

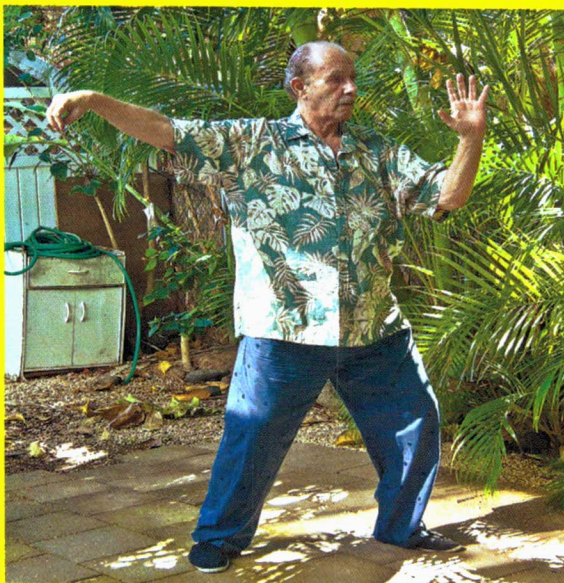
# T'AI CHI

**THE INTERNATIONAL MAGAZINE OF TAI CHI CHUAN**



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**C. P. ONG  
ON DANTIAN  
TRAINING**



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**MARK COHEN ON  
ZHAN ZHUANG AND  
TAI CHI TRAINING**



Vintage **T'AI CHI**: Gene Chen  
Translates "Chen Fa-ke's Secret of Mastery."



## The Central Role of the Dantian in Tai Chi Practice

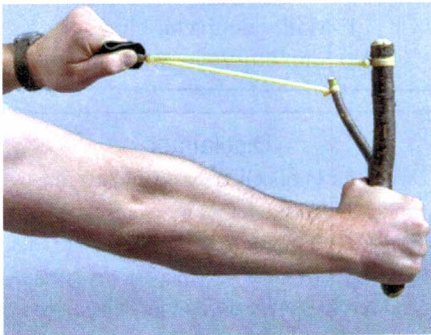
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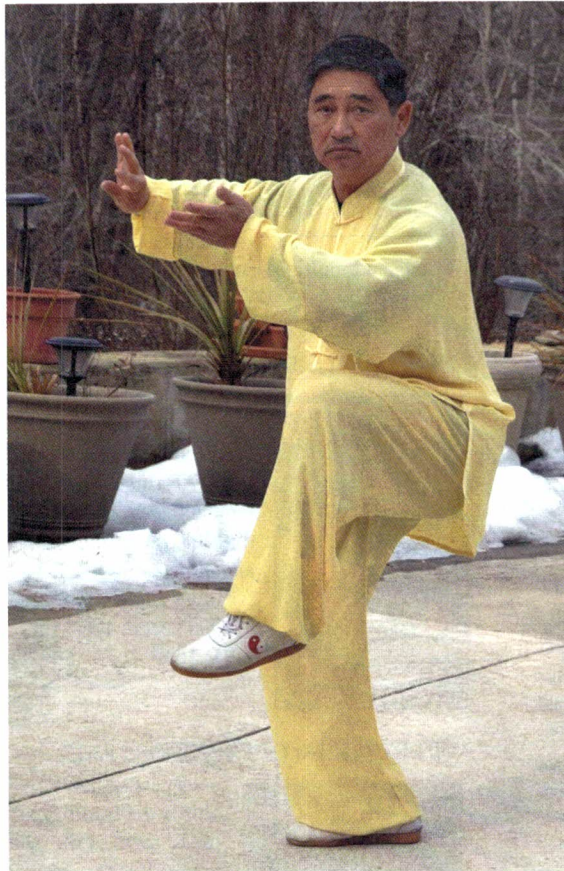
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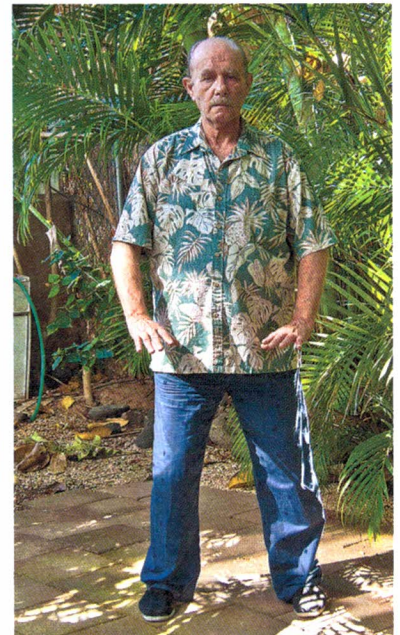


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# The Central Status of the Dantian

By C. P. Ong, Ph.D.

(An excerpt of this paper was presented at the Taiji Symposium in honor of Grandmaster Chen Xiaowang's 70<sup>th</sup> birthday celebration on Oct 2, 2015, Chenjiagou, China.)

## Abstract

The concept of the central status of the dantian captures, in the most essential form, the art of Taijiquan, from the pragmatism of training to the efficacy of its kungfu application.

Chen Xiaowang's teachings are encapsulated in the concept, which reduces the quest to the formation of the centrality of the dantian (*yi dantian hexin de xing cheng* 以丹田为核心的形成).

The principle of dantian centrality infuses the body with inner balance, which encompasses the full comprehensiveness of bipedal balance, and in so doing, motion is regulated to conform to the Taiji Theory of Yin and Yang.

Implicit in body motion generated under the imprimatur of Taiji

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Protect Heart Fist (Transition)

theory is that it is of the grandest Taiji order—unsurpassed in versatility, liveliness and kungfu utility.

The insight is inner balance: Without the maintenance of bipedal balance in the body's response, all C. P. talk of Taijiquan's prowess is rendered vacuous.

This paper injects physics and physiology into the exposition of dantian centrality to give the Taijiquan concepts, including *neijin* (inner strength), the precision of biomechanics.

It examines the force of *neijin* and the *jin* mechanics of *rou* ("softness") and *gang* ("hardness") behind the art of using "softness" to overcome "hardness" (*yi rou ke gang*), which underlies the wondrous martial skills of Taijiquan.

The science in the study not only sheds light on the esoteric Taiji concepts but, more importantly, it also

provides the practitioner with pragmatism in training to help attain mastery.

## "Dantian happy"

The intonation by Chen Xiaowang in his workshops, a silent beat between each word, still rings in my ears: "calm down, mind empty, body balanced, mind balanced, listening behind, qi sink-ing, dantian happy."

The theme of "dantian happy" recurs throughout the course of his teachings. The plain ordinariness of the phrase, seemingly expressed light-heartedly, turns out to represent the core principle of the art of Taijiquan:!

*Yi dantian wei hexin*  
以丹田为核心

Establish the central status of the dantian

We are familiar with the litany of exhortations in Taijiquan training:

- point the crown of the head up with no tension (*xu ling ding jin*)
- keep the body straight and centered (*li shen zhong zhen bu pian bu yi*)
- sink the shoulder and drop the elbow (*chen jian zhui zhou*)
- contain the chest and settle the waist (*han xiong ta yao*)
- bend the knees and open the kua (*qu xi kai kua*)
- relax the waist and round the crotch (*song yao yuan dang*), and so on.

It can be said that all these are directed at *fangsong*-relaxation for qi (also known as ch'i or ki) to



sink to the dantian (*qi chen dantian*) to nurture the central status of the dantian.

Indeed, the whole practice is about cultivating and maintaining the centrality of the dantian—infusing the principle in the body.

Imbued with the principle of dantian centrality, the body moves and responds with inner balance, and the wondrous skills of Taijiquan kungfu flow forth with ease.

That is to say, all the “ten thousand” kungfu techniques find their basis in dantian centrality, exemplifying the principle of:

*Wan fa gui yi* 万法归一

Ten thousand techniques sourced to one principle

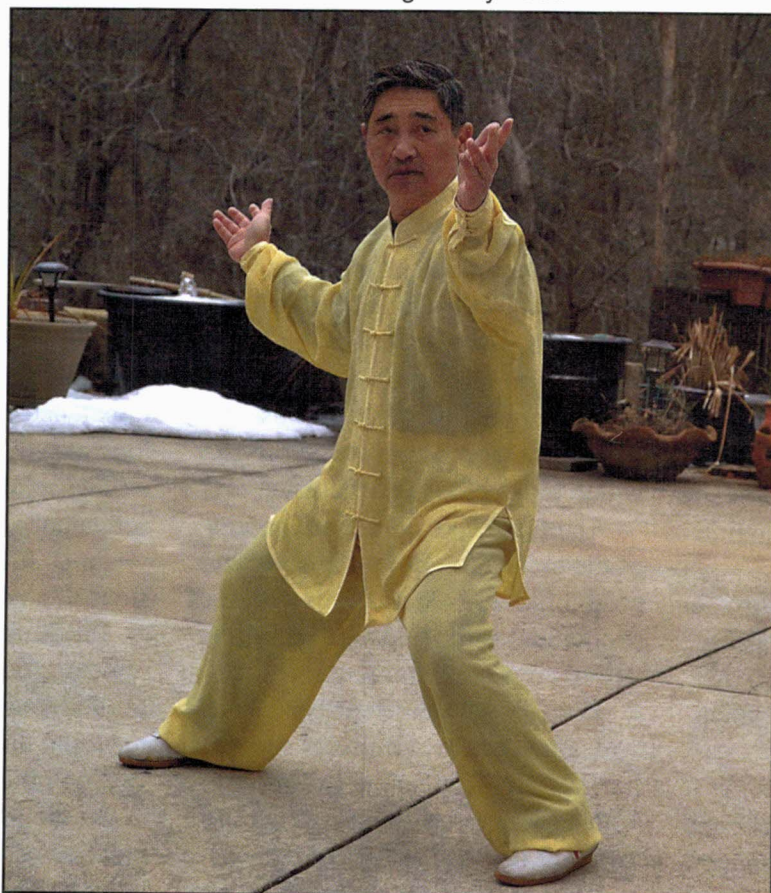
Achieving the formation of the central status of the dantian—*yi dantian hexin de xing cheng* 以丹田核心的形成—represents the mastery of the art of Taijiquan.

