JTS
Journal of Taiji Science
Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

Wang Zongyue's Taijiquan Discourse: The Biomechanics of Dongjin

C.P. Ong[1]

[1]*Independent Reseacher, Potomac, Maryland, USA.*

www.cpTaiji.com

Correspondence: *cpTaiji@gmail.com*

***Abstract*—**We present in this following paper a verse-by-verse translation of the *Taijiquan Discourse*, with annotations in the framework of biomechanics. In the text, *dongjin* 懂劲 the "comprehension of *jin*" crystallizes as a central concept. *Dongjin* can be viewed as how the body comprehends, and interacts functionally with force. While the body relates to force by its strength and functionality, the Taiji body, is considered to be instilled with *dongjin*, and perceives the force associated with *jin* (劲) as "soft" (*rou*) and "hard" (*gang*), which correspond to the vector quantities of the force, namely, direction and magnitude. In most cases the common response to an attacking force is to fight back, in a direct force-against-force interaction, which creates a "double-weighted" conditions (*shuangzhong* 双重) that tenses up, and traps the body from being able to maneuver. This renders the body vulnerable. Dongjin enables the body to respond to the incoming force by making postural adjustments to receive force at an angle, at the moment of impact, thus deflecting and mitigating it. In other words, the body uses the rou component (softness) to absorb and neutralize the incoming force. Also, *dongjin* accords liveliness and spontaneity in the response of rou and gang, which is a fundamental feature of martial skills. Dongjin is more comprehensive than perceiving force as a vector; it enables the body to use the dynamics of *rou* and *gang* functionally in its application, with great efficacy. *Dongjin* forms the biomechanical basis for Taijiquan's key strategy of responding with rou-softness in martial interactions (*yi rou wei zhu* 以柔为主).

Introduction

The comprehensive insight of *dongjin* is based on the balance of Yin-Yang. *Dongjin* (the comprehension of *jin-force*) is cultivated by the *fangsong* discipline of body motion at various joints, to create balance between the tensile forces of muscles, tendons, and fascia, against the external forces of gravity and other bodies that are present. The crux of this balancing lies at the triangle of the hip-joints and the sacral-iliac joint, which forms a hub of force transfer between the ground and the upper body. In this process, Dantian serves as the functional center of this hub, and therefore plays a pivotal role in the transmission of forces throughout the body. This defines the centrality of the Dantian (*yi Dantian wei hexin*). Taijiquan motion, inspired by *dongjin*, is in accord with the principles of Yin and Yang. This means the postural changes in response, are lively and spontaneous, and of the right *rou* (softness), and *gang (hardness)*. The import is that the force that ensues from the ideal motion will be of the right "force vector" in application.

The *Taijiquan Discourse* by Wang Zongyue first appeared in the latter part of the 19th century. It is considered to be a core classic in the canon of the art of Taijiquan. Within it, the principles that govern Taiji motion are well articulated, but they are expressed in archaic, traditional terms that do not easily link to modern scientific descriptions.

Despite this, the body relates readily to the central concept of the *Discourse*, *dongjin* ("comprehension of *jin*"), and the associated traditional concepts of *gang* (hardness), *rou* (softness), and *jin* ("internal force") as they manifest in the musculoskeletal framework.

We can parse them, as well as the meaning of "Qi sinking to the Dantian," and "double-weightedness" (*shuangzhong*) in the context of biomechanics. Indeed, by viewing Taijiquan as an art of body

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

motion, we eschew the esoteric and bring out the science in Taijiquan.

Such an approach may seem to diminish the role of traditional Taiji theory, but to the contrary, what is revealed is the wisdom of the traditional theory in resolving the fundamental issue in Taijiquan: How to discipline motion at the myriad joints of the body, when they are subject to varying multiple internal muscle forces and multiple external forces.

The significance of exploring the science behind Taijiquan is that one can employ biomechanics to try to better understand the meaning of the art. More importantly, with science we can attempt to better gauge the progress made in one's practice, in what can be a very long journey. The science gleaned from the Taiji methodology can thus be ported to Sports Science, which shares many similar issues in training.

Our review of the *Discourse* is organized by theme, corresponding to the related stanza in the text. It should be noted that this is not a literary exercise to appreciate the poetry of the original work, but rather an essay into the Scientific Thought behind Taijiquan. The full text of the *Discourse* in Chinese is given in the Appendix with pinyin for the reader's convenience. This is divided into 8 stanzas.

1. The Ideal Taiji Motion

The practice of Taijiquan is a discipline of body motion with the movement made in accord with the Taiji principles of Yin and Yang.

Taiji, born without limits,

Engine of motion, the Mother of Yin-Yang.

Movement separates, stillness unites.

Not over and not under, it takes the bends and straightens.

太极者，无极而生，
动静之机，阴阳之母也。
动之则分，静之则合。
无过不及，随曲就伸。

1.1 Taiji Theory

Taiji, the Theory of Grand Extremes, is not limited in scope in the Chinese discourse of all things, from the microscopic to the cosmic scale. Inherent in the theory is the concept of an engine that drives the motion of life—the principle of Qi, the life-force energy, that is the animating agent of all things (dong jing zhi ji 动静之机). Since ancient times, Chinese thinkers have used the Grand Theory in the study of cosmogony, geomancy, fengshui, medicine, etc., and, of course, Taijiquan.

The motion engendered by the engine has the operational effects of “motion separating, stillness uniting” (*dong zhi ze fen, jing zhi ze he* 动之则分，静之则合). States that evolve by this engine of motion have two distinguishable characteristics, the Yin or the Yang. Taiji, thus, is the Mother of Yin and Yang. The dynamics is governed by the Yin-Yang Principles towards harmony; at the heart of which is this Yin-Yang balance.

Taijiquan motion is a product of discipline, guided by the Principles of Yin-Yang balance that integrate the forces acting on the body in balance. Externally are the forces of gravity and the interactions that occur with other bodies, and internally are the tensile forces of muscle contractions, stretched tendons, ligaments, and fascia connective tissues of the musculoskeletal structure. This defines a comprehensive balance of our bipedal functionality with all the Yin-Yang nuances.

The metaphysics of Yin-Yang balance is captured fully with all its dynamics and multi-dimensionality in the ubiquitous Taijitu (太极图) or Taiji Diagram (Fig. 1). This is the circular image of two-halves, each in the form of a Yin or Yang fish. Within the Yin fish is an eye of Yang, and within the Yang fish, an eye of Yin, with each flowing into the other in harmony within the circle. The ideal Taiji motion is elegantly depicted in the Diagram.

