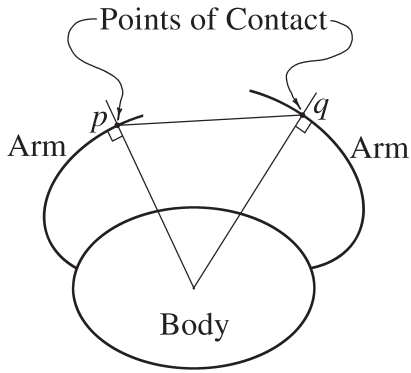

Fig. 13-1. A depiction of the body, with arms used to intercept an opponent's force at two points. The arms are drawn as arcs because, to the opponent, each point of contact *feels* like it is on the surface of an impenetrable sphere.

Chapter 14

Non-Intention, Intention, and "a Hand Is Not a Hand"

Non-Intention

Non-intention is a Taiji principle that can be quite perplexing. Non-intention implies that while doing an action, there is no conscious thought of the goal of that action and no conscious determination to accomplish that goal. By comparison, being-in-the-moment implies that in any action, the mind is appropriately and totally involved in that action, with no excursions into the past or future. Even though they might seem to be unrelated, the principles of being in the moment and non-intention are similar and complementary.

It is natural to wonder how one can accomplish anything without a goal, a desire to accomplish that goal, or looking into the past or future. It would seem that in a self-defense situation, it would be necessary to have the intention to win out, act with the right timing and skill resulting from one's training, be aware of future possibilities, and weigh those possibilities against what has happened before.

Here is where the distinction between conscious and subconscious minds is useful. Whereas the observational aspect of the conscious mind is disrupted by contemplating winning or being preoccupied with an awareness of all of the future possibilities in a situation, the subconscious mind can encompass those possibilities. The conscious mind merely observes through the senses and augments what is being accomplished by the subconscious mind, moment by moment.

Seeing action as guided mainly by the subconscious mind is the key to understanding non-intention and being in the moment. That is, with correct training and repeated practice, you need not have conscious intention or be conscious of the past or future—your subconscious mind takes care of that.

When your conscious mind attempts to deal with, for example, what comes next, it is not in the moment but making an excursion into the future. When your conscious mind moves into the future, the present passes by. Now your conscious mind is disadvantageously in the past, and you are behind, thereby sacrificing success. Moreover, when your conscious mind deals with what comes next, it is usurping your subconscious mind's role, and it is incapable of fulfilling that role in a timely fashion because that role involves too many actions and references to the past and future.

So non-intention and being in the moment require that the conscious mind is appropriately involved in overseeing events as they unfold.

Additionally, when you have a conscious intention to do something in a physical confrontation, an opponent can easily pick up that intention and use it to his or her advantage. Also, when your conscious mind momentarily shifts from the present, a trained opponent can pick that up too and immediately seize the advantage.

The Mental Transmission of Intention

One of the basic concepts in internal martial arts is that a skilled opponent can "read" our intentions and, thereby, be ready to thwart our attack or defense. Once there is a connection between two people, if trained, one of them can read the intention of the other directly, even without any input to the conventionally named senses (visual, auditory, tactile, etc.).

Ninjutsu, which I studied with Kevin Harrington and Michael DeMaio, is a Japanese art whose principles have much in common with those of Taijiquan. In that art, the mental projection of intention to harm another is called *sakki*, translated as *the force of the killer*[1] (see characters in Fig. 14-1, and compare with that in Fig. 14-2). An important part of Ninja training is to develop the ability to perceive and respond to *sakki*. The goal is to be protected from another's attack by moving to safety at the right instant—even when the attacker is not seen!

Fig. 14-1. The characters for the Japanese word, *sakki*. The character on the left is *satsu*, which means *kill*. The character on the right is *ki*, which is essentially the same as *qi* in Chinese (see Fig. 14-2). So *sakki* refers to the "intent" of the killer.[2]

1. Stephen K. Hayes, *The Ninja and Their Secret Fighting Art* (Rutland, VT: Charles E. Tuttle Company, 1981), 144–148.
2. See Andrew N. Nelson, *The Modern Reader's Japanese-English Character Dictionary: Original Classic* (North Clarendon, VT: Tuttle Publishing, 1995), 524.

Chapter 15

Maximizing Your Progress in Taiji

"*Petit à petit l'oiseau fait son nid.*"
Translation: "*Little by little, the bird builds its nest.*"

Studying Taiji

Practice

It is important for those who have attended classes in Yoga, Pilates, aerobics, and other popular exercises to understand that Taiji is different. Attending Taiji class is necessary but not sufficient—consistent, daily practice is required. Without practice, not only is little or no progress made, achieving the benefits is almost impossible (see the Chinese characters for *study* in Fig. 15-1) and the explanation below.

