

## **THE SALIENT SOURCES OF CHINESE YIN-YANG BALANCE: *Toward a Mind-Language-Brain Meta-hypothesis***

### ***Introduction***

It is increasingly accepted that reality consists of diverse elements, with many as *real opposites* (1). However, possibly due to the dual-hemispheric structure of the brain related to our bipedal body (2), we have a tendency to *polarize* all real opposites into simplified pairs of *mental opposites* to reduce the complexity of their relationships via a spatial or temporary *separation* (3), but they tend to be so simplified that they distort reality beyond recognition (4). It is our assumption that polarization results in *mental contradictions* or paradoxes if we apply the simplified mental opposites to the complex real opposites and if we conceptualize real opposites with wrong mental opposites. Hence, a specific frame of thinking as part of epistemology is required to manage contradictions. We define *frame of thinking* as a process and pattern of higher-order cognition (e.g., concept-formation and inference) in contrast to the lower-order cognition (e.g., perception and attention) (5). Based on this definition, we identify three most basic frames of thinking in the world. The first is a mechanistic frame for an absolute separation of opposites to deny and avoid contradictions (i.e., Aristotle's formal logic of either-or). The second is an ambiguous frame with a mixed approach to the opposites via a temporary tolerance of contradiction, but an ultimate solution of contradiction (i.e., Hegel's dialectical process of "both-or"). The third is an organic frame for a relative separation of opposites to appreciate and accommodate contradiction (i.e., Yin-Yang Balance of "either-and"). Among the three frames of thinking, the first has historically been the prevailing one in the West, and the second has remained marginalized in the West, but the third has been virtually ignored in the West (see the more recent research by Nisbett and colleagues for the rare exception, 6).

Taking the research by Nisbett and colleagues as the point of departure, our purpose here is to explore the salient sources of Yin-Yang Balance as a legitimate frame of thinking, and also its potential to complement and integrate with the Western frames into a *geocentric meta-frame*, especially given its

possible causal link with the duality (both separation and integration) of whole-brain function via the mediation of unique Chinese language beyond the dualism (only separation) of part-brain function in the West due to alphabetic languages. We seek to contribute by framing a mind-language-brain model as an explanation and application of Yin-Yang Balance, and treating the model as an *interdisciplinary meta-hypothesis* toward a greater integration of natural sciences and social studies. Our contribution can be best illustrated by the *brain* as a metaphor of Yin-Yang Balance given the dual-hemispheric structure (i.e., brain asymmetry with inter-hemispheric inhibition), whole-brain function (i.e., brain complementarity with inter-hemispheric connectivity), and plastic paradox (i.e., potential and difficulty of brain changes).

### ***Yin-Yang Balance as the Chinese Frame of Thinking***

Yin-Yang Balance, as formally stated in the *I Ching* (the Book of Changes) lies at the root of Chinese philosophies shared by all schools in Chinese history, including Confucianism, Taoism, and other schools, and Yin-Yang Balance has the biggest influence on the scholars in the West (7). Yin-Yang Balance derives from the Chinese philosophical ontology and epistemology (6, 7). As ontology, it assumes ontological reality as interdependent, interactive and interpenetrative, while it attempts, as epistemology, to make sense of these three ontological natures within a holistic, dynamic and duality frame of thinking (8). In this article, we focus on the epistemological sub-system of Yin-Yang Balance as a legitimate frame of thinking with valid scientific qualifications, especially potent for scientifically explaining complex phenomena, as showcased by several prominent figures in the scientific history in the West (e.g., Leibniz, Jung, and Bohr) as well as evidenced by the great advances in both science and technology in the history of China before the Western modernization around the end of the 16<sup>th</sup> century (9). The most striking distinctions between Yin-Yang Balance and Western frames are embodied in the field of medicine (e.g., the “five-phase” concept and acupuncture practice in Chinese medicine) (10).