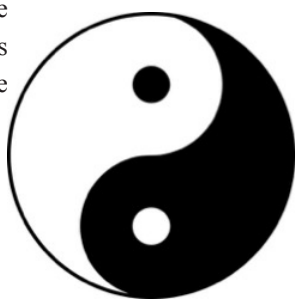

Fig. 1 Taiji Diagram.

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

1.2 The Dao of Seeking Balance

The structure of our bipedal framework is inherently unstable, and the body is constantly adjusting its balance. To keep upright, the body relies on the interaction between the inner ear, body proprioception, and visual clues, to constantly adjust the body.

Normally these processes occur in the background, and we are unaware of the number of actions that our body takes to keep us upright. However, when we undertake an artistic movement of the body, we become conscious of postural balance, as we have to generate various motions to form the desired posture. Intriguingly, in creating these movements, even though many moves must now be considered, we still do not need to make mental calculations to determine how to allocate muscle forces to maintain good posture. So, how do we get to the right combination of muscle forces for postural balance?

Seeking the solution of balance is to find a unique point in a range of imbalances, which in practice is impossible to pinpoint exactly. Taiji skirts around finding the exact solution and trains the body to recognize what is overextended (this being described in Taiji as excessive) or what is under-expressed (this being deficient). These are cognized as errors and expressed in the text as wuguo buji 无过不及. Thus, in Taiji, the focus is not on balance, per se, but on perceiving "what is over, or what is under" as sensed by the body.

It can be said that the attentiveness to these processes, through exercise, forges into the body a cognitive sensation of functional imbalance as it relates to the posture. Once the body senses and comprehends what is over, or what is under as postural errors, it can then work to resolve it. In this way, the Taiji solution to resolving imbalances is amazingly simple—just relax and stay in the middle ground within the margin of cognized errors. This cognitive sense of the postural balance as "not to be over and not to be under" is also often described as "neither lax nor resisting" (*bu diu bu ding* 不丢不顶).

Staying in the middle ground of *bu diu bu ding* is a non-exertive action, which reduces obstructive tension in the posture. This induces an improvement in the flow of motion, allowing it to flow by obstacles. In the Chinese text this is described as being similar to water "taking a bend and then straightens" (*sui qu jiu shen* 随曲就伸).

As practice advances, the perception of what is over and what is under extended sharpens in refinement, and the margin of errors narrows, and this attentiveness leads to a better state of balance, which results in a reduced chance of practitioners accidentally falling in old age.

This prescriptive exercise carves a solution-practice path which continually refines and sharpens the process, thereby reducing the error margins towards balance. In Chinese philosophy, this is the art of seeking balance without seeking it, the Dao of doing without doing (*wei wu wei*). The task of resolving for balance will be discussed in Section 3.

2. How does the body relate to force and *dongjin*?

The concept of force is implied in the "engine of motion" (*dong jing zhi ji* 动静之机). Force is defined in physics as the product of mass and acceleration. Normally we think of weight as mass and only consider it to be a force after we study gravity. As a result, we, usually, do not sense the weight of our arm, but we relate much better to the functional effect of the force of our hand hitting someone, where the collision of the hand with a person results in a change of momentum (mass x velocity).

We can also relate this to the mass factor in the force of a car crash, which at high speeds can be fatal, and compare that to the forces experienced in a push cart that is moving at a slower speed.

We also know that a stone dropped on our head can result in serious injury, but not a football of the same mass, which demonstrates the less obvious but important factor surrounding the time duration in the collision. The cushioning effect of the football provides a longer time duration for the change. These factors are expressed mathematically in Newton's Second Law:

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

Force = Change in Momentum/Time duration of the change

The body can learn to relate to the Law governing the changes in momentum caused by the forces of muscle contractions. Muscle force can only do one thing. It produces body motion.

While force is well-defined in physics, how does the body comprehend this force? In this case Taijiquan's answer lies in the concept of *dongjin* 懂劲 (the comprehension of *jin-force*).

The Discourse introduces two factors that do not seem to be scientific. These are *gang* 刚 ("hard") and *rou* 柔 ("soft"), which are used in basic Taiji vocabulary in all discussions of the application of force. However, it turns out that these terms can be described by physics and they are just Taijiquan's perception of force as a vector, with the terms related to magnitude and direction.

2.1 The Functional Effects of Force Vector

To hardness, I respond with softness
to "walk-follow,"
I follow his movements as he attacks
to "adhere."
If swift, I respond swiftly; if slow,
I follow slowly.
Changes are innumerable,
the same principle applies.

人刚我柔谓之走，
我顺人背谓之粘。
动急则急应，动缓则缓随。
虽变化万端，而理唯一贯。

The force of an attacker's strike is lessened if it is received on impact at an angle rather than directly. One can alter the magnitude of an incoming force by deflecting it, to avoid a direct impact; or by moving out of the way.

One can make postural changes to alter the angle of impact, thus the directional component of the attacking force is modified, to mitigate its damaging effects. Taijiquan does this by accessing the *rou* component (softness), by addressing the changeability of one's posture, to respond to the magnitude, the gang or hardness, of the strike.

At the same time, one can also access the gang component of one's response-action to keep one's posture in balance. This is depicted by the eye of *gang*-Yang in the *rou*-Yin half of the fish in the Taiji Diagram. Thus, in the *rou* response one is neutralizing, walking, and following the attacking force. "To hardness I respond with softness to walk-follow." (*Ren gang wo rou wei zhi zou* 人刚我柔谓之走).

There is another important quality in the response of *rou*. When pushed, the usual response is to push back. This is to keep one from being pushed off one's base.

In such a situation, the pushing-back action is directed straight at the push. If one is not as strong as the person who initiated the push, there is only one possible outcome. One will be pushed off their base.

Also, in this force-against-force response, the result is the defender tenses up. and his or her body will become locked in posture, which restricts the person's ability to maneuver.

In contrast, if the defender responds with *rou* (softness), this gives the defender the ability to access the vector properties of *rou* and *gang* to maintain maneuverability and balance. This *rou* response is a recurring theme in the Taijiquan Discourse.

This application of physics to Chinese martial art texts now provides the rationale of how Taijiquan uses "softness to overcome hardness" (*yi rou ke gang* 以柔克刚). Through responding with *rou*, one can absorb, neutralize, follow, stick, and stay with the opponent's body in the adhering action of *zhan* 粘 to the opponent's attacks (*Wo xun ren bei wei zhi zhan*我顺人背谓之粘). This limits the opponent's opportunity to strike until he falters. One can immediately read his faltering momentum from the sensitivity of one's zhan-adherence to his body, upon which a *gang* counterstrike can then be launched

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

instantaneously.