Fig. 15-1. The Chinese characters for the word *xuéxí*. The first character, *xué* (*learn*), shows a child with a dome above it to protect it. Above the dome are two helping hands, and the *x*'s represent the child's immature attempts at writing. The second character, *xí* (*practice*), shows wings above a rectangular character which is thought to be a corruption

of the character for *self* (an extra horizontal line is missing). The meaning is that the bird must learn to fly by itself. So studying involves first being helped to learn (*yin* aspect), but then you must practice (*yang* aspect).

Many—especially those who learn very quickly—are used to getting things fast without doing any work. That attribute works for certain studies but not for Taiji. Just missing one day of practice causes much to evaporate. Thus, it is suggested that a student should not go to bed without having practiced that day, and practicing twice daily is far preferable.

Fear of Making Mistakes

Some students avoid practicing because they worry about making mistakes. Actually, making mistakes is *necessary* for learning and progressing at Taiji. In school, we were taught not to make mistakes because we were being trained to work on an assembly line, where mistakes slow production. True learning, however, requires mistake-making.

For example, when you initiate an erroneous computer command, you learn not to do that again. But sometimes, you also discover a useful tool you never knew existed. Mistakes are valuable learning tools.

Obstacles to Learning Taiji

It has been suggested that a room full of monkeys typing randomly would eventually reproduce the works of Shakespeare. But the time required would in all probability be greater than that of the age of the universe.[1]

Trying to truly master Taiji can be similar to the monkeys on the typewriters. There are many books, videos, and websites devoted to Taiji. There are also many teachers of varying skill levels, teaching abilities, and willingness to impart their knowledge.

Whereas confusion, plateaus, frustrations, and contradictions are part of studying any art, such difficulties especially apply to Taiji. Many obstacles result not only from the historic family nature of Taiji as a martial art but also from bewildering transmission, whether intended (for secrecy) or not. These issues are discussed next.

The Historical Family Nature of Taiji

Over much of martial-arts history, there have been inner students and outsiders. Outsiders were taught but seldom given the full art. Inner students were almost always family members of true masters and usually started learning as children. Their close contact with masters at a young age and thereafter enabled them to learn in a way outsiders could not. Thus, most of us

1. See https://en.wikipedia.org/wiki/Infinite_monkey_theorem.

who do not have the privilege of learning in such a manner must endeavor to make up for this lack creatively, by using every possible tool.

Secrecy

Taijiquan (*quan = fist*) was historically a martial art. A hundred years ago in China, knowing a martial art could mean the difference between life and death. Thus, if the wrong outsiders learned it, they could then become a deadly threat to their teacher. So Taijiquan was kept secret for a long time. As a result, there are few left who were exposed to a full teaching or are able to transmit it.

Occasionally, an outsider who was trusted and showed high potential might be adopted and then treated as an inner student. An example is Yang Lu-chan's adoption by the Chen family.

The historical reason for not freely teaching outsiders no longer exists. Today, knowledge of hand-to-hand combat for self-protection is not essential in many regions and has become mostly obsolete in war. And Taiji is now done mostly for health and self-development.

Even for those who were given the inner teaching and want to share it, centuries-old customs tend to persist and are hard to break. The old secretive ways are so ingrained that those who have the knowledge find it hard to part with it. So students must lift themselves up by their own bootstraps in order to progress. Unless you are fortunate enough to have been provided an inner teaching, it is necessary to rely on tools of learning beyond coming to class regularly, practicing assiduously, and fully using your creative faculties for understanding.

Ways That Teachers Teach Beginners

It should be realized that teachers strive to do their best but may be subject to the following considerations:

1. They may teach like their teachers did/do, out of respect.
2. They may teach simplistically so that more students can get it ("paint-by-numbers" Taiji).
3. They may eliminate elements that are too advanced for most students to learn and for which teaching them would squander valuable class time.
4. They may eliminate important elements that their teachers warned them to keep secret.
5. They may eliminate what they were taught but don't sufficiently understand.
6. They may eliminate what they understand and can do but are unable to properly explain (language-skill limitations or lack of teaching experience).

7. They may emphasize *qi* connections and easily remembered landmarks ("Kodak" moments). The result might be that students incorrectly stop their movement at these places.

Students must understand such teaching considerations and generate their own ways of transcending them.

Dealing with Obstacles

Cultivating the Persistence of Your Expectation

When you see those who are highly skilled, there is a tendency to think they were born with that skill, and you tend not to realize that they had to put in a lot of work to achieve what they can do. However, if no students surpass their teacher(s), those arts and their associated wisdom severely deteriorate over time.