Yin-Yang Balance is unique as an open system to accommodate a balance between the “either-or” (Aristotle’s logic frame) and “both-or” (Hegel’s dialectical frame) frames. Specifically, Yin-Yang

Balance differs from the Western frames in the sense that the former does not regard contradictions as problems, but as the natural or organic (thus inevitable and desirable) results of a complex interaction between mind (epistemology) and reality (ontology). It treats contradictions as *permanent yet relative* (i.e., not absolutely mutually exclusive), like the two sides of the same coin at the same level. In this sense, contradictions are never resolvable, whether at the higher level or the same level (6-8). Highly distinctive from the either-or and “both-or” frames, Yin-Yang Balance emphasizes completeness at the expense of temporary, but not ultimate, consistency, with all mental opposites as permanently balanced in continuous continuums. In other words, Yin-Yang Balance fully appreciates and accommodates the existence of contradiction, thus apparently incompatible with the two Western frames.

In general, *relative term* is the most central to the unique value of Yin-Yang Balance as duality in contrast to dualism. In this sense, dualism is problematic because it is an absolute construct, while “dualism” in a relative term transforms itself into duality. For example, the central distinction between Yin-Yang Balance and Hegel’s dialectic frame lies in their different treatments of contradictions. Yin-Yang Balance embraces contradictions as permanently necessary because they are not only conflicting but also complementary both spatially and temporally (i.e., permanent yet relative contradiction), while Hegel’s dialectic frame treats contradictions as temporarily necessary because they must be ultimately resolved (i.e., temporarily complementary but ultimately conflicting, thus the need for *sublation*), so it is ultimately consistent with Aristotle’s either-or frame (6-8). Consequently, Yin-Yang Balance is the sole frame of thinking available in the world to fully appreciate and accommodate contradictions.

### ***The Salient Sources of Yin-Yang Balance***

Even though multiple factors may give rise to Yin-Yang Balance originally and continuously, we focus on two most salient ones. We posit that the indigenous philosophy and language in China, historically and at present time, are directly responsible for the birth and growth of Yin-Yang Balance, with these two factors as both proximal contexts and mechanisms for Yin-Yang Balance in China. First, Yin-Yang Balance is rooted in the Chinese philosophical tradition shared among all schools of thoughts

in China (7). This philosophical root has been reflected in the Chinese cognitive processes, historically and at present time (6-8). We regard the Chinese philosophy as the primary salient source of Yin-Yang Balance, rather than the historical social context in general and agricultural society in particular or the cultural value in general and collectivist value in particular (6).

The above view is rooted in five premises. The first is that the most salient sources have to be unique to China so that they can explain the indigenous origin of Yin-Yang Balance. In this respect, either agriculture or collectivism, as compared to philosophy, is too generic and universal to be the indigenous source of Yin-Yang Balance. The second is that the most salient sources must explain not only the initial birth but also the later growth of Yin-Yang Balance. In this respect, while historical context (agriculture) may explain the initial birth but not the later growth, cultural value (collectivism) would explain the later growth but not the initial birth of Yin-Yang Balance. In contrast, given the inherent overlap between philosophy and thinking, philosophy is able to explain both birth and growth of thinking frame. The third is that the most salient sources should have the proper scope to explain Yin-Yang Balance. In this respect, both historical context and cultural value are too broad in scope, while both agriculture and collectivism are too narrow. In contrast, given its open-ended flexible scope, philosophy is well positioned to cover Yin-Yang Balance. The fourth is that the most salient sources must be the most directly causal to thinking frame, even though all factors can be reciprocally related in a recursive process, rather than a linear pattern (another “chicken-egg” issue). In this respect, historical context is indirectly causal to thinking frame (with philosophy as the mediator), while cultural value is more likely to be determined by thinking frame rather than the other way around. The fifth is that there must be concrete evidence to support major claims. In this respect, there is little evidence beyond some speculations for the role of collectivism or agriculture (6). In contrast, we can find the direct evidence for the role of philosophy (7). Based on the above five premises, we regard Chinese philosophy, rather than cultural value (collectivism) or historical context (agriculture), as the salient source of Yin-Yang Balance.