The imperturbability of Chen Xiaowang’s dantian centrality was on display in his televised encounter with Longwu, a two-time Asia strongman champion and hailed the Asian Hercules.

The strongman could move an eighteen-wheeler and nudge a car into a tight parallel parking spot between two cars, but he could not move the older and



Chen Xiaowang in July 1996



Whirl Arm Stepping Backwards (Transition)

smaller Chen Xiaowang an inch, in an open challenge of three one-minute rounds.

The master merely stood there, attending to his dantian centrality to keep intact his inner balance without fighting back, as the strongman pushed and shoved at him with all his might to no avail.

What does dantian centrality mean in physics and physiology? We attempt to shed more light into the traditional Taiji theory and methodology, which will help guide one’s training towards nurturing dantian centrality and thus mastery. First, we look at how dantian centrality relates to bipedal balance.

### Inner balance

At the heart of dantian centrality is the concept of inner balance. A body may be in physical balance, but the dynamics of the underlying muscle actions is not the same.

Inner balance resides in the dynamics. Clearly, a master’s posture is not the same as that of a student, even though physically both are in balance. The master’s posture is unmistakably more formidable, exuding fluidity and solidity.

Many postures and actions in common situations demonstrate physical balance but are wanting in inner balance.

Consider the mundane task of picking up a box. By habit, the hands reach



out first for the box, with the body following and bending forward.

To keep the body from falling over, muscles along the back are activated by reflex to hold the leaning posture.

In lifting the box, the body is pulled down by the box's weight and requires more muscle power to maintain balance, with even more needed to lift it.

No wonder many a sore back results from the exertion of picking up things.

While the leaning postures are in physical balance, they lack inner balance. Bending at the knees, the body can maintain balance with less muscle activations and can use the leg muscles to help lift the box.

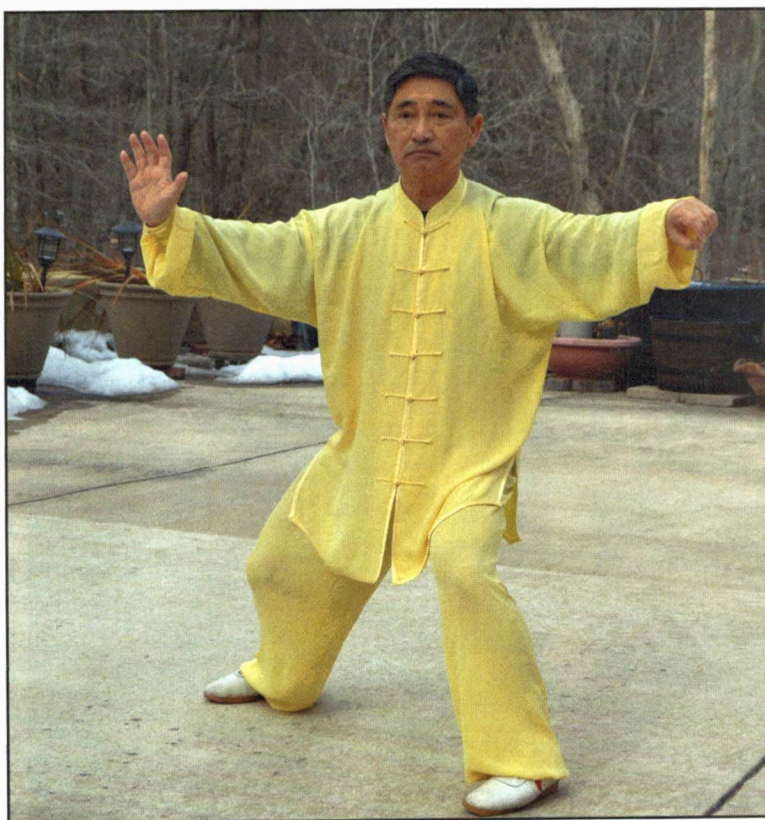
In the two sets of muscle activations, the second does the task with less effort and danger to the back than the first and also points to a better inner balance.

Another telling common situation is when you are asked to take a deep breath during a medical checkup as the doctor puts a stethoscope to your chest.

When you do so, the chest is heaved up and the abdomen is hollowed. The body becomes top-heavy and may topple easily with a gentle nudge.

It is in physical balance, with the center of mass in the same position as that of a standing posture at ease. However, the latter has better inner balance.

Bracing up the chest breaks the inner balance between the upper and lower body and weakens the support of the base.



Single Whip

The exhortation of *hanxiong* (contain the chest) in practice is to prevent this from happening and to reinforce the connection between the upper and lower body.

Inner balance is often breached in routine actions as we take balance for granted. For example, in the action of raising the arm high up to draw attention, the primary muscles at the shoulder—the deltoid and the pectoralis—dominate.

While in physical balance, the dominating action of these muscles causes the ribcage to be raised, which breaks the inner balance.

An opponent can take advantage of the breach to uproot the body and send it flying. Note that this action of excitement is the opposite of Taiji's deliberative slow motion.

Thus, for any given action or posture, a multitude of muscles supports it in varying levels of activation, with each composition resulting in a different internal quality of balance.

What is the ideal composition of muscle activations corresponding to

an action?

We may identify the multitudes of muscles involved in an action, but the input and output signals of muscle activations that correspond to an action are too complex to compute in real time.

Even as the mathematical models of engineering science give us better solutions in human robotics, they cannot feed into the neural circuitry to produce the action.

This is where we find the ingenuity of Taijiquan, which provides practical answers outside of the exact solutions of engineering science.

As it turns out, Taijiquan's solution is as elegant as it is simple—produce muscle activations, namely movements that conform to the yin-yang principles.

This metaphysical guidance may be alien to the musculo-skeletal framework, but the Taiji yin-yang approach turns out to be quite functional and pragmatic in practice.

*Inner imbalance* is defined as an imbalance of yin and yang. *Taiji balance* or *inner balance* is attained through the resolution of yin-yang imbalances, so as not to be too yin or too yang.

The solution does not seek the exact balance, like adding so much of yin or so much of yang on opposite sides of a scale.

Taiji's strategy is to stay in the middle ground between the excesses of yin and yang and to work on reducing the margin of errors (*wucha* 误差) in the practice.

As the margin of errors tapers, the practice path gradually converges to inner balance. This exemplifies the



quintessential way of the Tao (*Dao* 道).

In body motion, the yin-yang imbalance is manifested in the musculoskeletal structure as an excess or deficiency in the activation levels of muscles in the support at the joints.

The quest of Taiji balance is then reduced to resolving the imbalances of muscle activations. But what is the body cognition of this imbalance?

The Taiji journey is to cultivate this cognition and to develop the tools to reduce the errors of imbalance, which is a continual process that entails the cultivation of qi energy and the discipline of meditation.

Are the neural circuits of the brain predisposed to the principle of inner balance?

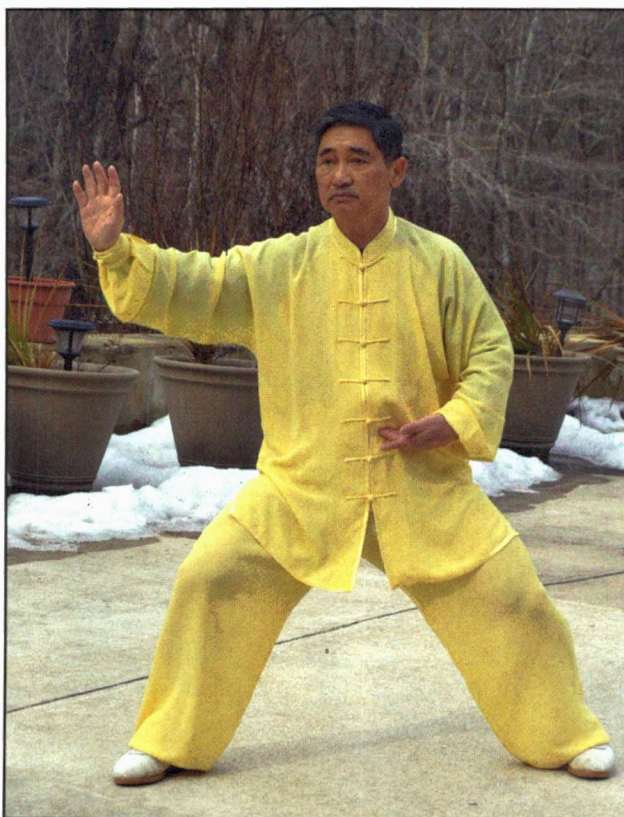
### **The brain is not wired to respect inner balance**

Our bipedal structure is inherently unstable, not unlike that of an inverted pendulum, where any movement or perturbation would cause it to fall.