Over the decades that I have taught physics, I have observed that often students sabotage their learning process by thinking, "I'll never be able to do that." Expressing such an idea—or just thinking it—programs your subconscious mind to blindly accept the impossibility of succeeding. The door is then closed to any possibility of achieving a desired benefit. Henry Ford (1863–1947) aptly said:

> Whether you think you can or you think you can't, you're right.

Abstaining from negative thinking does not mean that you should go to the other extreme. Just see things as they are, and understand that things of great value take time to achieve. Allow your skill level to evolve naturally.

Use All of Your Tools

Students of any Teaching often lack the tools to make refinements to what they learn. Such a process requires critical thinking, analytical skills, perseverance, and knowledge of other arts such as science, mathematics, philosophy, etc. Ford also said:

> If you need a machine [or tool] and don't buy it, then you will ultimately find that you have paid for it and [still] don't have it.

A similar truth holds for tools for learning Taiji. Of course, excelling at Taiji requires consistent practice. But having and utilizing the proper tool is essential for getting any job done efficiently, and a price is paid for not doing so. But once you have that tool, its usefulness will carry through to new and seemingly unrelated material.

Tools of Learning

Tools for learning include the Internet, videos, books, workshops, group practice, reflection, visualization, dreams, lots of experimentation, and having

Chapter 16

Perspectives on Taiji

Internal Versus External Martial Arts

There are two distinctions between external and internal: (1) External martial arts were brought in from outside of China, and internal arts originated within China. (2) External arts emphasize speed, strength, and technique, and internal arts emphasize sensitivity to and understanding of force and minimal use of it.

Taijiquan, Baguazhang, and Xing-Yi Quan are examples of internal arts in both of the above senses. Ninjutsu, which is from Japan, is internal in the sense that it emphasizes sensitivity and understanding and minimal use of force.

Examples of arts that emphasize speed, strength, and technique are Shaolin (China), Karate (Japan), and Tae Kwon Do (Korea). Those studying such arts practice strikes, kicks, ground maneuvers, weapons, etc., to the point where these actions become totally automatic and dependable.

Whereas strength and speed are of value in internal arts, they are not emphasized for their own sake but as byproducts of practice of correct body usage. Techniques are not practiced in internal arts. Instead, "applications" are studied—not for the purpose of using them reflexively but for understanding and inculcating their underlying principles of action. The primary idea is to understand force and intention; that is, an opponent's touch enables an internal practitioner to be aware of the opponent's various bodily tensions and, from that, to know what the opponent wants to do next. Even without utilizing bodily contact or use of eyes, a trained internal-arts practitioner can pick up not only the opponent's intention to do harm but also the mental changes the opponent experiences as he proceeds in his attack (see discussion about *sakki* in Chapter 14).

Such knowledge of the opponent's thought process reduces the internal practitioner's need to emphasize strength and speed, which are superseded by a refinement of the timing and precision of defensive and attacking movements. For example, by the internal practitioner moving only just before the

opponent's attack lands, the attacker becomes overconfident. Moreover, when a counterattack is timed right, it has a much more devastating effect.

> It is said, "If others don't move, I don't move. If others move slightly, I move first."[1]
>
> —Wu Yu-hsiang

Thus, practice of internal arts emphasizes cultivating sensitivity to movement, tension, and intention in oneself—in order to know these states of another, it is first necessary to know and be able to adjust one's own corresponding states. By your doing so, the opponent has a harder time reading your tensions and intention and is thereby not alerted to your actions.

To this end, movements are practiced using maximum relaxation and minimum strength, feeling everything within and without (inertia, gravity, momentum, natural swing of arms and legs). Also, when doing Push-Hands, which is a sensitivity exercise involving a partner, it is important to distinguish *yin* and *yang* (permitting your partner to enter your space without interference) and have no movements resulting from preconceived ideas.

Lifting Versus Lowering

Is lifting an arm at constant speed harder than lowering it at constant speed? Or are the two actions the same? First consider (a) holding an inanimate weight, (b) lifting it at constant speed, and (c) lowering it at constant speed (Fig. 16-1).

Let us attempt to analyze this puzzle, in terms of physics, physiology, and psychology.