The second salient source of Yin-Yang Balance is Chinese language, especially its unique tone in its oral form and unique compound structure in its written form, with the logographic radical on the left side of compound word, but the phonetic portion on the right side of the same word (11). Further, it has been widely recognized that Chinese language is rich in images and metaphors relative to abstract constructs, which in the West is directly related to alphabetic languages. Hence, many Western scholars refer to Chinese frame of thinking as “correlative thinking” (12). We reframe “correlative thinking” in terms of a holistic, dynamic and duality frame of thinking with two unique features: its cognitive focus on a balance of analogy and intuition, and its linguistic focus on a balance of metaphor and construct. This reframed “correlative thinking” resembles the alleged “female” pattern of whole-brain thinking by tapping both hemispheres of the brain, in contrast to the alleged “male” pattern of part-brain thinking in the West dominated by the left hemisphere (13). There is growing evidence that the Chinese of either gender tend to activate both hemispheres of their brains, primarily due to the unique nature of Chinese language as the only major non-alphabetic language in the world (14). This is in sharp contrast to all alphabetic languages, which have initiated and reinforced the dominance of the left hemisphere in the West (15). Our argument is consistent with the evidence of brain asymmetries that the left hemisphere is primarily verbal, focal, and analytic, while the right hemisphere is largely non-verbal, diffuse, and holistic (2). Finally, Chinese language is full of contradictory phrases and proverbs (6-7), most likely to be both the cause and effect of Yin-Yang Balance. Hence, we take Chinese language as the other most salient source of Yin-Yang Balance to complement the primary source of Chinese philosophy. In this sense, the frame of Yin-Yang Balance is expected to associate with the whole-brain function among the Chinese, which is, in turn, related to the Chinese language toward a mind-language-brain causal chain.

The above view is rooted in two premises concerning the role of language. The first premise is that language is the most salient mechanism for passing on cultural heritage through generations since language is the carrier or media of both culture and cognition (16). This explains the cultural distinction in frame of thinking. The second premise is that language can be learned, rather than being genetic in

nature (17), but it is not always easy to learn, especially after the critical period as the best window of opportunity. This time-sensitive feature of language is similar to that of the brain, referred to as brain plasticity. *Brain plasticity* refers to the capability of the brain to rewire after an intensive use of certain parts of the brain for particular activities, including the so-called “signature activities” of culture, such as language learning and thinking frame (18). In other words, language and the brain share the same character that they are neither genetically fixed nor freely transformable. This is another key “nature-nurture” issue. In this sense, we take issue with either the claim that cognitive difference is genetically determined or the view that cognitive difference is only situational as instant responses to momentarily salient priming cues (19). Regarding the later view, we posit that *cultural malleability* in any aspects, including its cognitive component, is at best relative rather than absolute, similar to brain plasticity. Consistent with Yin-Yang Balance, our perspective can shed light on the “*plastic paradox*” that the same neuroplastic properties that make the brain more flexible also make the brain more rigid (18).

Finally, to extend the above discussion, we propose that there is a possible link between whole-brain function as the micro-level cognitive process (primarily related to neuroscience, thus brain) and Yin-Yang Balance as the macro-level cognitive process (primarily related to philosophy, thus mind), with non-alphabet language as the meso-level mediator between brain and mind. We also posit that there may be a reciprocally causal chain between thinking frame (the central element of the mind) and brain function (the central element of the brain), also with language as the mediator. We term this the *meta-hypothesis of mind-language-brain model*. There is growing evidence in support of our proposed meta-hypothesis beyond the general recognition that the emergence of language is a critical milestone in the evolution of brain asymmetry. For instance, we may reframe the split fovea theory as primarily for logographic languages (e.g., Chinese characters), while applying the bilateral projection theory to alphabetic languages (20). It is also evident that the size of corpus callosum, which is the fiber tract to connect the two hemispheres, is related to academic performance in language learning, and the brain asymmetry seems related negatively with the anatomical connectivity between the brain hemispheres;

the right-handers tend to have a smaller corpus callosum than the mixed-handers, but this correlation is only for men rather than women (21). It is worth noting that musicians happen to be similar to the case of mixed-handers. Even though the corpus callosum of musicians is generally larger than that of non-musicians, this effect only occurs for men but not for women (22). The two puzzles regarding the sex effect on handedness and musicianship may be explained by the possibility that women have already benefited from their natural whole-brain capacity for language, thus no need for the nurturing role of handedness and musicianship (13). Another possible explanation lies in the duality nature of corpus callosum to both facilitate and inhibit inter-connectivity (2). Hence, it is of great interest to test if the Chinese have a larger corpus callosum than that of Westerners, given the impact of Chinese language on whole-brain function, similar to the *nurtured effect* of mixed-handedness and musicianship on males in contrast to the natural whole-brain function of females. Further, we may propose that the effect of Chinese language on whole-brain function should be greater than mixed-handedness or musicianship because Chinese language (both written and spoken forms) would enhance the cognitive and visual capabilities of the brain beyond those motor or auditory functions associated with mixed-handedness or musicianship (14).