The *zhan*-adherence to an attacker's body is more than a touch or sticking sensation. The *zhan* establishes a contact connectivity with his body so that one can decipher his motion and his intention. This establishes a strategic advantage of the *zhan*-adherence, which is based on *rou*.

However, to maintain a *zhan*-adherence, one must continually follow the opponent's body motion, to flow with it. If his movements are swift, one must also be swift, if slow, one must be slow to keep the connectivity. ("If swift, I respond swiftly; if slow, I follow slowly." *Dong ji ze ji ying, dong huan se huan sui.* 动急则急应，动缓则缓随).

At this point a student may ask what will happen if I am not as swift as the opponent? In this case *zhan* can still be maintained at a contact point closer to his center of motion. For example, one can keep adherence at the arm closer to the elbow or shoulder without being as fast as the hand. If his action is manifestly slow, and not a ruse for a hidden kick or strike to emerge suddenly, then of course, it does not mean that one should not proceed with gang to dispose of him!

Therefore, respond with *rou* to walk-follow and flow with his body to *zhan*-adhere to maintain contact and connectivity. This is the meaning behind: "Changes are innumerable. The same principle applies." (*Sui bianhua wanduan, er li wei yi guan* 虽变化万端，而理唯一贯). In this way, the body gains familiarity of the functionality of force as a vector; or the body comprehension of force, *dongjin*.

2.2 The Body Comprehension of Force, D*ongjin*

As training matures, one gradually
comprehends force,

Poised thus, one ascends to the spiritual plane,

But unless one puts in the time and effort;

The insight of wholesome mastery cannot arise.

由着熟而渐悟懂劲，
由懂劲而阶及神明。
然非用力之久。
不能豁然贯通焉！

It can be said that our body does not relate to force the way we understand force in physics or engineering. The reason is simple. The body cannot use mathematics to work with force. Yet, getting the body to comprehend force and apply it functionally is critical in martial arts. Taijiquan's answer to how the body comprehends these forces lies in the concept of *jin*.

The Proposition of *Jin* 劲

Taijiquan introduces the concept of *jin* 劲 as the entity that the body uses to comprehend force vectors. We commonly relate to force by its strength or power. However, Taijiquan shuns its application in training, and instead relies on what the body can relate to, namely, on gang and *rou*, as discussed earlier. These are the attributes of force that correspond to the vector quantities of magnitude and direction.

The body relates to *rou* through postural changeability to neutralize the power behind an attack, and to gang in the alignment of postural momentum to summon whole-body power. Additionally, the Taiji concept of *jin* embodies its functionality in application, as well as its effectiveness. In other words, *jin* is also about how the body can use it to transmit force from one part to another. This aspect is crucial because our anatomy, confined to segments moving at the joints, is limited to mechanical solutions; it cannot replicate a pulley in force transmission.

With no physical gauges to measure the effects of function, functional effectiveness is incorporated into the concept of *jin*. Implicit in the concept of jin is the transmission of force that bears the right force vector. This factor is built into *jin* in its development through the functional feedback of gang and *rou.* Thus, implicit in the concept of *jin* is that it is a highly conditioned and refined force.

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

Jin is Taijiquan's concept of force vector as perceived by the body as *gang* and *rou,* corresponding to the vector quantities of magnitude and direction. The concept embodies body comprehension and functionality in application.

In the Taijiquan form practice, the body constantly adjusts muscle forces against gravity to retain postural balance, by engaging the dynamics of *gang* and *rou*. The attentiveness to practice these movements in slow motion instills the vector principle through the body sensing the *gang* and *rou*, cultivating *dongjin* 懂劲, the body comprehension of *jin*.

In push-hand drills, the body is adjusting *gang* and *rou* against both gravity and the external forces generated by a partner, which together reinforces the comprehension of *jin.*

Implicit in the experiential cultivation of *dongjin* is that the body is also enabled to access the *gang* and *rou* of *jin* to maneuver, or reposition itself to retain constant balance; and "As training matures, one gradually comprehends force.", (*Youzhe shu er jianwu dongjin* 由着熟而渐悟懂劲)."

In application*, dongjin* renders *jin* as a highly refined force, which is distinguished from *li* (力), the colloquial term for force. To emphasize this distinction, *jin* is often referred to as *neijin* (内劲), which means "internal force", to point to the amount of "internal" work involved in training *gang* and *rou.* This hallowed *neijin* is developed as the body's core strength in Taijiquan. The amazing martial feats of Taijiquan are attributed to the force of *neijin*.

Indeed, poised on the comprehension of *jin*, one's practice ascends to the spiritual plane that represents a unity of mind and body. ("Poised thus, one ascends to the spiritual plane." *You dongjin er jie ji shenming* 由懂劲而阶及神明). The immediate import of this elevation is that the body's response in an encounter will be spontaneous, and the body will immediately apply the right force vector.

However, like growing a plant, the nurturing of this *dongjin* cannot be rushed; it is a process of time and effort in study and training, which is the meaning of Kungfu (*gongfu* 功夫). There are no shortcuts and no limits in Taiji Kungfu development. Unless one puts in the effort to practice Kungfu, one cannot attain wholesome mastery *(huoran* 豁然). In other words, without putting in the time and effort, the fruits of mastery cannot bear (*Ran fei yong li zhi jiu, buneng huoran guantong yan* 然非用力之久，不能豁然贯通焉).

3. Fangsong, Qi and Balance

Point the crown up without stretching, Qi sinks to the Dantian

虚领顶劲，气沉丹田
Xu ling ding jin, Qi chen dantian

It is uncanny how well these few characters encapsulate the genre of the art. Though some find it had to believe it, the whole practice of Taijiquan to develop *neijin* is distilled in this one short verse. In fact, one can find a lot of science, by unpacking the role of Dantian (丹田) and Qi (气).

Qi, is the ubiquitous vital life-force energy, and is a whole subject by itself, but we can take it as given in Traditional Chinese Medicine, or the reader can find a review of Qi in the author's prior paper, Science in Qi.[1]

The practitioner's comprehension of *jin* grows by experiential development from the dynamics of gang and *rou*, that is grounded in bipedal balance. As mentioned, this discussion has relied on the body's senses, to convey to the brain what is in excess or what is deficient in imbalance, as well as of the gang and *rou*. In this complex equation, Qi comes in as the sensation transduced from the body senses to gauge the Yin and Yang. The nurturing of Qi in Taiji practice is to cultivate the Qi cognition of the body senses to facilitate the goal of Yin-Yang balance.