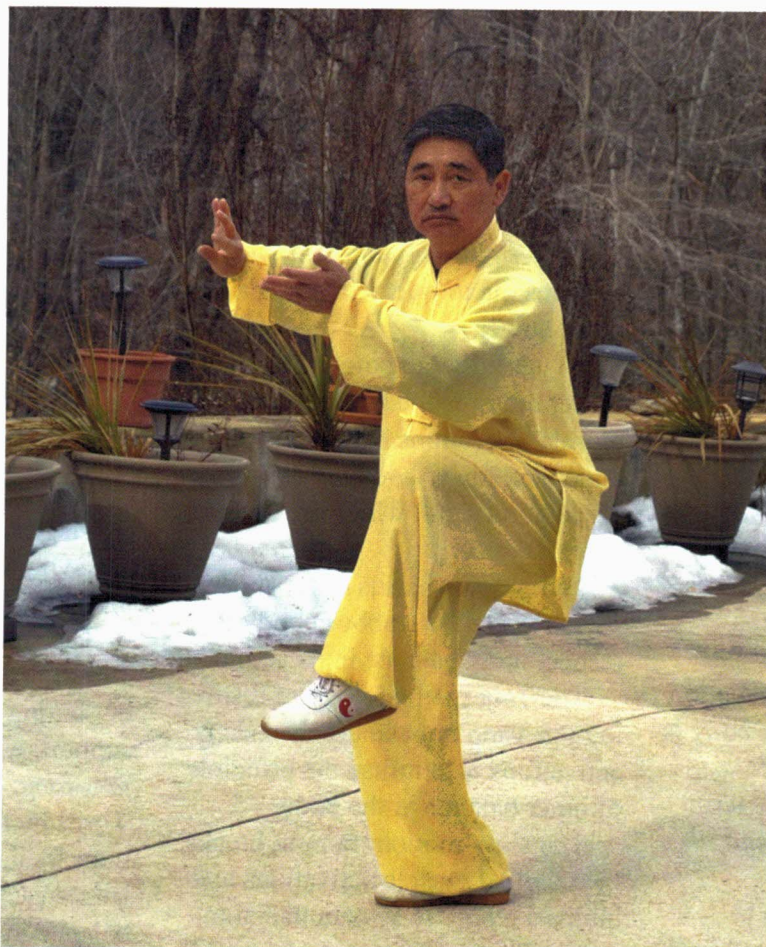
The reason we are not falling is because the body is kept in physical balance by constant muscle adjustments, monitored by the inner ear and proprioceptors and regulated in the cerebellum and the brain stem without conscious input.

Although the brain is wired to activate muscles to keep balance, it pays little to no heed to the body structure, as seen in the unsound leaning posture forced in the casual picking up of a box.

That is, the “natural



Lazy Tying Coat



Buddha Pounding (transition)

response” to keep balance is an immediate-term answer, which does not consider inner balance.

Worse still, more often than not, the response compromises inner balance. In other words, the neural circuitry is not programmed to reliably recruit the right combination of muscles that can perform a task better.

Indeed, the exertion in the imbalance of muscle activations may end up causing injuries to the knees, ankles or back, as witnessed in sports, martial arts, dance and the workplace. In short, the brain is not wired to respect inner balance.

This means that we are not wired to deliver a knock-out punch or a long drive in golf unless we are trained or talented.

Also, the responses of muscle activations, which have become habitual, are not geared for high-level performance.

That is why as much as a weekend golfer tries, he cannot produce the long drives of a professional golfer—the inner balance is not resolved.

The novice golfer swings the club hard thinking that the harder he strikes at the ball, the further it would go.

However, the anxiousness for a long drive triggers the activations of the prime moving muscles of the shoulders and arms to lead in the golf swing and results in the arms jumping ahead of the body’s waist rotation.

The swinging action



ends up deprived of the muscle power of the lower body. Moreover, the right side tends to dominate (for a right-hand drive), dragging at the left side.

The drive suffers because muscle power has to be diverted to compensate for the effects of muscle actions that are not aligned and balanced internally.

There is no faculty in the brain to assess a better selection of muscle activations for an action.

Nevertheless, the neural circuits provide responses that work amazingly well for bipedal balance and functionality.

Although they are not wired to assess inner balance, the neural circuits provide for a wide variety of general pattern generators for walking, swimming, and the many movements associated with common actions.

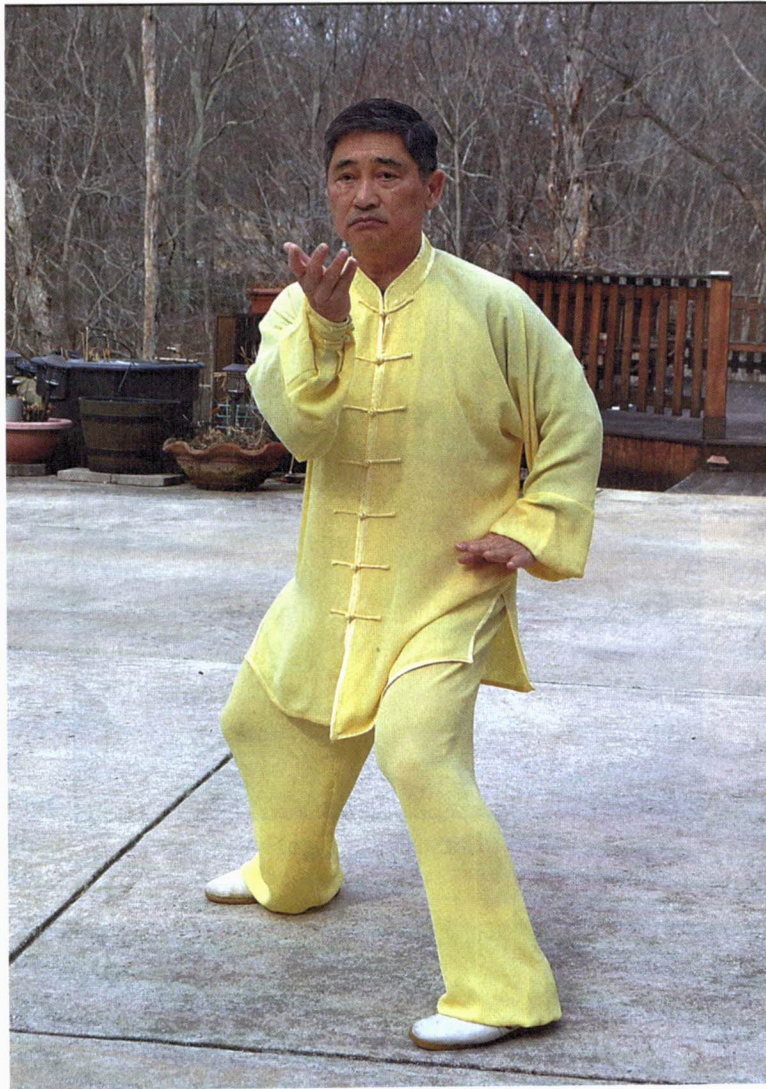
However, inner balance is critical in generating the waist power necessary for performance in sports and martial arts.

Physics tells us that the torque action of the upper body has to be supported by the torque reaction of the lower body in the opposite direction.

The action-reaction junction occurs at the waist—hence waist power—where the mass distribution between the upper and lower body is most proportionally equal.

The Chinese use a specific term for this waist junction—the *kua* 胯 (the hip-joint junction).

For waist power, the term is *dang-yao jin* 裆腰劲. *Dang* refers to the groin region, and *yao*, the waist.



Flash Back (transition)

So the terminology of *dang-yao jin* captures the torque action-reaction of waist power.

To tap fully the potential of waist power requires the balance of the muscle activations between the upper and lower body and between the left and right, which are issues of inner balance.

The physics part is easy. The hard part is to get the stubborn body to respect inner balance in its actions.

The Taiji methodology of resolving yin-yang imbalances of muscle activations is to infuse the principle of inner balance in the body.

The slow-motion training breaks the habitual muscle activations and builds a response system that automatically incorporates the factor of

inner balance.

It modifies the neural circuitry to respond with inner balance instead of just physical balance.

**Fangsong** 放松 and **qi** 气

The cognition of imbalance is tricky because we do not have awareness of the muscle actions. We can deduce the imbalance of muscle activations from its effects, which may be too late in some circumstances.

For example, we become aware of our physical balance only after it is lost. However, we can learn to be cognitive of the effects of imbalance, such as tenseness and stiffness.

Let us examine the balance of an arm extended to the side, shoulder level, common in Taiji form movements, such as the posture of *Lanzhayi* (“Lazy Tying Coat”).

In holding the arm in position for a period of time, tenseness will set in quickly, especially for a beginner, which is an indication that certain muscles—often the shoulder muscles—are working harder than needed.

The tenseness or *jiang jin* 僵劲 is a symptom of inner imbalance of muscle activations.

The sensation of tenseness elicits a response to relieve it, by relaxing or “letting go” of the tense muscle support, which in Chinese is called *fangsong*. The *fangsong* mechanism works by resettling the muscle actions to another level of support with less tenseness, which improves the balance in the arm.

This mechanism can be simulated



by someone holding the tip of your finger, as you let the arm hang as a cable between the shoulder and the finger support.

Or it can be induced by “sinking the shoulder and dropping the elbow (*chen jian zhui zhou*).”

As the muscles resettle, the prime-mover muscles dominate less. With less hindrance from tenseness, the body (usually the hands first) senses a flow of energy, which is ascribed to as qi energy, simply from the action of fangsong.

In effect, fangsong induces the sensation of qi flow when an imbalance at the joints is reduced. That sensation represents the rudiments in perceiving inner balance.

