

TRADITIONALLY BASED SYSTEMS OF ACUPUNCTURE – THEIR ‘EXPLANATORY’ NATURE, MODELS, NEEDS AND REQUIREMENTS FOR TESTING THEM

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Abstract

What are traditionally based systems of acupuncture, TBSAs? How are they different from other styles of acupuncture? What is the nature of knowledge and what the assumptions about the nature of things that underlie TBSAs? How is this thinking different from the nature of knowledge and assumptions about the nature of things that underlie modern scientific knowledge of the world? This presentation will briefly explore these issues in relation to the notion of the ‘explanatory’ models underlying TBSAs and biomedical knowledge of the body. It will examine the impact of these differences on how we develop testable ‘explanatory models’ of TBSAs and the likely requirements of such studies. These differences affect how we conceive of clinical testing of TBSAs, raising difficult questions about the viability of ‘explanatory’ trials of TBSAs. These differences also affect how we conceive of testing the ‘mechanisms’ of traditionally based systems of acupuncture. To date these issues have not been dealt with in clinical or physiological testing of TBSAs.

The issues are compounded further by the fact that there are many different types of TBSAs with very different stimulation methods. This diversity challenges our assumptions about the nature of TBSAs and theories underlying them, making it difficult to make generalizations. The author believes that by looking behind this diversity and its ensuing complexity it may be possible to grasp something about the nature of the theories underlying these systems. The TBSA ‘root treatment’ which specifically uses traditional concepts and methods is applied with the principle aim of helping restore order in the whole body, by helping to ‘regulate’ the qi. The presentation will conclude with an introduction to alternative ways of conceiving of the concepts and purposes of TBSA systems of acupuncture, proposing that TBSA treatments may take advantage of low-level energy information regulation systems in the body.

Introduction

The term Traditional East Asian Medicine (TEAM) is defined here as those therapies of East Asian origin based on historical theories of the body in health and disease that are centred-upon the concept of qi [氣]. This includes traditionally based systems of acupuncture (TBSA) from Asia, and in recent decades the West. It also includes systems of herbal medicine (zhongyao [中藥]) practice such as the bencao [本草] traditions, Japanese kampo [漢方]. It also includes massage traditions such as tuina [推拿], shiatsu [指压], and self-development traditions such as taijiquan [太極拳], qigong [氣功] from Asia and in recent decades the West (see Figure 1).

FIGURE 1

There have always been different TBSAs from the earliest to present times in the field of acupuncture [13, 19, 22, 91]. Scholars tracing the development of acupuncture from the period just before to the publication of the first acupuncture related texts of the ‘Huangdi Neijing,’ [黃帝內經] the ‘Suwen’ [素問] and ‘Lingshu’ [靈樞] summarise the role of the acupuncture needle as a treatment instrument for regulating the qi: “*Needling regulates (tunes) the qi* (tiao qi [調氣])” [88:79 quoting chapter 75 of the Lingshu]. Leading scholar Vivien Lo says of acupuncture “I differentiate ‘acupuncture’ from bloodletting and other minor surgery by the target of medical intervention. Acupuncture, as I define it, is the act of piercing the body with the intention of moving qi in the channels” [63:29]. But acupuncture has not always involved the insertion of acupuncture needles, from its first descriptions in the Lingshu, it has also involved use of ‘needles’ with rounded ends that were pressed or rubbed on the surface of the body as non-insertion forms of acupuncture [21:48-54, 64:102-103], techniques which are still in use today [21, 35, 95]. Needling has always been at different depths, including very shallow needling [27]. Needling as a treatment method was introduced after the use of moxa cauterization had already been described [63, 64, 104], hence the frequent use of the term [鍼灸] ‘zhenjiu’ (Japanese ‘shinkyu’) ‘acumoxa therapy’ to refer to acupuncture. Treatment with needles or moxa is directed to the acupuncture points or ‘xue’ [穴], the most important of which are located along the twelve jingmai [經脈] or channels. The twelve jingmai are a development from an earlier primitive physiological concept, the ‘mai’ [脈], first described in texts found in the Zhanjiashan [張家山] (circa 196-186 BCE) and the Mawangdui [馬王堆] (circa 168 BCE) archaeological sites [32, 39]. The term ‘jing’ [經] can be understood in a number of ways, but scholars of the period usually understand it as implying order or regularity [e.g. 96], so that the term jingmai is about ordering the physiology (mai) of the body. Thus the principle purpose of a system of acupuncture following traditional theories of acupuncture (TBSAs) is to apply needling techniques in order to restore order to the qi, to help regulate the qi. This is a core idea underlying TBSAs, but one that has found many means of expression, with varying degrees of emphasis and different understanding of how to do this. To understand this more I turn to an examination of the theories of TBSAs, in particular their role as ‘explanatory models’.