As we posit that philosophy “pulls” and language “pushes” the brain toward a certain frame of thinking, it is likely that the ancient Chinese might have deliberately chosen to adopt and continue their original “correlative thinking” in the form of a unique language because of their convictions regarding natural ontology (i.e., interdependent, interactive and interpenetrative reality) and organic epistemology (i.e., holistic, dynamic, and duality cognition) (6-8). This view can be best illustrated by the traditional Chinese medicine in contrast to Western modern medicine (10). The above two propositions suggest a meta-hypothesis concerning the mind-language-brain causal chain, which is interdisciplinary in nature. Specifically, we propose that unique philosophy and language have the greatest potential to “wire” the brain to a particular cultural pattern because the two are the most salient cognitive processes and tools to tune the brain.

With philosophy as the primary source and language as the secondary source of thinking frame, Chinese philosophy is necessary and sufficient for the development of Yin-Yang Balance inside China, but Chinese language is only necessary but insufficient; further, Chinese language is neither necessary nor sufficient for those non-Chinese to adopt Yin-Yang Balance, as shown in the cases of Leibniz, Jung and Bohr. Our view regarding the distinction between whole-brain and part-brain functions differs from the alleged distinctions in the brain structure and function between male and female. While the former distinction is largely cultural or social, the latter is genetic or biological. Hence, we take issue with the argument that thinking frame is genetic or biological in nature. We speculate that a genius may adopt a new frame of thinking without the need to learn the related language, but an average person can benefit from learning the language related to the foreign frame of thinking. Several studies have shown that native English speakers can activate both hemispheres of their brains when reading the Chinese after learning the language, thus in support of the emerging view regarding brain plasticity (17). Consistent with Yin-Yang Balance, we stress that brain plasticity and cultural malleability should be understood in relative, rather than absolute, terms.

### ***The Geocentric Future of Yin-Yang Balance***

Consistent with our central assumption that polarization tend to result in mental contradictions, especially in the context of complex reality, we posit that the thinking frames in the West (Aristotle's either-or and Hegel's both-or) are ill-equipped for effectively managing today's complexities, while Yin-Yang Balance is best positioned to meet the challenges of today and future. It is worth noting that Yin-Yang Balance had been highly effective before the end of the 16<sup>th</sup> Century since the ractical nature of Yin-Yang Balance was adequate for the organic complexity (which required imprecise conceptions and measures) in the *pre-modern era*, but it was definitely inadequate for the mechanistic complexity (which required precise conceptions and measures) in the *modern era* from the start of the 17<sup>th</sup> Century (4, 23). We believe that the world is entering a distinctive "*trans-modern*" era with organic complexity at the macro level and mechanistic complexity at the micro level. The path-dependent trajectories in the



evolution of philosophies and languages in the East and West have led to a mechanical, reductionist, abstract, verbal, focal, linear, and closed frame of thinking in the West (functions of the *left hemisphere* of the brain), but an organic, holistic, intuitive, nonverbal, contextual, nonlinear and open frame in the East (functions of the *right hemisphere* of the brain) (2, 8). In other words, the Western frame follows a top-down deductive process as dualism, but the Eastern frame adopts a bottom-up inductive process as duality (8). It is expected that each of the frames has both strengths and weaknesses, so neither alone is sufficient to manage all types of problems, similar to the notion that whole-brain function is better than part-brain function. The best option is to integrate the two frames of thinking in the East and West into a geocentric meta-frame, as we need both hemispheres of our brain to best meet the increasing complex world we face today and in the future (2). It is worth noting that the dual-processing model resembles the asymmetrical functions of the two brain hemispheres and also the two frames of thinking in the East and West, with System 1 for the right hemisphere in the Eastern frame of thinking, and System 2 for the left hemisphere in the Western frame of thinking (2, 5).