Yin-Yang balance goes beyond physical balance; it incorporates the functionality of balance. For example, there is balance in the posture of a person standing at attention before a sergeant in a drill. With the chest braced up, the air in the abdomen hollows, rendering the body top-heavy, and can be easily toppled with a gentle nudge. The tensing of the chest

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

muscles affects the functionality of the posture while the physical balance remains.

In another example. If you stretch out your right arm horizontally to the side and hold it for a few minutes, there is a varying combination of the muscle forces of the arm and shoulder supporting the limb's weight in balance. In this action, what is a preferred combination of muscle forces? After a while, the effort to maintain the physical balance makes the arm tense, giving you some ache and discomfort, which affects the arm's functionality. This elicits a response of relaxation that eases the tenseness, bringing some relief. This "relaxation" turns out to be a rudimentary operation of *fangsong* (放松), "relaxing by letting go," which lets the body settle into a better state of balance with less stress. The body experiences a sensation of easing, by the *fangsong* adjustment of the posture, which Taiji attributes as a Qi sensation. That is, *fangsong* induces a preferred state of balance, which is associated with a better Qi state.[2]

As a final example, in the same arm position, now extend your fingers and keep them stretched. With the fingers stretched, you find that you cannot flex the fingers unless you relax the hand to regain its functionality. Likewise, if the wrist, elbow, or shoulder joints are tensed up, the arm's functionality is compromised while still in physical balance. *Fangsong* relaxation at the joints settles the arm in a better state of balance, cognized as a better Qi state, and facilitates the arm's functionality.

To recap, in Taijiquan, we can view Qi as a sensation of kinetics, transduced from the impulses of the body senses of proprioception, pressure, touch, heat, sight, sound, etc. The *fangsong* operation gives a better state of balance and functionality, namely, a better state of Yin-Yang balance. In *fangsong,* Qi is thus harnessed as it is nurtured to discipline the forces involved in producing the arm motion. This is the biomechanics of "using Qi to move the body" (*yi Qi yun shen* 以气运身). The process of Qi nurturing inculcates the principles of *dongjin* in the body.

3.1 Fascia tensional network and Qi-connectivity

We do not relate directly to the muscle forces, but we have a sense of muscle contractions from the motion they produce. We take for granted the smoothness of the motion, which is the dynamic balance of the muscles working in agonist-antagonist pairs. The forces of muscle contractions generate tensions in the muscle-tendon units, ligaments and the fascia enveloping them, which combine to counter against the external forces of gravity and of other bodies if present. We can learn to perceive the tension generated, referred to as fascia tension.

In the *fangsong* of the arm, the fascia tension is perceived by the Qi sensation, which defines a tensional connectivity. So, operationally, the Qi-cognition provides a Qi-connectivity of the arm via the fascia tension. *Fangsong* in nurturing Qi thus facilitates the transmission of the muscle and tensional forces from the shoulder to the hand through the elbow. In this way, the Qi in *fangsong* utilizes the medium of fascia tension to discipline the arm's motion.

We can extend the discussion of the dynamics of the arm to the dynamics of all the segments of the body. By working on fangsong of all the joints, we can extend the tensional connectivity of the arm to the whole body, forming a fascial tensional network. In this way, Taiji cultivates the cognition of the tensional network as Qi, thereby building the Qi-connectivity bodywide, which is harnessed in disciplined body motion to be in accord with the principles of Yin-Yang balance. More discussion on fascia tension and Qi can be found in the author's paper.[3]

3.2 "Qi sinking to the Dantian"

The power in sport actions comes from the waist, but successfully applying it is quite another matter, which is why most weekend golfers find it hard to improve their drive. Knowing the physics, that greater momentum is generated with more speed or mass, is easy, but engaging the body segments to move in well-aligned momenta requires a lot of discipline. What makes it more difficult is that, habitually, our torso does not turn as a whole. In our walking, the chest turns in one direction, while the abdominal

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

region twists in the opposite direction. Doing so cancels out the angular momentum, an action facilitated by the curvatures of the spine.[4]

To tap the full potential of waist power, it is necessary that the torso and pelvic girdle must rotate as a whole, while supported by the base below, turning in the opposite orientation. This is the discipline of the transmission of forces at the triangle of joints, consisting of the hip joints and the sacral-iliac joint (SIJ). Taijiquan has a specific term for the waist, called the *kua* (胯), to describe the complex of the pelvis and the triangle of joints. The *kua* serves as the junction of force transfer between the upper and lower body, channeled from the ground.[5]

Recognizing its pivotal role in force transmission, Taijiquan practice revolves around the discipline of the *kua*, namely, the *fangsong* of the *kua* at the triangle of joints. The Dantian, which is the point located three-fingers below the navel, and a third of the way in, serves as the functional center of the *kua*. The Qi nurtured through *fangsong* at the kua is sensed as filling the pelvic bowl and concentrating at the Dantian center, which is cognized as "Qi sinking to the Dantian" (*Qi chen dantian* 气沉丹田). However, the balance at the triangle of joints is not localized. It is integrated with the other joints of the body due to the tensile integrity of the body frame. This means that balancing at one joint can affect another, requiring a re-calibration, which makes the task of balancing a matrix of joints seem quite intractable. The *fangsong* process bypasses this complex issue by working on the correspondence between pairs of the body's major joints. The *fangsong* of the shoulder and hip-joints disciplines the motion of the torso as a whole, which consolidates the *fangsong* of the *kua* and reinforces the force-transference role of the *kua*. The *fangsong* process can then be extended to the elbow-knee and hand-foot pairs, to systematically resolve the balance of the matrix of joints via the fascia tensional network.[6]

Operationally, the *fangsong* of the matrix of joints is also resolving the balance at each joint relative to the Dantian center, thus nurturing the Qi to sink to the Dantian repeatedly. This consolidates the Qi-connectivity body-wide, centered at the Dantian, as Qi is harnessed in the discipline body motion. This defines the centrality of the Dantian. The mastery of the art of Taiji is thus ingeniously reduced to the actualization of the role of Dantian centrality in Qi-connectivity. The actualization of Dantian centrality is articulated by Chen Xiaowang as *Dantian wei hexin de xing cheng* 丹田为核心的行成. This is further discussed in the author's prior essay.[7]

3.3 *Xu ling ding jin*

Crucial to fangsong of the kua is the balance of the head. Straightening the head may keep it from nodding, but to engage its balance with the *kua* requires tensional connectivity between them. This is facilitated by *ding jin* 顶劲, pointing the crown of the head up as the torso settles by its weight into the *kua*. However, the action of pointing may inadvertently cause the neck to be stretched, which introduces tenseness. *Xu ling* 虚领 comes in to modify it with "empty leading" or without the active pushing or stretching to negate any cause of tenseness. This is emulated by imagining the head being suspended at the crown and bending slightly at the knees to let the body drop but not the head, which actions involve eccentric muscle contractions. The dropping action induces the torso to settle at the kua, generating tensional connectivity along the spine with the balance of the head via the thoracolumbar fascia and the nuchal fascia. This augments the body-wide fascia tensional network from the head to the feet.