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In the modern period acupuncture has been shown to be a ‘complex intervention’ especially traditionally based systems of acupuncture [5, 68, 80, 81, 89, 91]. Complex interventions need to be carefully defined and often have much more complex mechanisms of action and inter-action [29, 72].

Explanatory models

Today, if we talk about explanatory models of a therapy we are referring to the mechanisms and physiological pathways through which that therapy is thought to act. Therapy x acts on physiological pathway y to trigger change z which reduces the symptom. In this model there is a chain of causal events (x-y-z) between the therapy and the change of symptom. In clinical research the explanatory trial is “aimed at confirming a physiological hypothesis, precisely specified as a causal relationship between administration of an intervention and some physiological outcome” [102].

Stephen Hawking, arguably the world’s greatest scientist recently wrote about models: “*Whenever we develop a model of the world and find it to be successful, we tend to attribute to the model the quality of reality or absolute truth. But... the same physical situation can be modelled in different ways, each employing different fundamental elements and concepts. It might be that to describe the universe we have to employ different theories in different situations. Each theory may have its own version of reality, but according to model-dependent realism, that diversity is acceptable, and none of the versions can be said to be more real than any other*” [40]. Such a conclusion from one of the world’s leading scientists makes us raise questions about simple ideas such as the ‘explanatory model’ and assumptions and conclusions we might draw from it.

In acupuncture we find three kinds of ‘explanatory’ models, the first a mechanistic one, the second proposed on the basis of known physiology and the third based on traditional qi-based descriptions of the body. The first arises out of research on a particular clinical outcome. For example if acupuncture is said to reduce pain, what mechanisms must or could be involved for the therapy to be able to reduce the pain? The hypothesised mechanism that reduces the pain is worked out with evidence showing a relationship between the input (acupuncture) and the measured output (release of endorphins resulting in pain reduction). When these physiological models are demonstrated through careful research then an explanatory model of acupuncture in the treatment of pain is thought to be confirmed [25, 83]. Hammerschlag and colleagues pointed out that this line of evidence does not actually expose the mechanisms involved rather it establishes correlation between the input of acupuncture and the measured output [37, 38]. The actual mechanisms of acupuncture remain unclear [37, 38]. But additionally this line of reasoning provides evidence only for a limited use of acupuncture, eg pain reduction, and does not cover the broader use of acupuncture for conditions unaffected by the specific physiological pathway. It is dubious whether such models are ‘explanatory models’ of acupuncture, though they might eventually be valid as explanations for some of the effects of acupuncture.

The second explanatory model utilises known physiological entities and their pathways of action. This kind of explanatory model proposes that acupuncture works through those entities, for example, that acupuncture points are trigger points and that acupuncture works via the same mechanisms that trigger points work. This kind of model is developed by replacing the original concepts of acupuncture with more plausible sounding established biomedical concepts (replacement models). In the case of the proposed model that acupuncture is really dry needling of trigger points, certain challenges remain. For example, the claim that acupuncture points and trigger points are identical remains problematic [14, 15], there are ongoing problems with the identification of trigger points [65], trigger point needling has yet to demonstrate efficacy beyond placebo [31, 50] while acupuncture has demonstrated efficacy beyond placebo in a number of medical conditions [e.g. 44, 58, 60]. In the case of trigger points as an explanatory model of acupuncture, many unresolved problems exist. This second kind of explanatory model the ‘replacement’ models of acupuncture, point to experimental evidence, without mapping the practice of acupuncture to those models and often little clinical trial evidence exists of the efficacy of those models of treatment. It is dubious whether these are really ‘explanatory models’ of acupuncture, and until the evidence is sufficient, judgement about their validity should be suspended.