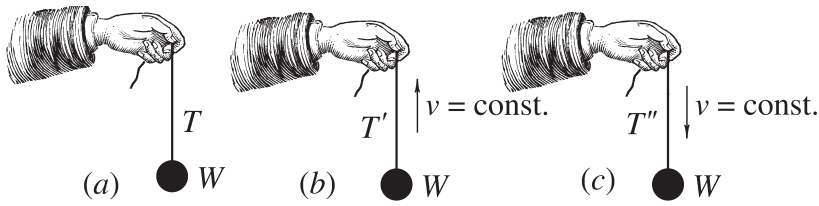

Fig. 16-1. Hand holding a string connected to a weight W (*a*) stationary, (*b*) lifting at constant speed v, and (*c*) lowering at constant speed v. The respective tensions in the string are T, T', and T'' (see Chapter 9 for the definition of *tension*).

1. Benjamin Pang Jeng Lo, Martin Inn, Robert Amacker, and Susan Foe, eds., *The Essence of T'ai Chi Ch'uan, The Literary Tradition* (Berkeley, CA: North Atlantic Books, 1985), 57.

Question 1: When the hand lifts the weight at a constant rate, is the tension T' in the string greater than, less than, or the same as the tension T when the weight is held stationary?

Question 2: When the hand lowers the weight at a constant rate, is the tension T'' in the string greater than, less than, or the same as the tension T when the weight is held stationary?

In Terms of Physics

Most people untrained in physics will intuitively think that when the weight is raised at constant speed, T' is greater than T, and when the weight is lowered at constant speed, T'' is less than T. Actually, the tension in the string is the same in all three cases. It is a consequence of Newton's first law that a mass will remain stationary or move at constant speed in a straight line only if the net force on it is zero. Thus, the downward force of gravity (its weight), which is the same in all three cases, must be balanced by the same upward pull of the string.

Note, however, that if the weight were accelerated (Fig. 16-2), the intuitive guess would be correct. That is, if the weight were accelerated upward, then T' *would* be greater than T, and if the weight were accelerated downward, then T'' *would* be less than T (Fig. 16-2).

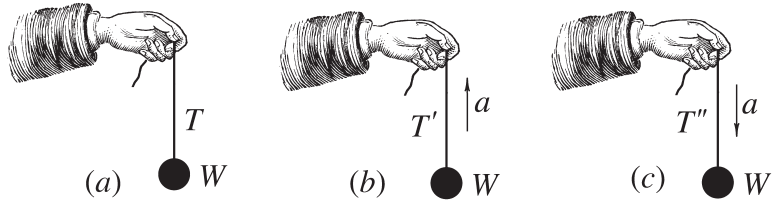

Fig. 16-2. Hand holding a string connected to a weight *W* (*a*) stationary, (*b*) lifting it with an upward acceleration *a*, and (*c*) lowering it with a downward acceleration *a*. The respective tensions in the string are *T*, *T′*, and *T″*.

Of course, lifting and lowering an arm differ from the actions in the examples above because an arm has leverage that changes from essentially zero when it is hanging to a maximum when it is held horizontally. As arms are raised from hanging to horizontal, the required strength increases. The opposite occurs during lowering. But the amount of strength is the same for small upward and downward excursions at a given arm level when lifting or lowering at constant speed.

In Terms of Psychology

Why then might it seem easier to lower an arm than raise it? Perhaps that perception occurs because we all know that gravity pulls massive objects downward. So, psychologically, we believe that lowering a limb is easier than raising it, and we then perceive it to be that way.

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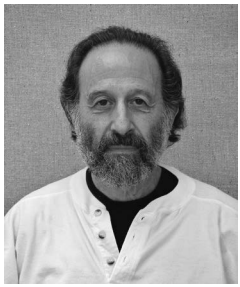
ABOUT THE AUTHOR



Robert Chuckrow (1936–) has studied Taiji, Qigong, and other movement, self-development, and healing arts since 1970 under high-level masters such as Cheng Man-ch'ing, William C. C. Ch'en, Elaine Summers, Alice Holtman, Harvey I. Sober, Kevin Harrington, and Sam Chin Fan-siong. He has taught Taiji extensively and has authored five prior books, three on Taiji. His *The Tai Chi Book* was a finalist in the Independent Publisher Book Awards in the health/medicine category. His book, *Tai Chi Dynamics*, won two awards: the 2008 USA Book News award for "best book in health: exercise and fitness" and the Eric Hoffer award.

Chuckrow is certified as a master teacher of Kinetic Awareness®, has a Ph.D. in experimental physics from NYU, and has taught physics at NYU, The Cooper Union, Fieldston, and other schools.

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- Health and martial advantages of expansion over contraction.
- Quotes from the classics and how they confirm the interpretations of the principles of T'ai Chi.
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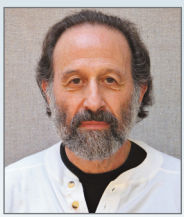

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