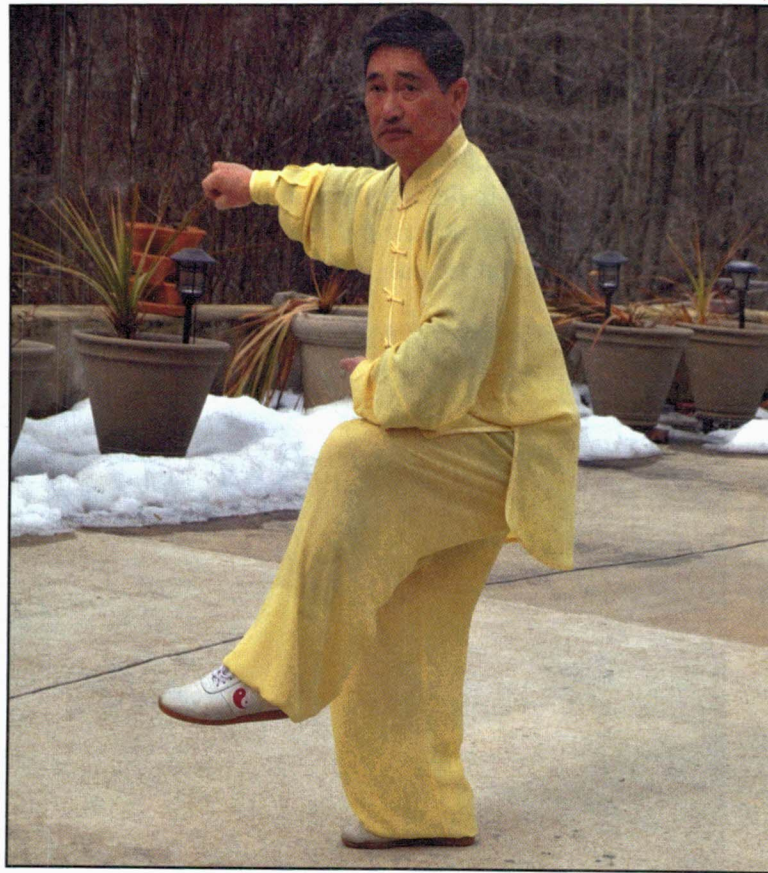
That is, the fangsong mechanism cultivates a perception of inner balance by associating qi flow with a reduction of the errors of imbalance at the joints.

In this manner, fangsong generates qi. As skill in fangsong improves, the more qi flows—in practice, the more fangsong-relaxed, the more qi.

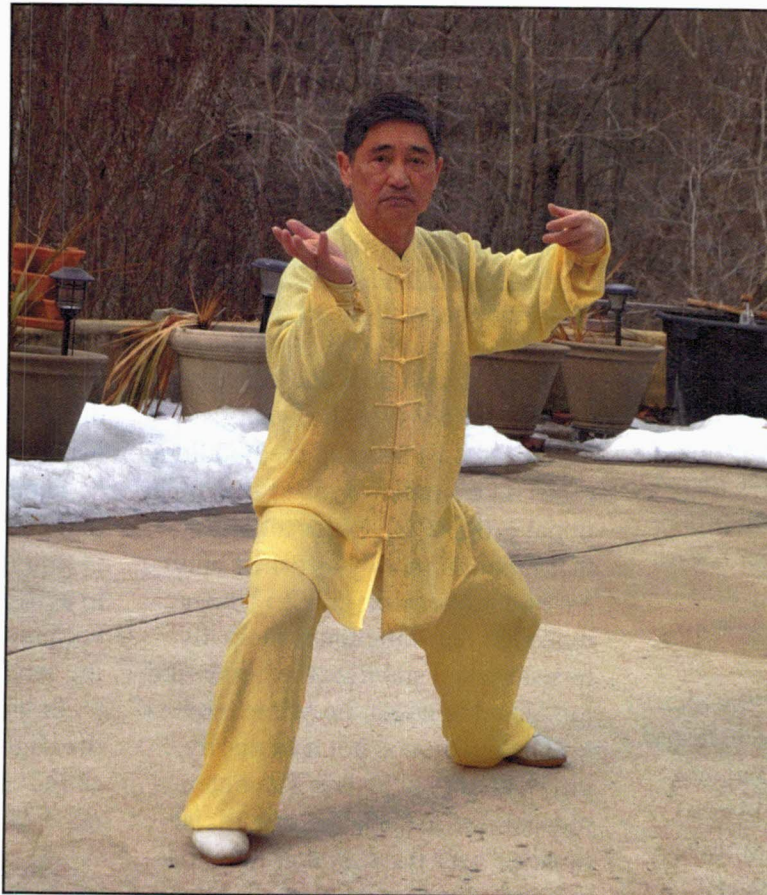
As qi matures, one can use qi as a medium to discipline muscle actions—the greater the ease of qi flow, the better the balance.

In the process, the body gains awareness of the elbow and the wrist, as well as the weight of the arm and the sense of qi threading through and connecting the joints (qi-connectedness).

There is another aspect to fangsong. The fangsong mechanism does not ren-



Single Whip (Transition)



Six Sealing Four Closing (Transition)

der the support of the arm lax or languid, like a drooping house plant that has not been watered.

Were the support lax, there would be a loss of qi-connectedness in the arm (*diu 丢*), analogous to a slack cord or a garden hose with no water.

Stretching the arm physically to correct the slackness would introduce unwanted tenseness in the arm.

The Taiji instruction to correct this *diu* looseness is *shen jing ba gu* 伸筋拔骨 (“stretch the tendons and bones”).

This simulates an “internal stretching” that works to add tension to the slackness without causing tenseness and, as such, nurtures a connectedness of qi in the arm as it relaxes.

In other words, the mechanism of fangsong alternates between relaxation and internal stretching to reduce the errors of muscle actions and thereby cultivates qi in the process.

Although the mechanism of fangsong and qi is discussed using the arm as an illustration, the principle applies to any part or joint of the body to nurture inner balance and, hence, qi throughout the body.

The qi developed charges the motion



of Taijiquan to render it fluid and strong.

Thus, fangsong is not just an antidote to *jiang jin* or tenseness, but more importantly, it nurtures inner balance and cultivates qi and, along with that, develops body awareness of the joints and qi-connectedness of the body.

**“Use mind-intent, don’t use force” (*Yong yi bu yong li*)**

An oft invoked principle in Taijiquan practice is “use mind-intent, don’t use force” (*yong yi bu yong li* 用意不用力).

So exalted is the principle that it is enshrined as governing the whole practice of Taijiquan (*ci quan shi yong yi bu yong li* 此全是用意不用力).<sup>3</sup>

The practitioner is constantly admonished to abide by the practice dictum. However, the rule has also sown much confusion.

“Don’t use *li* (force)” is often interpreted as not to use muscular force, which of course is meaningless as movement is powered by the contractile actions of

muscles. This interpretation is also the reason why much of Taijiquan literature disdains talk of muscles.

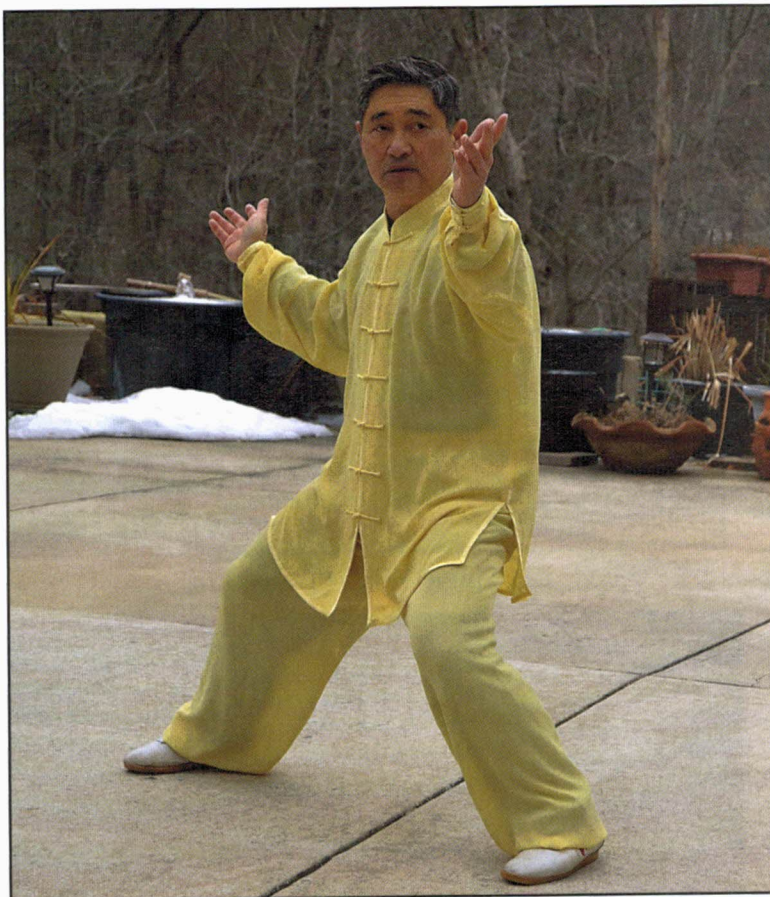
The overriding concern is that if one practices contrary to the principle—using *li* without proper regard to *yi*—it would invariably cause tenseness (*jiang jin* 僵劲) and impede qi, leading to c

Yet, rather than eschew the idea of using *li*, let us look deeper, in terms of muscle activations and balance.