The third type of explanatory model developed as acupuncture began developing in the period 150-100 BCE and is used by TBSAs. They make reference to concepts such as qi [氣], jingmai [經脈] (meridians), xue [穴] (acu-holes), needling to regulate qi [調氣], xu-shi [虛實] (weakness-excess), bu-xie [補瀉], (strengthen-drain) and so on. Many different models of acupuncture practice evolved over this more than two thousand year history, each selecting from and applying different aspects of the traditional ideas based on individual practitioner education, preferences, cultural background and clinical experiences [19, 22, 67, 90, 91]. The fact that such diversity exists and that different models of practice appear to have contradictory theories suggests that the theoretical models of practice may be problematic as ‘explanatory’ models in the sense defined above. To understand this I explore the kind of thinking and underlying world view assumptions that were made as these traditional theories and ideas developed. For, as we will see, it does not seem likely that the traditional ideas were intended to be nor could they function as ‘explanatory models’ that establish “a causal relationship between administration of an intervention and some physiological outcome.” The theories of TBSAs seem to function differently.

TEAM theories

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TEAM theories

There are profound differences in the ways of thinking and assumptions about the nature of the world in TEAM and modern scientific descriptions of the body [22]. Appendix 1 describes the core differences, here I summarise them very briefly. The assumptions about the nature of the world that lie at the heart of TEAM practices from the time of their inception (200-100 BCE) until now are largely characterized by the following features: Rather than seek the nature of things through breaking them down to smaller and smaller units (reductionist approach) there has been a tendency in TEAM to see things as parts of irreducible wholes, focusing especially on their relationships and mutual actions (syncretic thinking) {not to be confused with ‘holism’ – see appendix 1}. In TEAM thinking there is a virtual absence of seeking objective descriptions of the world and a virtual absence of the ‘either-or’ thinking that lies at the heart of the scientific method. Knowledge was more of the nature of ‘skill-knowledge’ (action oriented, describing things in ways that allowed actions to address problems in the world) rather than the ‘representational knowledge’ of modern science [97].

In systems of practice where knowledge is not of objective causally related phenomena, rather of action oriented theories that help address problems in the world, what can we say about those theories? Traditional theories and models of the world including the medical theories of TEAM such as the qi and jingmai, play a different role than modern scientific theories. A very reasonable explanation of the role of theory in TEAM and subsequently TBSAs is that it refers to functional concepts that are primarily about guiding clinical judgments in order to select what the practitioner considers to be an optimal treatment within the system of practice he uses [19:222, 78]. Of course the patterns of diagnosis used within different systems of TEAM practice [e.g. 94, 110] can be seen as referring to phenomena that are associated with the problems of the patient but such association cannot be taken as ‘causally related’ until studies have been done that establish them to be causal relationships.

The challenges of TBSA explanatory models

Now that the basic issues have been outlined, problems in the conceptualisation and testing of explanatory models of TBSAs can be examined. Three main areas will be discussed: 1- the explanatory RCT, 2- basic science of TBSAs, 3- the need for a broader view of TBSAs.