The tensional network provides the medium for *dongjin* to transmit *jin*-force between the ground and the upper body. The action of the jin-force of waist-power transmits from the *kua* up the torso to the shoulders, through the elbows to the extremities, and the reaction *jin*-force pushes down through the knees to the feet, to anchor solidly onto the ground.

The continual settling of Qi in the Dantian not only builds, consolidates and refines its role of centrality, but the Qi nurtured also provides a measure of how well the practice is progressing in the body's comprehension of the Yin-Yang balance. Indeed, the beguiling mantra of *Xu ling ding jin*, Qi chen dantian captures fully the practice theory of Taijiquan, foregoing the benefit of the details of muscle anatomy. That both Qi and Dantian are not scientific

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

constructs, attests to the pivotal role that art can play in the service of science, which often adds an aura of mystique to *dongjin*. The actions of *dongjin* may seem magical to an opponent in an interaction, as described in the next stanza of verses.

4. The Martial Functionality of Taijiquan Motion

Not slanting, not leaning; suddenly hidden, suddenly appearing

Press on the left, the left is empty; press on the right, the right hollows

Reach up, it's higher; reach down, it's lower

Advance, it recedes further; retreat, it presses in closer.

不偏不倚, 忽隐忽现
左重则左虚，右重则右杳
仰之则弥高，俯之则弥深
进之则愈长，退之则愈促

The verses above articulate the functional efficacy of Taijiquan motion in martial art interactions. Inspired by Yin-Yang principles and *dongjin*, the Taiji motion is "not slanting, not leaning," so when engaged in push-hands or combat, it betrays no indication of pressure or threat to the opponent, who finds the motion "impartial," seemingly flowing in sync with his own. He can find no weaknesses, which seem hidden. When he suddenly sees an opportunity to attack, just as suddenly it disappears, "suddenly hidden, suddenly appearing."

The body empowered by *dongjin* responds via the vector values of gang and *rou* to adhere and flow with the opponent's motion. When the opponent attacks or presses on the left, the Taiji body responds with *rou*-softness, yielding, and leaving the left empty; likewise, if it occurs on the right, the right hollows. If he reaches up to target above, he finds that it has moved higher; likewise, if he targets below, it seems to have descended lower. If he advances, the target seems to recede, and if he retreats, he feels more pressed in. And if he is more aggressive, he finds himself faltering and is dispatched unceremoniously.

With the liveliness accorded by the principles of Yin-Yang and *dongjin*, the Taiji body responds spontaneously with the right force vector to accommodate the opponent's action. The maneuvers in Taijiquan thus appear to be magical to the opponent. His slightest error would be picked up by the sensitivity of Taijiquan's consummate balance, and a counterattack would be launched instantaneously by *dongjin* to send him flying.

5. Taijiquan's Consummate Balance

A feather cannot be added, a fly cannot alight.

People cannot gauge me, but I can read them.

Such heroes have no peers, forged thus by these principles!

一羽不能加, 蝇虫不能落
人不知我, 我独知人
英雄所向无敌, 盖皆由此而及也!

The Sanddorn Balance act is often considered to be a spellbinding demonstration of the balance of 14 palm leaf ribs and a single feather. Starting with the balance of a feather on a branch, it is then balanced freely on the next, then on the next, one by one until the last branch. The elaborate structure stands freely in mesmerizing balance. Then upon the removal of the feather, the branches fall one by one, demonstrating dramatically the delicate support of the single feather in the balance.[8]

The allure of a feather to convey the delicacy of balance appears in the verse: A feather cannot be added, a fly cannot alight (*Yi yu beneng jia, ying chong buneng luo* 一羽不能加，蝇虫不能落). However, while our bipedal structure is inherently unstable, the reference to balance in Taijiquan includes a functional factor. The body can withstand piles of kilos without collapsing. It has muscle engines generating forces to dynamically balance external forces. Taiji balance is more; it incorporates the crucial functionality of lively changeability to maneuver. Not only does the Taiji body adjust to changes in load, but, more significantly, it is also extremely sensitive to subtle load changes in the balance.

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

The arduous training process of *fangsong* to settle the Qi in the Dantian is continually infusing the body with the principle of balance in ever greater refinement. This cultivates the sensitivity of feather-weight changes critical to maintaining the advantage of martial functionality in balance. Accorded with this feather-weight sensitivity, the subtle responses of the Taiji body are almost undetectable, or magically invisible, while the same sensitivity can decipher an opponent's slightest change in motion, as conveyed in the verse: People cannot gauge me, but I can read them (*Ren buzhi wo, wo du zhi ren* 人不知我, 我独知人).

The body comprehension of *jin* is also consolidating the feather-weight sensitivity in the dynamics of gang and *rou* in the refinement process. Thus, as the Taiji expert ascends the rarefied heights of mastery, he can find no one to match his skills: Such heroes produced can find no peers, forged thus by these principles! (*Yingxiong suoxiangwudi, gai jie you ci er ji ye*英雄所向无敌, 盖皆由此而及也!).

6. Touting the Superiority of the Art of Taijiquan

Uncharacteristic of the Chinese culture of humility, the next few verses tout the superiority of the art of Taijiquan. Taijiquan regards itself as standing above the other martial arts systems, which it critiques as relying primarily on the advantages of superior strength and speed to prevail.

Branches of martial arts abound; they may differ in characteristics,

Most are about the strong subduing the weak, and the slow yielding to the fast!

A stronger force beating a weaker, a slower hand losing to a faster,

These are of the natural order, not from innovative mechanics!

斯技旁门甚多，虽势有区别，
概不外乎壮欺弱、慢让快耳！
有力打无力，手慢让手快，
是皆先天自然之能，
非关学力而有为也！

The charm of Taijiquan is that it offers a way to overcome the shortcomings of being weaker or slower to defeat one who is stronger and faster. This is borne out in the much touted Taiji skill of “four ounces repelling a thousand pounds” which is most demonstrative that superior strength is not the only deciding factor in winning. The verse after describes the situation of Taijiquan elderlies beating back a besieging crowd; the oldies are clearly not as fast or as strong.