Muscle activations in physical movements are divided into three functional groups: the agonists, which are the prime movers; the antagonists that oppose the agonists

to provide smoothness and control of the movement; and the synergists, which secure and stabilize the joints and function to support movement.

Examples of the above are the biceps in flexing the arm for the agonists, the triceps and biceps as an antagonistic pair, and the brachialis



Whirl Arms Stepping Backwards (Transition)

and the coracobrachialis seated beneath the biceps for the synergists.

Taijiquan’s training methodology relies on a simpler basis of two functional groups: 1.) “outer muscles” that function mainly as prime movers of a movement; and 2.) “inner muscles” that function principally to secure and stabilize the bones and joints and to assist the prime movers.

The division is not necessarily physical nor exclusive. The outer muscles are usually the superficial muscles near the skin that function as agonists or antagonists, and the inner muscles are usually more deeply seated and function as synergists.

In practice, the difference is relative in the cognition—to subdue the outer muscles and let the inner muscles align.

The command to execute a movement activates both the inner and outer muscles, but the levels of their activation are not the same, which can result in muscle stress and inner imbalance.

By habit and convenience, the outer muscles tend to dominate without attending to their alignment with the inner muscles.

As a consequence, there would be an offset in the balance at the joints and would trigger the inner muscles to fire at higher levels to compensate in their function to stabilize and secure the joints.

This would introduce stress, which would, in turn, impinge on the ease of motion flow—the very symptom of tenseness.

The dictum of “Don’t use *li* (force),” therefore, does not mean not to use

muscle force, but rather “not to use” outer muscles to inhibit their dominance.

Fangsong is the operational tool to do this. At the same time, “using *yi* (mind)” allows the inner muscles to activate in alignment and balance with the outer muscles, thus nurturing inner balance and qi.

In this way, the process eliminates the slightest presence of “clumsy” *zhuo li* (*bu bian you fen hao zhi zhuo jin* 不便有分毫之拙劲).<sup>4</sup>

**The paramount status of the kua junction and dantian qi**

The wily business of resolving



imbalance through fangsong (fangsong resolution) is that we have hundreds of joints, and the body-frame has a certain tensile integrity.

Resolving the imbalances joint by joint is daunting enough, but even more daunting is that the resolution at one joint affects the balance at the other joints.

The tensile integrity requires a recalibration each time. This need for constant feedback and readjustments of muscle activations at multiple joints may seem an impossible task.

However, not knowing the anatomy or neural circuitry did not stymie Taiji masters of old.

We turn to the ingenuity of Taijiquan again. Ironically, the answers to this complex problem are in the traditional and arcane concepts of qi and *dantian* 丹田.

The *dantian* (“field of elixir”) is a point in the lower abdominal region, three fingers below the navel, and about a third of the way inside.

In practice, the training methodology simplifies and organizes the “hundred joints” into sections, so that one can work through them systematically.

This is expounded in the *Principle of the Three Unities* (*Sanhe* 三和), the *Principle of Three Sections* (*Sanjie* 三节), and the *Principle of Four Extremities* (*Sishao* 四梢), found in the essay, *Ten Essential Principles of Taijiquan*, by Chen Changxin, the 14<sup>th</sup> generation Chen Family patriarch.

In essence, the *Sanjie* and *Sanhe* principles divide the body-frame into sections and subsections of three and



Step Back Press Elbow (Transition)

into correspondences of three major joints: shoulders and hips (*kua*), the elbows and knees, and the hands and feet.

(A more thorough discussion of these principles is found in the author’s book.<sup>5</sup>)

The hips (*kua* 胯) are preeminent among the joints of the human bipedal structure. The *kua* refers more to the inguinal fold and represents the junction where the motion divides between the upper and lower body.

Inner balance of the *kua* is critical to the comprehensiveness of bipedal balance and functionality.

For example, the generation of waist power (*dang-yao jin*) relies on the torque action and reaction at this junction.

The *kua* is thus accorded a paramount status. Note that the *dantian* lies functionally midway between the *kua*.

The methodology looks to the *kua* as a base of reference to resolve the

yin-yang imbalances.

It starts with the resolution of the imbalance of muscle activations at the *kua*, which is referenced to the *dantian* center, so that fangsong can work on the internal motion of the left and right hip joints.

This builds a foundation of balance at the *kua* junction relative to the *dantian*. This key foundational balance will be reexamined in the next section.

With this foundation, the fangsong resolution of the shoulder joints in conjunction with the *kua* relative to the *dantian* center—of the shoulder-*kua* correspondence—

can be made.

By extending the process, the fangsong resolution can be applied to the other corresponding pairs: the elbows and knees, and then the hands and feet.

In the systematic approach to fangsong at the joints, the associated qi flow extends throughout the body. This establishes the *dantian* as the central station to assess the muscle activations and qi flow.

The *dantian* as a reference point serves to centralize the feedback issues of the fangsong resolution and qi flow of the joints.

This means that the recalibration of balance at the other joints triggered by fangsong initiated at each joint is built into the process, by virtue of the centrality of the *dantian*, as well as by the principle of the unities of the three correspondences (the *Principle of Sanhe*).

In practice, it is far easier—the methodology simply asks the practi-



tioner to continually apply fangsong to resolve the muscle activations with reference to the dantian.

Doing so also builds a connectivity of motion and qi between the dantian and the joint being worked on and through the intervening joints.

In effect, the fangsong resolution grows in sophistication while working on the imbalances as perceived in the dantian.

Corresponding to the resolution of imbalance is the qi nurtured, which gradually fills the whole body.

The continual focus at the dantian induces qi to settle and accumulate in the lower abdominal region and for the “qi to sink in the dantian” (*qi chen dantian* 气沉丹田).

In other words, qi concentrates at the dantian as it extends to fill the body. As the fullness of qi forms, it defines a web of qi-connectivity centered at the dantian.

The fullness of dantian qi (*dantian qi baoman* 丹田气饱满) establishes the central status of the dantian—the actualization of the dantian as the center of the body-wide connectivity of qi.

This represents the unification of qi and motion and of dantian qi and inner balance.



Flash Back (Transition)



Tame Tiger Pose

Indeed, the fullness of dantian qi signifies the crowning achievement of inner balance and represents the attainment of mastery of the art.

It is easy to be misled to regard some qi sensation at the dantian region as dantian qi.

Dantian qi does not indicate a local condition; it represents a body-wide qi connectivity nurtured in the fangsong play of the multiple series of muscle activations between the joints and the dantian.

The sequential activations build up the energy of the muscle actions without compromising inner balance at each stage, which culminates as the fullness of dantian qi—the formation of the central status of the dantian.

### **The core balance of the lumbar vertebrae at the pelvic seat**

Given the pivotal role of dantian centrality, we examine the anatomy of the lower back and kua at the dantian region.

The skeletal frame, with the ribcage sticking out and hanging on the upper part of the vertebral column whose lower end sits on the pelvic base, with the sacrum as the sole link, cannot be more structurally unsound.

No other bones hold up the ribcage besides the vertebral column. But, dressed in muscles, the bipedal structure delivers a remarkable range of versatility in mobility and



Xiaowang's teachings on dantian centrality:

### Principle of Motion

*Yi dantian wei hexin* 以丹田为核心  
心

*Yi dong quan shen bi dong* 一动  
全身必动

*Jie jie guan chuang* 节节贯穿  
*Yi qi guan tong* 一气贯通

Establish the central status of the  
dantian

When one part  
moves, the whole body  
moves

Threading through  
every joint

Qi unifies with mo-  
tion as one.

### Inner Strength (*Neijin*) and Dantian Centrality

Taijiquan as a mar-  
tial art never fails to  
intrigue—the gentle and  
slow motion that charac-  
terizes the training can-  
not be more antithetical  
to the speed and power  
of a knockout punch or  
to the strength of muscle  
mass.

Taijiquan does not  
just boast of excellence  
in kungfu skills, but of  
extraordinary martial  
prowess—it produces in-  
vincible kungfu heroes without peer.

In fact, the *Taijiquan Classics*<sup>7</sup>  
immodestly touts its own art as  
superior to the other martial sys-  
tems, decrying the others as, without  
exception, only about the stronger  
bullying and subduing the weaker  
(*gai bu wai hu zhuang qi ruo* 概不外  
乎壮欺弱).

Taijiquan kungfu skills are sin-  
gular—about the “weaker defeating  
the stronger,” and “the slower hand  
beating the faster,” epitomized by the

skill of “four ounces overcoming a  
thousand pounds” (*si liang bo qian  
jin* 四两拨千斤).

The other oft-cited kungfu skills  
that exemplify Taijiquan's extraordi-  
naryness include:

*Yin jin luo kong*

Lead opponent's attacking force  
to emptiness

*Jie li lai da ren*

Borrow opponent's force to strike  
back



*Yi rou ke gang*

Using “softness” to overcome  
“hardness.”

These embody the kungfu arts of  
not relying on superior strength and  
of not fighting force with force. They  
describe techniques that do not fit  
into the usual narrative of combat,  
which emphasizes speed, power, and  
muscle mass.

Instead, the kungfu skills appear  
to defy the laws of physics. But none  
have led to the discovery of any new  
physics.

The source of these wondrous  
kungfu springs from the principle of  
dantian centrality, which endows the  
body with *neijin* or inner strength.

The term *nei* 内 (inner) is used  
because the skills seem effortless and  
are not physically apparent, such that  
the underlying strength is hidden.

Often *neijin* is simply referred to  
as *jin*, dropping the qualification of  
*nei* as superfluous.