This geocentric perspective can shed light on the unresolved *Needham Puzzle*: Why was China so advanced in science and technology in the pre-modern era, but so backward in the modern era? (23). Yin-Yang Balance, related to China's unique language and whole-brain function, could be the key to this puzzle in the sense that Yin-Yang Balance was a proper frame of thinking for the pre-modern era when experience and intuition were salient, but not appropriate for the modern era when experiment and logic were central. The new puzzle is how we integrate Western frame with Eastern frame for the trans-modern era when both intuition and logic are expected to be equally critical, and their balance is necessarily required.

It is our central argument that, if the pre-modern era relied mostly on Yin-Yang balance, with the focus on nonverbal and organic intuition, and the modern era required the most mechanistic science based on the verbal and mechanistic logic of either-or (or the dialectical process of both-or), the "trans-modern" era will demand a balance between the mechanistic separation (via the means of analytic logic

in the left hemisphere of the brain) and the organic integration (via the means of holistic intuition in the right hemisphere of the brain). We have to stress that, while it has emphasized whole-brain function, the traditional version of Chinese Yin-Yang Balance appears much stronger at the right-hemispheric functions (e.g., intuitive and holistic) than its left-hemispheric functions (e.g., logical and analytic) as compared to the left-hemispheric dominance in the West (2, 14). This implies that none of the frames in the West and East is perfect, thus the need for a geocentric meta-frame via an integration of extant frames of thinking. This resembles the historical trajectory from the right-hemispheric function to the left-hemispheric function and finally back to the right-hemispheric function (2), thus an application of Yin-Yang Balance (8).

In this sense, the East can definitely learn from the West in terms of mechanistic and abstract logic required for analysis via precise conception and measure, while the West can also learn from the East in terms of organic and rich intuition required for syntheses via imprecise conception and measure. The final result of this integration and balance is a geocentric meta-frame, which we can still refer to as geocentric Yin-Yang Balance, with the Western frame as the building blocks, and the Eastern frame as the overall framework to assemble the building blocks. Hence, Yin-Yang Balance plays a special role in providing a new geocentric framework to accommodate both Western logic and Eastern intuition, consistent with the findings that the human brain in all cultures has both globally similar functions and locally unique functions (20). Our central theme poses an *interdisciplinary meta-hypothesis* in terms of a reciprocal causal chain between mind, language, and brain. This meta-hypothesis can shed light on the Needham Puzzle by treating language as the mediator between the mind and the brain (see Table 1 for details). It is our hypothesis that Chinese language, as based on both images and sounds in contrast the alphabetic in the West, as the essential “tuning” device for the brain, is responsible for Yin-Yang Balance as the dominant frame of thinking via the whole-brain function in China. In other words, at the meso level, language, especially its verbal and written versions, is able to connect genetic or biological elements at the micro level to social or cultural elements at the macro level.

It is worth noting that the geocentric integration will not be a *symmetrical* one with each side making an equal contribution to the final whole similar to the case of corporate merger. Rather, this integration will most likely resemble a corporate acquisition with Chinese Yin-Yang Balance as the “acquirer” and formal logic as the “acquiree”. There are two essential reasons for this asymmetrical acquisition. First, Yin-Yang Balance enjoys the potential to incorporate the Western logic, while the latter cannot incorporate the former. It is obvious that it is possible for duality (dominant in the East) to incorporate dualism (dominant in the West), but not for dualism to embrace duality. It is similar to the fact that whole-brain function (dominant in the East) can embrace part-brain function (dominant in the West), rather than the other way around. This is because that the right hemisphere (stronger in the East with its whole-brain function) appears to be aware of the important function and contribution of the left hemisphere, thus willing and able to embrace it, but the left hemisphere (dominant in the West) seems ignorant of the necessary function and contribution of the right hemisphere, thus attempting to reject it (2). This is also similar to the case for integrative medicine (dominant in the East) to absorb specialized medicine (dominant in the West), rather than the vice versa (24).