Four ounces repel a thousand pounds” shows not only strength can win!

Witness elderlies driving back a throng, where is the speed advantage?

察四两拨千斤之句，显非力胜！
观耄耋御众之形,快何能为?

We, of course, can attribute to the mechanics of lever, the skill of these martial feats. However, to move a thousand pounds placed at 3 inches from a fulcrum with 4 ounces, the lever arm would have to be over 1000 feet! Our anatomy is too constrained to effect such a setup. Still, the reference in the verse is not meant to be metaphorical either, but to highlight a Taiji Kungfu skill of the highest order.

The leverage applied is not linear, but rather like the torque of a screwdriver. If you held the handle, while the opponent holds the tip, no matter how great his strength, you could control the dynamics with little effort. The key is to exert control of the *kua* as the handle of a screwdriver. With the leverage, the torque generated at the *kua* can easily overcome a grip on your arm. Also, by turning minutely at the *kua*, you can divert the pressure away from the body. This involves the body's rotational motion, which is disciplined in the practice of “silk-reeling” motion or *chansigong* (缠丝功).[9]

Speed may not be the only deciding factor, but at the normal range of fighting, speed is of critical advantage in delivery. The strikes of the fist, or foot can come from unexpected angles. So, speed is also critical in defense. However, the advantage of speed is diminished in close quarters, which limit the

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

extension of the limbs. The swiftest speed of the fist or foot at delivery is reached only through full extension. In situations when fighters are grappling, the advantage of speed is blunted. Moreover, the Taiji body has the advantage of *dongjin*, the comprehension of *jin,* which can decipher the opponent's relative speed in motion and intercept a faster hand at a point on the arm with lesser speed.

However, this by no means implies invincibility. The sacrosanct belief of Taiji's superiority was given a rude awakening when a MMA fighter floored a self-styled Taijiquan master in a matter of seconds. The fighter's fast punch easily found its way to the head of the so-called Taiji master![10] Great theory is one thing, but comprehensive mastery is quite another. The mastery of *dongjin* is an experiential development of the Yin-Yang art.

7. Double-weightedness and Yin-Yang

Stand poised in balance, ever-ready, lively as a wheel.

Yield and sink to follow, "double-weightedness" will stagnate.

Often, after years of dedication, still unable to neutralize

Rather, be controlled by others; the flaw is "double-weightedness."

立如枰准备，活似车轮。
偏沉则随，双重则滞。
每见数年纯功，不能运化者，
率皆自为人制，双重之病未悟耳。

This verse directs focus on the experiential insight of *dongjin*. The Taiji body ingrained with *dongjin,* is grounded in Yin-Yang balance. It is ever-ready to respond to any situation with the liveliness of the dynamics of *rou* and gang. However, as seemingly in balance as one may be, if one responds to an incoming force with force, such as pushing back when pushed, as is commonly the case, the outcome will likely be unfavorable, if one is physically weaker. The reaction of responding with force against force (*yong li ding kang*用力顶抗) in martial application poses the greatest challenge to overcome.

The reaction of force-against-force creates a double-force condition of "double-weightedness," referred to as *shuangzhong* 双重, which locks up the body-frame from effecting change in functional maneuverability. Body motion stagnates as a result of double-weightedness from the response of force-against-force.

The Taiji body with *dongjin* avoids such a response but rather calls on the *rou*-softness to yield to the incoming force and absorb the impact. To do so, the body maneuvers its postural setup to receive the force at an appropriate angle. At the same time, it accesses *gang jin* to maintain postural support. In this way, *dongjin* enables the body to "sink and follow" (pian chen ze sui 偏沉则随), thus neutralizing the force and avoiding the flaw of becoming double-weighted.

Unless double-weightedness is avoided, body motion will stagnate, and one will be vulnerable. That is why, even after years of dedication of practice, one may still be unable to effect postural changes to neutralize, and end up being controlled instead. The problem is that the flaw of double-weightedness is not yet grasped. The next stanza of verses offers a solution for the illness of double-weightedness.

To avoid this illness, comprehend Yin and Yang

To adhere is to walk-follow, to walk-follow is to adhere,

Yang does not leave Yin, Yin does not leave Yang. Yin and Yang mutually in aid, then comprehension of *jin* is achieved.

欲避此病，须知阴阳。
粘即是走，走即是粘，
阳不离阴，阴不离阳，
阴阳相济，方为懂劲。

With no science to turn to, Taijiquan could only resort to the soft logic of Yin and Yang to find a solution to the illness of double-weightedness. Double-weightedness is a breakdown of the dynamics of rou

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

and gang, caused by an infraction of the Yin-Yang principles. So, the remedy is to study and know Yin and Yang.

Yin and Yang are very subtle in manifestation. For instance, zhan-adhere (*zhan* 粘) and walk-follow (*zou* 走), discussed earlier, refer to different actions, but we find that, functionally, "*zhan is zou, and zou is zhan" (Zhan ji shi zou, zou ji shi zhan*粘即是走，走即是粘). Both the actions of zhan and zou are facilitated by *dongjin*, inspired by Yin and Yang. Both zhan and zou rely on *rou jin*. If you cannot use zou to neutralize, zhan will fail; if you cannot zhan, zou will not be effective.

The Yin-Yang principles are represented in the Taiji Diagram (Fig. 1): Yin does not separate from Yang, and Yang does not separate from Yin; in Yin there is Yang, and in Yang there is Yin; Yin and Yang mutually aid each other. These principles are infused in dongjin manifested as rou and gang: Rou and gang of jin are not separate; in rou there is gang, and in gang there is rou; rou and gang are mutually in aid of each other. They apply aptly to the vector quantities of magnitude (gang) and direction (rou), of force, which the body can relate to. They empower dongjin's role in balance and the liveliness of change via the dynamics of gang and rou that cure the flaw of double-weightedness. This forms the biomechanical rationale of Taijiquan's continual and mindful process of maturing and refining dongjin, the body comprehension of *jin*.

8. Art of Self-cultivation

Once you grasp *jin*, the more you train, the more refined it will be.

Contemplate and study, gradually the body will do as you wish.

Give up self to follow, avoid erring in the near, the goal is distant.

It is said, a minute error can cascade to a miss by a thousand miles.

Students must not fail to make this fine distinction! This is the Theory.