If Taijiquan masters can be distin-

guished, it is by the ordi-  
naryness of their physique,  
which underscores that the  
development of *jin* is not  
external.

Often the fascinating  
skills are depicted by an old  
man handling and dispelling  
with ease a bunch of hooli-  
gans descending on him.  
This depiction is not an  
exaggeration of Taijiquan's  
martial skills.

The wonderment of  
Taijiquan kungfu titillates  
only because one is not  
cognizant of *neijin*—the  
strength of inner balance.

*Neijin* has two aspects:  
“softness” *rou* 柔 and “hard-  
ness” *gang* 刚. The *rou*-soft-  
ness refers to the fluidity of  
the body structure rendered  
by the ease of motion flow  
at the joints.

The *gang*-hardness refers to the  
body structure moving as a frame,  
which unifies mass in motion. In oth-  
er words, *gang* manifests as a frame,  
and *rou*, as the dynamics within the  
frame.

Though opposite in character,  
*gang* and *rou* are complementary and  
mutually aid one another (*gang rou  
xiang ji*).

In Taiji training, fangsong at-  
tentiveness to the effects of muscle  
activations nurtures both *rou* and  
*gang*, simultaneously—the first, *rou*,



through awareness of the movements at the joints, and the second, *gang*, through awareness of the body as a structural frame.

Thus, the body gains fluidity through the joints and solidity of a more unified mass for greater momentum in motion.

Moving at the joints to manifest *rou* or as a frame to manifest *gang* may seem obvious, but not for the body, especially when under pressure.

For example, when caught in an armlock, under pressure and pain, the arm becomes locked and cannot maneuver, like a wheel that is blocked.

However, with the principle of *rou*, the body knows it is not rigid like the spokes of a wheel, but can turn in smaller radii at the appropriate joints to escape from the hold.

The magic of *jin* in Taijiquan kungfu lies in the body's spontaneous response in *rou* or *gang* and their interchange to meet the challenge as the situation demands.

An opponent encounters a body that is both soft and hard, supple and firm, lively (*qing ling* 轻灵) and stable (稳重)—his target seems to dissolve in the face of attack.

Where is the force, and how do the *rou* and *gang* of *jin* relate to force?

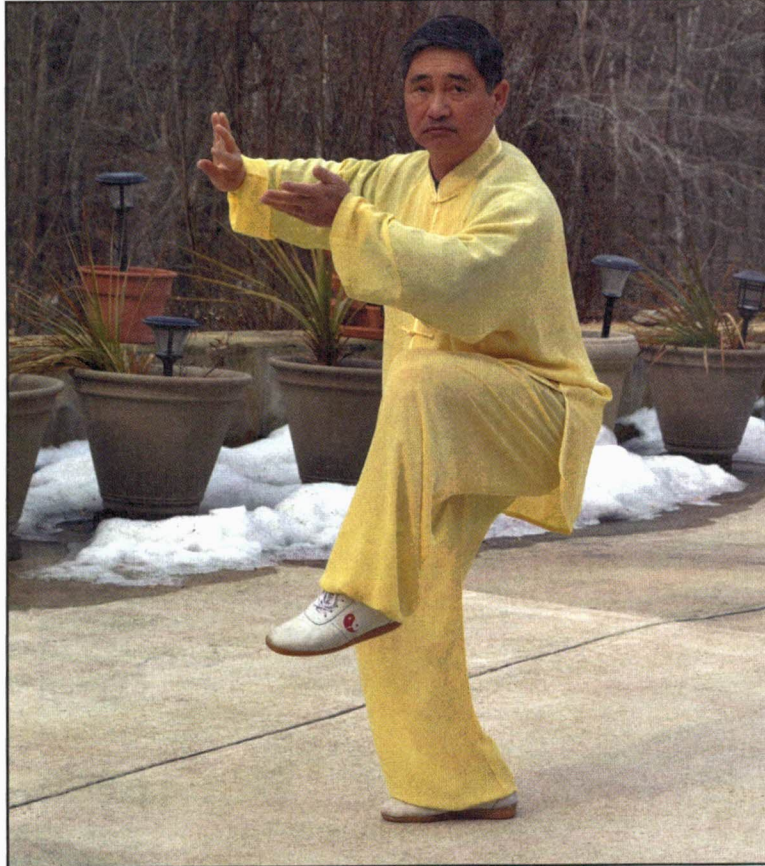
### The force of *neijin*

As mentioned earlier, Taijiquan disdains talk of physical force. The exhortation “not to use *li* 力 (force)” has become so ingrained in the psyche that it has created a paranoia against using anything that may be perceived as *li*.

Taijiquan uses the character 劲 *jin* to refer to power and strength, which etymologically indicates a highly trained and refined kind of *li* 力.

*Jin* is precise, maneuverable through its *rou* and *gang*, and is responsive and lively. Implicitly, *jin* is more than strength—it entails the production of strength as well.

Taijiquan training is directed at cultivating *jin* 劲, not *li* 力. Indeed,



Buddha Pounding (Transition)

the differentiation of *jin* 劲 and *li* 力 is often used to define what is or is not Taijiquan.

The strength that one builds in physical exercises, such as weight-lifting, is that of *li*, not of *jin*. Sport training is motivated by outcome—how high, long, far, fast, or strong—which denominates *li*.

*Jin* is inspired by inner balance; it is developed by the Taiji methods of internal training of cultivating dantian centrality.

*Li* lacks the agility and the liveliness (*ling huo* 灵活) of *jin*. Confu-

sion in the interpretation of *jin* and *li* is unavoidable as *jin* is a term specific to Taijiquan, while *li* is a term of common usage. In the culture of Taijiquan, *jin* is exalted, while *li* is denigrated.

In physics, force is a vector of direction and magnitude, with no distinction as to whether it is inspired internally or externally.

For example, in a knockout

punch, physics does not distinguish between *jin* or *li*, only the impact force produced in the collision between fist and head.

In fact, the same punch does not deliver the same force, not because it is executed by a boxer or a Taijiquan expert, but depending on what is struck, be it a pillow, a board or a brick, or where in the body, belly or head.

The body produces two kinds of force: one from the contractile actions of muscles that moves the body, and the other that results when the body's motion is obstructed or resisted.

We do not experience directly the contractile force of the muscles, but we do experience the force

when body motion is obstructed or resisted. The latter is the force that inflicts damage when a fist, foot, elbow or knee strikes an opponent.<sup>8</sup>

This is the force that arises from a change in momentum (mass times velocity), which is stated mathematically in Newton's Second Law of Motion:

Average force = Change in Momentum/Time duration of the change

The issue of how the motion is generated does not arise, but it is clear that a well-delivered waist-powered punch can cause a



concussion, while that of only the arm swinging may result at best in a bloodied nose.

The difference between *jin* and *li* lies not in the force per se, but in the quality of body motion—a matter of the underlying muscle actions.

The quest for *jin* is therefore about training to produce the ideal kind of motion. Taijiquan's answer is to move in accord with Taiji yin-yang principles.

### Definition of the force of jin

The *force of jin* or *neijin* is the force that arises from body motion that conforms with yin-yang balance, which translates to the inner balance of muscle activation dynamics behind a posture or action.

Although articulated in terms of yin and yang, inner balance is concretely represented in terms of muscle activations and is resolvable pragmatically via the medium of qi by fangsong.

In practice, the quest reduces to the development of full dantian qi, which culminates in the formation of the central status of the dantian.

The fruit of the kungfu-training efforts is that with dantian centrality, motion is unified with qi—the motion is fluid and can change with ease, not strained nor locked from exertion.

The body experiences the qi-charged motion as *jin* and the qi-connectivity as *jin*-connectivity centered at the dantian.

The *jin* expressed at any part of

the body is supported and balanced by the *jin* action-reaction at the dantian center.

Regulated by the principle of dantian centrality, inner balance underpins all the body's actions and postures.

In any breach of balance, muscle power must be expended to compensate for the errors of imbalance, which would detract from the result-



Brush Knee

ing force.

Therefore, the force of *jin*, with its basis of inner balance, is consummate.

### Manipulating *neijin* in application

While we may compute or model the force vectors of physics, the body does not relate to these vector values in its response. How does the body generate the force needed in application, which has to be variable to meet changing circumstances?

The body can only generate motion, not force—body force manifests from a change in momentum.

However, with full dantian qi, motion unifies with qi. So the body gets a feedback of qi in the qi-connectivity centered at the dantian, which is experienced as a feedback of *jin*—more specifically, as the *rou* or *gang* of *jin*—and the sensations through the body's joints and frame.

The feedback of *jin* modulates the qi-motion, guided by the principle of dantian centrality—analogue to using a bubble level. The motion produced is thus governed by inner balance, resulting in a *jin* response with the force needed.

This response changes as the situation changes. In short, the body manipulates the force vectors of *jin* through the response of *rou* and *gang*.

In application to an incoming force, the Taiji body receives it with soft *jin*, like a shock absorber, which at the same time manipulates the receiving angle to lessen impact.

This soft *rou* response relies on the body's cognition of the dynamics at the joints. On the other hand, to generate the force of *jin* to repel an opponent, the body responds with *gang*-hardness by aligning the frame structure, which unifies more mass in motion to increase momentum.

*Jin* maneuvers in kungfu rely on the lively (*linghuo*) ease of change between *rou* and *gang*. It can be said that in cultivating dantian centrality, the neural circuitry is being rewired by the constant reference to settle in the *kua* and to center at the dantian.



So ingrained with the principle, the body responds by reflex to keep inner balance as a matter of course, so that *jin* is ever-ready to be expressed.