The explanatory RCT

Since an explanatory RCT is “aimed at confirming a physiological hypothesis, precisely specified as a causal relationship between administration of an intervention and some physiological outcome” [102], we can see immediate problems for explanatory trials of TBSAs. Despite what proponents of TBSAs might say, until studies have been conducted establishing objective causal relationships between the TBSA theories and (some) physiological outcome(s), the theories of each TBSA cannot be ‘explanatory’ in the sense defined here. Thus ‘explanatory’ trials of TBSAs are problematic. Arguments have recently been published drawing similar conclusions [56]. Not only are the ‘mechanisms’ of acupuncture unclear in TBSAs since the theories could not describe the mechanisms of treatment, but the mechanisms of acupuncture (explanatory model one above) remain unclear [37, 38]. There remains the further problem that if the mechanisms are unclear, then what constitutes a viable placebo control remains unclear [56]. Attempts to conduct ‘explanatory trials’ of acupuncture have focussed on testing only one or two key variables: the location of needling, the type of needling [20, 109]. While these are important features of acupuncture practice, they do not constitute an explanatory model since we do not have definitive answers yet about the physiological basis of ‘acupoints’ or the different needling techniques. Further, evidence has shown that TBSAs are complex interventions [4, 5, 56, 68, 80, 81, 89, 91] and reducing the theories of these to two variables such as point location and needling technique does not reflect TBSA practice nor can it tell us about the explanatory models of TBSAs. I do not dwell on these difficult issues further as these are not the main theme of the current paper, but it seems unlikely at present that clinical trials of a TBSA can test the mechanisms of the treatment and that ‘explanatory’ RCTs of TBSAs may not be possible as a test of the theories or mechanisms of TBSAs.

Basic science of TBSAs

What steps are needed in order to investigate TBSA concepts such as ‘qi’ or ‘jingmai’ so that the hypothesis that they may have an objective basis can be tested and if so, what their physiological bases might be? Put another way, how do we ensure the validity of any claims to have established the objective existence of or physiological basis of these concepts and theories? This is a theme I have addressed in a separate paper [18], so here I summarise the core ideas. A number of studies have been done and various claims made regarding the nature of concepts such as qi, the acupoints, the jingmai/channels, deqi etc. However, no studies to date have addressed the issue that the concepts that were investigated are, by nature, functional concepts that guide clinical practice, were not described as having an objective nature and if observed have always been observed by the naked senses. Birch and Bovey argue that any measurements must be matched to reliable observations associated with the entity investigated and that as functional concepts their behaviour must also be assessed [18]. For example, after making observations of the entity, make measurements using the selected technology, then apply treatment to create a change in that entity, confirm those changes through reliable observation, then repeat the measurement to see if changes can be detected. This is based on the idea that measurable changes should match predicted changes based on theories of the entity. These are two fundamental steps that have been missing in research to date. Additionally, since there are important variations within the TBSA literature so that concepts from that literature are often described in different ways, significant work needs first to be done to establish reasonably agreed upon models of the entity to be investigated. Often this step is also poorly attended by researchers as it requires the work of historians, linguists, anthropologists who do not usually

concepts from that literature are often described in different ways, significant work needs first to be done to establish reasonably agreed upon models of the entity to be investigated. Often this step is also poorly attended by researchers as it requires the work of historians, linguists, anthropologists who do not usually work with laboratory researchers [18]. Once agreed upon models are developed it may also be necessary to tighten up the hypotheses using mathematical modelling approaches so that sufficiently precise hypotheses can be generated [18]. Another area where insufficient attention has been given is in the choice of measurement technologies, there is rarely sufficient evidence given and arguments provided to justify the choice of those technologies. Birch and Bovey summarise this in an iterative 9-step process [18].