Second, this acquisition symbolizes the required, but much delayed, Chinese “Renaissance” and “Enlightenment”, so China as a latecomer can modernize so as to catch up with the early-movers in the West (23, 25). In other words, despite its ability to accommodate the Western logic, Yin-Yang Balance has its own limitations, thus a need for its integration with the Western logic. In essence, this West-East integration itself is an application of Yin-Yang Balance. The brain, given its dual-hemispheric structure (asymmetry with inter-hemispheric inhibition), its whole-brain function (complementarity with inter-hemispheric connectivity), and its plastic paradox (potential and difficulty of brain changes) is perhaps the best metaphor of Yin-Yang Balance, especially its new geocentric version that can be built on its traditional Chinese version. For instance, it is evident that the brain will have an optimal performance when its hemispheres engage in specialized processes that are *both complementary and contradictory*,

such as visualizing both global contour (a specialty of right hemisphere) and local detail (a specialty of left hemisphere) (20).

Finally, a geocentric integration requires both the West and East to be open-minded as shown by the cases of Leibniz, Jung and Bohr. One of the most promising research areas to start this process would be cross-cultural research on the patterns of whole-brain and part-brain functions, especially the possible link between Yin-Yang Balance and whole-brain function via the mediating effect of Chinese language. On this issue, neuroscience can shed valuable light, especially on the culture-brain link in relation to the nature-nurture debate and the bridge between natural sciences and social studies, which is represented by the emerging field of *cultural neuroscience* (26). A practical field with the greatest potential to facilitate a geocentric integration is *medicine*, where cross-fertilization between the Eastern and Western medical traditions may lead to a geocentric medicine with new light on the age-old debate over mind-brain duality and whole-part duality. They are some cases of potentially endless applications of geocentric Yin-Yang Balance beyond the confines of Chinese culture since Yin-Yan Balance has the unique capability to turn almost all debates into dualities rather than dualisms. Finally, we highlight the value of language learning for developing a geocentric Yin-Yang Balance. A practical implication is a unique advantage of learning the Chinese language to facilitate whole-brain function (17).

In conclusion, we have argued that Yin-Yang Balance, as a legitimate frame of thinking in the East, has two unique values. First, it is the sole frame capable of appreciating and accommodating all contradictions. Second, it is the only frame capable of incorporating other systems. To best illustrate the above points, the brain can be the best metaphor of Yin-Yang Balance. Tied to both the mind and the brain, language can be an effective mechanism to facilitate the development of geocentric meta-frame with Yin-Yang Balance as its core. To that end, we must address the interdisciplinary meta-hypothesis regarding the mind-language-brain chain with language as the key mediator between the genetic or biological elements at the micro level (the primary domain of natural sciences) as well as the cultural or social elements at the macro level (the primary domain of social studies). This new meta-

hypothesis can be the focus of cultural neuroscience, which is a new application of Yin-Yang Balance to culture and brain as a meta-duality.

**Table 1**

**The Distinctions in Mind, Language and Brain between the West and East**

	<b>The West</b>	<b>The East</b>
<b>Mind</b>	<i>Analysis/Logic</i>	<i>Synthesis/Intuition</i>
<b>Language</b>	<i>Alphabet/Abstract</i>	<i>Image-Sound/Concrete</i>
<b>Brain</b>	<i>Part/Asymmetry</i>	<i>Whole/Symmetry</i>

**Notes:**

1. While the notion of “West” refers to the countries in Europe and North America with their shared heritage of Greek culture and written language, the notion of “East” refers to the countries in the East Asia, including China, Japan, and Korea, which share the common heritage of Chinese culture and written language.
2. The notion of “mind” refers to the higher-order cognitive process and pattern as a frame of thinking to manage real opposites and mental contradictions, including Aristotle’s formal logic, Hegel’s dialectical process from the West, as well as Yin-Yang Balance from the East. We regard “mind” as largely social and cultural in nature.
3. The notion of “brain” refers to the structure of wiring and connection among brain cells when they are activated during the process of cognitive function. We regard “brain” as largely genetic and biological in nature.
4. The notion of “language” refers to the verbal written languages in both the West and East. Language serves as the most fundamental “tuning” device to affect both thinking frame and brain function, and language also acts as the mediator between mind and brain. Largely due to its mediating role, language is the link between the genetic/biological and social/cultural antecedents of distinctive thinking frames in the East and West.
5. While the West is characterized as emphasizing analysis and logic in its frame of thinking possibly due to its exclusive use of alphabet in its language and part-brain function, the East is characterized as emphasizing synthesis and intuition in its frame of thinking possibly due to its inclusive use of image-sound in its language and whole-brain function.

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