### The mechanics of Taijiquan's kungfu skills

Taijiquan kungfu skills all rely on the spontaneous change in the *jin* response between *rou* and *gang* and on the maintenance of inner balance.

For example, in the skill of “leading an opponent’s attacking force to emptiness” (*yin jin luo kong*), the body’s *jin* receives the incoming force with *rou*-softness to lessen its impact.

With the *jin* of inner balance staying the opponent’s force, one can turn at the waist to guide the force away from harm’s way into “emptiness.”

Without inner balance, one might not be able to turn, being locked by the body reaction to push back; and without a sufficient store of *gongli* 功力 (the strength developed in basic training) to stay the opponent’s force in the maneuver, one might be shoved off before any skills could apply. This exemplifies the art of using “softness” to overcome “hardness” (*yi rou ke gang*).

With the force guided away from the target, the force dissipates and the opponent falters. Then one takes advantage (*de ji de shi* 得机得势) to “borrow” the faltering momentum to propel him off (*jie li lai da ren*), by spontaneously responding with *gang jin*. The opponent is thrown a great distance with seemingly little effort—much less than might be expected.

The technique of “four ounces repelling a thousand pounds” (*si liang bo qian jin*) also shares the same category as “leading an opponent’s

attacking force to emptiness” in that only a small force is needed to guide a much stronger attacking force off.

However, the technique points more to a leverage of tremendous advantage. Galileo once boasted even more grandly that he could move the



Six Sealing Four Closing (Transition)

earth, provided he had a long enough lever and a place for the fulcrum to apply the lever.

In order for a small effort of four ounces to move a thousand pounds placed at six inches from a fulcrum, the lever would have to exceed a length of 2000 feet. The human anat-

**With the overwhelming advantage of the screwdriver leverage, no matter how big or strong the opponent, the grip is broken.**

omy simply cannot facilitate linear leverage of such scale.

The remarkable advantage of leverage alluded to in Taijiquan comes from *chanrao* 缠绕 (coiling motion) in emulating the leverage of a screwdriver.

It is the advantage of controlling the handle of a screwdriver against an opponent holding the tip. The rotation of the dantian initiates the waist-kua turning of the body, which acts as the handle turning a screwdriver.

For instance, if one’s arm is seized in an opponent’s grip, one can turn at the waist-kua as the handle of screwdriver, to act against the opponent’s hold, as at the tip.

With the overwhelming advantage of the screwdriver leverage, no matter how big or strong the opponent, the grip is broken.

The effectiveness of the coiling leverage relies critically on the body’s *jin* connectivity centered at the dantian. The response of the *jin*’s *rou* and *gang* varies the coiling radii in accordance with the load to generate the necessary torque in the leverage.

Ultimately, the advantage of the *chanrao* action relies on the principle of dantian centrality, applied in the body’s rotational motions.

The *chanrao* action is powered by the *jin* of the body’s rotational motions—a series of self and general rotations. This *jin* is developed by training *chansi* 缠丝 (“silk-reeling”) motion.

The *chansi* element is present in all body motion, so is implicitly practiced in all martial arts.

For Chen Style Taijiquan, the practice is explicit and incorporated at the basic level from the outset. The *chansi* training brings coherence to the series of self and general rota-



function.

Ingeniously, it is the structural precariousness of the lumbar support at the pelvic base that is being exploited to great advantage, to provide agility and liveliness.

Our bipedal mobility rides on the maneuverability at the lumbar-pelvic support. If the ribcage were supported by additional skeletal props between the ribs and the pelvic crest, as sound architectural and structural design dictates, how constrained our mobility would be!

Therefore, critical to bipedal balance and functionality is the integrity of the lumbar-pelvic support.

Recognition of this point is the insight behind the principle of dantian centrality. Crucial to the integrity of this region are the inner muscles that secure and stabilize the vertebral structure of the lumbar at the pelvic seat.

A series of three deep muscles secure the lumbar vertebrae to the pelvic crest and the upper part of the thigh bone (femur): the psoas, the iliacus, and the quadratus lumborum.

The top part of the psoas muscles attaches to the lumbar vertebrae; the bottom, to the head of the femur.

The iliacus muscles also attach to the head of the femur, but its top part attaches to the crest of the pelvis (also known as the iliac crest).

Together these two muscle groups are referred to as the ilio-psoas. The quadratus lumborum, which lies behind the psoas band, binds the lumbar vertebrae to the iliac crest at the back (Fig. 1).

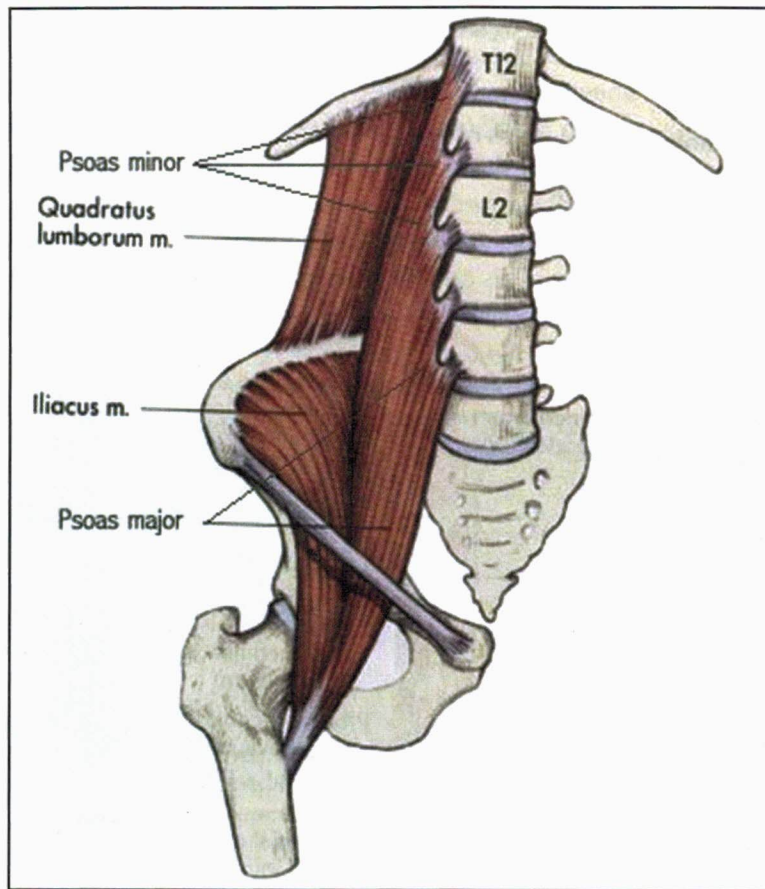


Fig. 1

These three lumbar-iliac muscles work in synergy in their primary function to secure and stabilize the erect structure at the lumbar region.

The balance of the activations of these inner muscles is thus a core factor affecting all bipedal functionality. These muscles also support lateral flexion, the side-to-side bending of the trunk.

#### Fig. 1. The three lumbar-iliac muscles securing the lumbar vertebrae

Wrapping around the midsection like a corset are two halves of the abdominal muscle sheets (the inner transversus and the two oblique muscles) that zip together at the abdominal fascia (aponeurosis) in the front, forming the midline (called linea alba), and, at the back, attach to the thoracolumbar fascia.

Each half of the muscle sheet is innervated independently and works in coordination with the other half-

sheets to produce the versatile motions of the waist, in addition to supporting the lower back and mid-section.

The abdominal muscles maintain their flexibility of function even as they expand hugely in pregnancies (and in beer bellies).

Often times at work, play, and sports, the inner lumbar-iliac muscles are overwhelmed by the dominance of the abdominal and other outer muscles in action.

To counter the domination by the outer muscles, the body responds not with restraint, but by activating the inner muscles at elevated levels, which ends up breaching the inner balance.

This tenses up and burdens the motion and inhibits the action's power output.

The power output is lessened by the muscle energy that has to be expended to compensate in the inner imbalance, when the integrity of the lumbar-pelvic support is not maintained.

Thus, we can attribute the failure to summon our waist power in a swing or punch to a breach of this integrity.

Taijiquan is invested in the cultivation of inner balance at the kua and dantian to keep intact this integrity because of its roots in martial arts.

The resolution of the activations of this critical balance is incorporated operationally by the constant focus at the dantian throughout the fangsong practice.

In the fangsong play at the kua and dantian, the abdominal and other outer muscles are being inhibited



from overwhelming and obscuring the lumbar-iliac muscles, so that the mindful and deliberately slow movements may induce the inner muscles to activate in alignment and balance.

This strengthens the lower back and crucially maintains the integrity of the precarious lumbar-pelvic structure as a matter of course in the body's response.

The maturation of dantian centrality relies critically on the lumbar-iliac muscles to secure and keep intact the lower lumbar support at the pelvic base.

The resolution of these inner muscles and the abdominal muscles represents the deepest internal fangsong play that must be reached in order to develop full dantian qi, and thus true centrality.

Development of such entails deep practice of standing meditation—staying stationary in a posture for a long duration of time.

An immediate benefit of Taijiquan practice is the amelioration of chronic backaches.

Chronic backaches are usually caused by the sinister accumulation of stress, which results from the elevated activation levels of the lumbar-iliac muscles in response to the dominance of the outer muscles in action.

Lying supine allows the back muscles to rest and relax, which brings some temporary relief, as do hot plasters, rubs and massage. But none of these address the issue of imbalance that causes it.