懂劲后，愈练愈精.
默识揣摩，渐至从心所欲。
本是舍已从人，多误舍近求远，
所谓差之毫厘，谬之千里，
学者不可不详辨焉！是为论。

Unfortunately, there are no gauge that can read Yin and Yang as they manifest in the rou and gang of jin. The comprehension of jin and jin dynamics are cognized by Qi sensations. The Qi cognition is grounded on factors of functionality, so, despite lacking in scientific precision, it is practical and can be applied with increasing reliability by feedback with increasing refinement. Thus, one can study, investigate, and contemplate both the Yin-Yang theory and its manifestation in jin on the musculoskeletal framework as one progresses developmentally (*mo shi chuai mo* 默识揣摩).

The theory of yielding, not fighting with force-against-force, is not motivated by the humility of turning one's cheek. Taiji Kungfu fighting is underscored by the strategy of "giving up self to follow" (*she ji cong ren* 舍已从人) which is to harmonize with the opponent's motion based on Yin and Yang balance. This shores up the body's ever-readiness to maneuver at will and take timely advantage whenever an opportunity arises in combat.

Since the body's balance and liveliness of change are manifestations of Yin-Yang balance, the path to mastery is one of instilling the body with the Yin-Yang principles. This is necessarily an experiential Kungfu process of time and effort. Thus, Taijiquan is an art of self-cultivation not just a physical drill. Namely, one must keep doing form practice, to inspire the postural transformations by *dongjin* to be in accord with Yin-Yang balance, see Fig. 2.

However, one is likely to encounter many mistakes in the journey of mastering the comprehension of *jin*. One may be misguided by the gratification of muscle force and veer off course from the goal of Yin-Yang balance. The common mistake is that one shortchanges or sacrifices the basics, and fails to avoid the many errors at the initial phases of training in the quest of mastery, where the goal is distant (duo wu she

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

jin qiu yuan 多误舍近求远). A dire warning to the Taiji seeker is in the saying: A minute error can cause a miss "by a thousand miles." (Suo wei cha zhi haoli, miu zhi qianli 所谓差之毫厘谬之千里). A minute error in initiating the mechanics at the triangle of joints can amplify through the myriad joints of the body to a huge error in jin transmission to the extremity. However, dongjin and the Taiji fangsong methodology provide an insurance that maintains adherence to the Yin-Yang principles. Additionally, the motor neural system also ensures that we maintain our bipedal functionality. Nevertheless, in Chaos Theory, we have the unpredictable phenomenon of the butterfly effect, The fluttering of a butterfly can cause a Tornado on the other side of the world[11], which turns out to be an old Chinese proverb, Hudie xiaoying liansuo (蝴蝶效應，連鎖反應). The drastic differences in the form's appearance in the different schools of Taijiquan may just be caused by the butterfly effect along the transmission line. Forms can still differ while abiding by the Yin-Yang priniciples, as illustrated by the butterfly effect on pattern formations following the same rules in the Veritasium video.[12] Taijiquan motion is not based on form appearance only. As long as the motion is in accord with the Yin-Yang principles, the force that arises will be jin, of the right force vector.

Fig. 2 A Taijiquan posture, poised in *fangsong* balance between the tensile forces of the muslces, tendons, ligaments, and fascia, and the external force of gravity. Form practice is a self-cultivation process to keep inspiring postural transformations by *dongjin* to be in accord with Yin-Yang balance.

9. Conclusion

Although we have reviewed the central concept of *dongjin* from the perspective of biomechanics, and related the *gang* and *rou* of *jin* to the vector values of the associated force, they are, nevertheless, not scientific constructs, as they incorporate aspects of functionality in application. We do not calculate the forces that move the hand to touch the nose, like we compute the planetary trajectories from differential equations derived from gravitational forces. Although the muscle forces that generate body motion, too, obey Newton's Laws of Motion, the hand's motion involves many skeletal muscles, each made up of contractile subunits. These forces cannot be expressed in terms of computable variables, unlike gravitational forces which depend only on the distances between the planets. Moreover, we do not relate directly to the muscle forces. We do not connect to the biceps or triceps per se. That is why body motion is not studied by the classical formulations of Newtonian mechanics.

The Taiji solution relies on what the body can sense or relate to, namely, on the concept of *dongjin* by the formulation of *gang* and *rou*, and on Qi-cognition to resolve postural balances based on the non-axiomatic soft logic of Yin and Yang. This is the prescription of nurturing Qi that resolves imbalances, which process is distilled to sinking the Qi to the Dantian. Amazingly, the very practice carves a solution-path that leads to Yin-Yang balance, generating the ideal motion of Taijiquan. The upshot is that the response that ensues from the ideal Taiji motion is of the right force vector in application. The *jin-force* itself arises from the ideal motion by virtue of Newton's laws and of Yin-Yang balance.

However, the practice of Taijiquan today is motivated more for its health and therapeutic efficacy. In Traditional Chinese Medicine, a measure of health well-being is a good store of Qi in circulation. Indeed, the Taiji methodology draws on the Qi energetics of

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

the ancient art of *daoyin tuna*, which promotes the Qi harmony of the "Five Internal Organs" (*Wuzang*). We find the harmonizing effects of Qi permeating via the body-wide fascial tensional network, which envelops all the internal organs. Taiji practice, then, contributes to the homeostasis of the body's organ systems, the passport to health. For an overview of Taiji health, see the NIH Fact Sheet.[13]

Finally, it is noted that the practice of Taijiquan is more than a physical exercise. The self-cultivation process embodies a meditation component. The operation of *fangsong-relaxation* that resolves imbalances entails attentiveness to the practice, hence the slow-motion methodology. The attentiveness keeps the mind from wandering to stay in focus, and to sharpen in refinement. The meditation component develops mindfulness and tranquility that ascends to spiritual clarity and insight (*shenming* 神明).