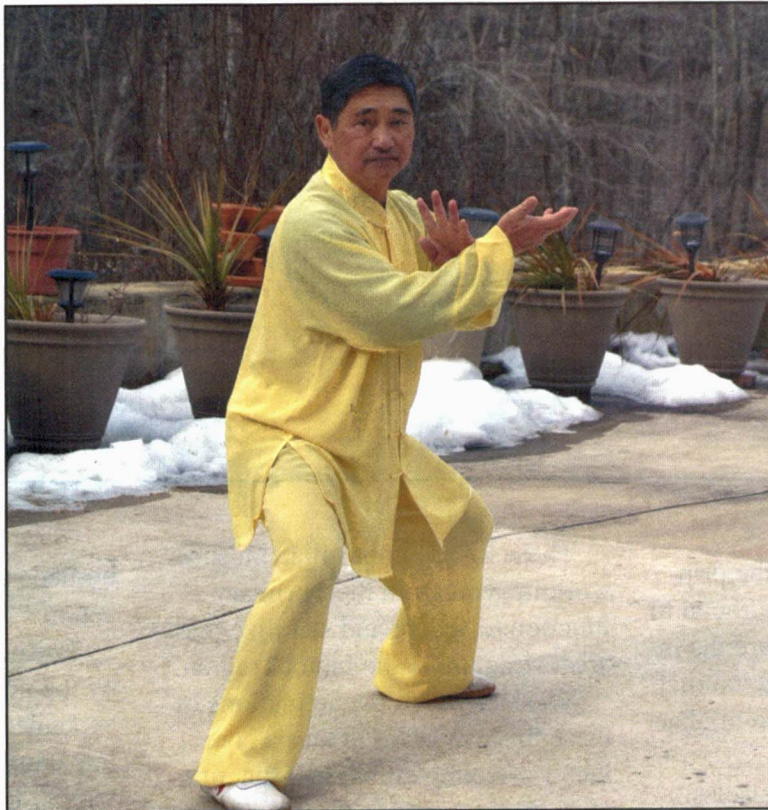
### Using dantian qi to regulate motion

The actualization of dantian centrality signifies that the dantian qi is full and can be used to detect yin-

yang imbalance in any part of the body through the qi medium, analogous to a liquid bubble in a leveler.

We use dantian qi to decipher and discipline the activations of the inner and outer muscles. In this sense, we use dantian qi to regulate Taiji motion. This advancement of using qi is also described as “qi breaking through” (*qi da tong* 气打通).

This brings us to the *yi-qi-motion*



Lazy Tying Coat (Transition)

paradigm of generating motion as perceived by the body in the qi medium: as *yi* (mind-intent) commands and initiates, qi arrives; as qi arrives, the body moves (*yi dao qi dao, qi dao shen dong* 意到气到,气到身动).

How does this fit into the model of the motor cortex sending signals to the motor neurons, through the cortico-spinal tract, that innervate the muscles to produce motion?

The *yi-qi-motion* paradigm describes how the body produces motion as it is perceived and guided in Taijiquan practice.

In executing motion following a *yi* command, governed by the princi-

ple of inner balance, the activations of the inner and outer muscles balance and align with a corresponding qi flow, which is perceived by the body as qi arriving from the *yi*-signal.

The experience of qi arriving is an input signaling inner balance, which accordingly modulates the output signals to the motor neurons to activate the muscles.

The motion that ensues is thus regulated by inner balance. That is to say, the motion initiated by dantian qi is modulated by qi to maintain inner balance in the action. In the accord of motion and qi, the dantian is “happy.”

To recap, in motion initiated by dantian qi, the integrity of the lumbar-pelvic support is intact, namely, the lumbar-iliac muscles are engaged in balance at the core.

Secured and stabilized thus by the inner muscles, the activations of the abdominal muscles, the *erectus spinae* and the abdominal

*erectus*, and that of the other outer muscles can align and not jump out of sequence to compromise balance.

Therefore, the discipline of Taiji motion is reduced to motion initiated by dantian qi. This means that Taiji motion can be studied by the different ways of manipulating dantian qi.

This is presented as “dantian internal rotation” (*dantian neizhuan* 丹田内转), which Chen Xiaowang classifies into three modes, which the reader can pursue in the author's book.<sup>6</sup>

We conclude this section with the Principle of Motion (*Yundong Guilü* 运动规律), which encapsulates Chen



tions in the body.

*Chansi jin* is simply the *jin* that arises from *chansi* motion. For a more detailed discussion, please see the chapter on *Chansijin* in the author's book.<sup>9</sup>

From this perspective, we say that Taiji motion is powered by *chansi jin*. Indeed, almost all kungfu skills spring from *chansi jin*.

This includes *qinna*, the art of capturing joints and pinching nerves to immobilize an opponent and of escape from same.

The power of *dang-yao jin* (waist power) and *fajin* (the explosive release of energy) are also expressions of *chansi jin*.

Tang Hao (1897-1959), the martial arts historian, noted that the martial application of *chanrao* was first codified in the verse in the *Song of Boxing Canon* by Chen Wangting:

*Zhu kao chanrao wo jie yi* 诸  
靠缠绕我皆依

I fully rely on coiling as the  
basis of all my kungfu  
techniques.

Chen Wangting (c. 1600-1680) was the ninth-generation patriarch of the Chen Family, who reinvented the family's martial arts tradition, which would become known as Taijiquan.

### Conclusion

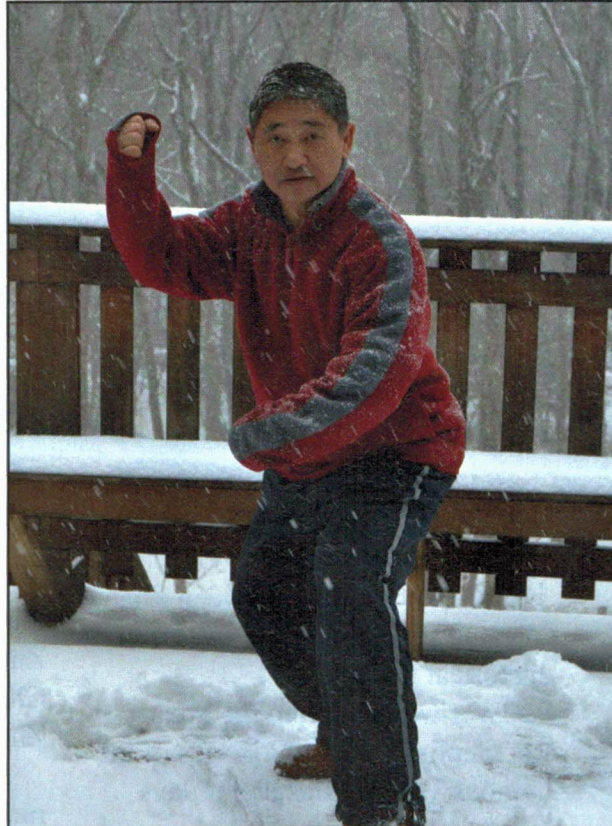
The science in the exposition may not capture all the subtle nuances of *qi* and *jin*. But certainly, without coiling leverage, there is no phenomenon of "*si liang bo qian jin*."

Without the dynamics of *jin* from the maneuvers of *rou* and *gang*, there is no art of "*yi rou ke gang*." Without the opponent's faltering momentum, there is no "*jie li lai da ren*."

Were the action of the upper body not supported by the reaction of the lower body, or the *jin* of the left and

right not balanced—namely, were the action *jin* and the reaction *jin* not aligned to abide by Newton's Third Law of Motion ("Action equals Reaction")—waist power (*dang-yao jin*) would not be effectively executed.

By injecting physics and physiology into the discussion and by bringing the role of muscle force and activations into the forefront, rather than shunning it as in traditional



Beast Head Pose

exposition, we gain the precision of science in the biomechanics of *neijin*.

With that understanding we can train more effectively and rely less on secrecy and avoid nebulous methods that expect decades of devotion to gain mastery.

It is not the place of science to contravene the metaphysics of Taiji. However, physics and physiology are not incompatible with Taijiquan, as seen in the discussion in the musculoskeletal framework.

The kungfu skills of Taijiquan may appear to defy the laws of physics, but they do find basis in science.

In other words, physics and physiology do explain Taijiquan, but it is the yin-yang metaphysics of Taiji that inspires the training that delivers the goods to the body.

By reducing the practice to the development of dantian centrality, the yin-yang methodology of Taiji cuts through the maze of neural networks and the complex of muscle activations, to regulate and generate motion in accord with the Taiji principles, and thus delivers the consummate force of *neijin*.

To conclude, keep the dantian happy!

(Endnotes)

1. Chen Xiaowang. *Chen Family Taijiquan*. t(2008). p. 308. Note: The discussion on theory, *Taiji Essence*, is entirely devoted to the central status of the dantian.

2. CCTV Oct 2012  
<https://www.youtube.com/watch?v=FtCfUaL-leo>

3. Chen Weiming. *Yang Chengfu's Taijiquan Theory of Ten Essentials* 杨澄浦太极拳说十要.

4. Ibid 3.

5. C.P. Ong. *Taijiquan: Cultivating Inner Strength*. (2013). Chapter 7.

6. Ibid 3. *Dantian Internal Rotation (Dantian neizhuan)*. p. 209.

7. Wang Zongyue. *Taijiquan Classics*. Note: One of the five canons of Taijiquan.

8. Ibid 3 More detailed discussion in *Momentum* p. 116.

9. Ibid 3. Chapter 8, *Theory of Chansijin*. p. 193. •