Appendix

Wang Zongyue Taijiquan Discourse
朗读王宗岳《太极拳论》

1.
太极者，无极而生，动静之机，阴阳之母也。
Tàijí zhě, wújí ér shēng, dòngjìng zhī jī, yīnyáng zhī mǔ yě.
动之则分，静之则合。
Dòng zhī zé fēn, jìng zhī zé hé.
无过不及，随曲就伸。
Wúguò bu jí, suí qū jiù shēn.
2.
人刚我柔谓之走，我顺人背谓之粘。
Rén gāng wǒ róu wèi zhī zǒu, wǒ shùn rén bèi wèi zhī zhān.
动急则急应，动缓则缓随。
Dòng jí zé jí yīng, dòng huǎn zé huǎn suí.
虽变化万端，而理唯一贯。
Suī biànhuà wànduān, ér lǐ wéi yīguàn.
由着熟而渐悟懂劲，由懂劲而阶及神明。
Yóuzhe shú ér jiànwù dǒng jìn, yóu dǒng jìn ér jiē jí shénmíng.
然非用力之久，不能豁然贯通焉。
Rán fēi yònglì zhī jiǔ, bùnéng huòrán guàntōng yān.
3.
虚领顶劲，气沉丹田.
Xū lǐng dǐng jìn, qì chén dāntián.
4.
不偏不倚，忽隐忽现。
bùpiān bù yǐ, hū yǐn hū xiàn.
左重则左虚，右重则右杳。
Zuǒ zhòng zé zuǒ xū, yòu zhòng zé yòu yǎo.
仰之则弥高，俯之则弥深。
Yǎng zhī zé mígāo, fǔ zhī zé mí shēn.
进之则愈长，退之则愈促。
Jìn zhī zé yù zhǎng, tuì zhī zé yù cù.
5.
一羽不能加，蝇虫不能落。
Yī yǔ bùnéng jiā, yíng chóng bùnéng luò.
人不知我，我独知人。
Rén bùzhī wǒ, wǒ dú zhīrén.
英雄所向无敌，盖皆由此而及也！

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

Yīngxióng suǒxiàngwúdí, gài jiē yóu cǐ ér jí yě!
6.
斯技旁门甚多，虽势有区别，
Sī jì pángmén shén duō, suī shì yǒu qūbié,
概不外乎壮欺弱、慢让快耳，
gài bù wài hū zhuàng qī ruò, màn ràng kuài ěr,
有力打无力，手慢让手快，
yǒulì dǎ wúlì, shǒumàn ràng shǒukuài,
是皆先天自然之能，非关学力而有为也。
shì jiē xiāntiān zìrán zhī néng, fēi guān xuélì ér yǒu wéi yě.
察四两拨千斤之句，显非力胜！
Chá sìliǎngbōqiānjīn zhī jù, xiǎn fēilì shèng!
观耄耋御众之形，快何能为？
Guān màodié yù zhòng zhī xíng, kuài hé néng wéi?
7.
立如枰准备，活似车轮，
Lì rú píng zhǔnbèi, huó shì chēlún,
偏沉则随，双重则滞。
piān chén zé suí, shuāngchóng zé zhì.
每见数年纯功，不能运化者，
Měi jiàn shù nián chún gōng, bùnéng yùn huà zhě,
率皆自为人制，双重之病未悟耳。
lǜ jiē zì wéirén zhì, shuāng chóng zhī bìng wèi wù ěr.
欲避此病，须知阴阳，
Yù bì cǐ bìng, xūzhī yīnyáng,
粘即是走，走即是粘，
zhān jí shì zǒu, zǒu jí shì zhān,
阳不离阴，阴不离阳，
yáng bùlí yīn, yīn bùlí yáng,
阴阳相济，方为懂劲。
yīnyáng xiāng jì, fāng wéi dǒng jìn.
8.
懂劲后，愈练愈精，
Dǒng jìn hòu yù liàn yù jīng,
默识揣摩，渐至从心所欲。
mò shí chuǎimó, jiàn zhì cóngxīnsuǒyù.
本是舍已从人，多误舍近求远，
Běn shì shě jǐ cóng rén, duō wù shějìnqiúyuǎn,
所谓差之毫厘，谬之千里，
suǒwèi chà zhī háolí, miù zhī qiānlǐ,
学者不可不详辨焉！是为论。
xuézhě bùkě bùxiáng biàn yān! Shì wèi lùn.

DOI: 10.57612/2022.JTS.01.04

Vol.1 Iss.1 / June / 2022
Digital Edition: ISSN 2832- 062X
Print Edition : ISSN 2832-0611

References

1. Ong, C.P. Science in Qi. 2021 Journal of Integrative Medicine, Vol 10, Issue 1, Jun 2021. DOI: https://doi.org/10.30564/jim.v10i1.3220 https://ojs.bilpublishing.com/index.php/jim/article/view/3220/pdf

2. Ong, C.P. A Scientific Perspective of the Three Harmony Principle of Taijiquan. 2022 Journal of Integrative Medicine, Vol 11, Issue 1, 2022. DOI: https://doi.org/10.30564/jim.v11i1.4654. https://ojs.bilpublishing.com/index.php/jim/article/view/4654

3. Ong, C.P. Healthcare and Sports from the Perspective of Qi, Fascia, and Taijiquan. 2021 Journal of Integrative Medicine https://ojs.bilpublishing.com/index.php/jim/article/view/3365/pdf

4. Ong, C.P. Spinal Engine & Waist Power from Taijiquan Viewpoint. J Integrative Med Ther. 2017;4(1): 12 http://www.avensonline.org/wp-content/uploads/JIMT-2378-1343-04-0014.pdf

5. Vleeming, A et al. "The sacroiliac joint: an overview of its anatomy, function and potential clinical implications." *Journal of anatomy* vol. 221,6 (2012): 537-67. doi:10.1111/j.1469-7580.2012.01564.x https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3512279/

6. Ong, C.P. A Scientific Perspective of the Three Harmony Principle of Taijiquan. 2022 Journal of Integrative Medicine, Vol 11, Issue 1, 2022. DOI: https://doi.org/10.30564/jim.v11i1.4654.

7. Ong, C.P. The Central Status of the Dantian. T'ai Chi. Vol. 40. No 1. Spring 2016. https://www.researchgate.net/publication/352371744_The_Central_Status_of_the_Dantian

8. Miyoko Shida-Rigolo. Sanddorn Balance of a feather. https://www.youtube.com/watch?v=-KVPA-9hofw

9. Ong, C.P. Taijiquan: Cultivating inner strength. (2013) ISBN-13: 978-0615874074 (Bagua Press, USA.). Chap 8 p. 193. www.cpTaiji.com

10. Ong, C.P. Is Taijiquan a martial art or a dance. Life Research. Jan 2019, vol 2, No 1. DOI: 10.12032/life2019-0125-006. https://www.tmrjournals.com/public/articlePDF/20201130/4203c45478308f929b5e6512bb778a8f.pdf

11. The Butterfly Effect, Quote attributed to Edward Norton Lorenz, 1972

12. Veritasium. The Science of the Butterfly Effect. Dec 6 2019. https://www.youtube.com/watch?v=fDek6cYijxI&t=103s

13. National Center for Complementary and Integrative Health (NIH). Tai Chi, What you need to know. https://www.nccih.nih.gov/health/tai-chi-what-you-need-to-know

DOI: 10.57612/2022.JTS.01.04