The need for a broader view of TBSAs

How are we to understand the theoretical concepts of TBSAs? In principle they are based on concepts embedded in different perspectives of the nature of the world than many concepts in biology and medicine [34]. Ignoring these perspectives runs the risk of reducing the validity of any studies and their findings. Thus it is helpful to think about how to model these theories in ways that respects the underlying theories, a step mentioned by researchers grappling with the investigation of therapies as a whole system or as a complex intervention [29, 108]. We may also have to accept quite different descriptions as valid even though they may appear contradictory [40]. Since the theories refer to ideas that are functional entities rather than obviously anatomical entities then it might be useful to consider these ideas as describing more subtle phenomena that function not as the physiological processes themselves (which have been well defined in modern biological terms already) but rather as systems that influence or even help regulate physiological systems. Yoshio Manaka developed a line of reasoning that hints at this. He studied acupuncture widely, the variety of historical and modern ideas and methods that can be found [70]. In his efforts to investigate TEAM based practices, he was looking for a practical solution to the following problem: If the traditional theories (jingmai, qi, yin-yang etc) are 'real' how can they be investigated when accessed by so many different styles and levels of stimulation - TCM needling - simple non-stimulatory needling - Japanese Meridian Therapy inserted needling - various non-penetrating needling? He realised that this is like looking for the lowest common denominator in a sequence of numbers such as: 2 - 8 - 30 - 68 - 188 - 368. The only thing they have in common is the number 1 or 2. If different styles of acupuncture administer different levels of stimulation intensity and each claims to be accessing the same systems (qi, jingmai, etc) then it can only be by the lowest intensity stimulus that they can do this, as this is the only thing they all have in common. Thus, if the TEAM concepts of qi, jingmai, etc are anything more than 'software' [70] or rules for applying treatment [19], they must operate at very low energy levels. Further if the goal of acupuncture is to 'regulate the qi' [調氣] (Lingshu chapter 75 is explicit about this [88:79]) then perhaps these low-energy level phenomena are rather about regulation of the body. He then proceeded through a series of investigations to explore the nature of qi, the jingmai, their acupoints and proposed the model of 'acupuncture as intervention in the biological information system' [69]. While his experimental evidence is weak due to flaws in the studies his underlying ideas are worth further consideration. He proposed that perhaps modelling acupuncture in the framework of for example systems theory, information theory, complexity theory may be helpful as they allow perspectives of the body that don't appear to violate underlying TEAM assumptions about the nature of the world and the body's place in it [70].

To make this clearer let's look briefly at a series of different types of needling: non-penetrating needling [35] / very lightly inserted needling (0.5-1.0mm) with no sensation [94, 95] / slightly more deeply inserted needling (2-5mm) with no sensation [21, 70] / deeper insertion intramuscularly (5-20+mm) with no sensation [21] / deeper insertion needling (5-20+mm) with sensations - called deqi [得氣] in many forms of acupuncture today [85]. All levels of needling activate 'bio-information'. The term 'bio-information' as used here refers to all biological structures and their functional systems, it also refers to the multiple control and regulatory systems that operate within and between biological organisms, it also refers to the flow of information from outside the body into the body and its biological responses/adaptations. A good general model for this can be found in the book 'Anti-chance' by Schoffeniels [92], the conceptual basis of this model of bio-information is found in detail in 'The second medical revolution' by Foss and Rothenberg [34] as well as more recently by Bischof [23] and Rein [87].

As the needling is applied at different depths with different levels of stimulus, it is not difficult to imagine that different physiological systems are being accessed.

- 5- At the deeper anatomical level with sensory stimulation sensations various mechanisms within the CNS and endocrine systems can become activated.
- 4- At the deeper anatomical level with minimal or no sensory stimulation these same mechanisms may be activated, but likely to a much lesser degree if at all, instead the local tissues (muscular, connective tissue, vascular, local nerves) will be activated in varying degrees and amounts.
- 3- At the more shallow insertion levels with no sensory stimulation if the needling is not intramuscular, the muscle tissues will not be involved in responses rather local subcutaneous tissue structures (vascular, connective tissue, etc) will be activated.
- 2- With very shallow insertion, the skin and subcutaneous tissues will be the only systems activated, including surface sensory nerves, perhaps pressure receptors, current of injury response from the penetration of and small damage to the skin, etc.
- 1- With non-inserted needling few of the mechanisms described above will be activated and responses will be due to other input.

With level five stimulation methods it is possible to see responses from all levels 1-5. With level four stimulation it is possible to see responses from all levels 1-4, and so on for the other levels. All inputs (stimulation levels) are a form of bio-information flow and all responses are a form of bio-information flow. This conceptual framework provides a 'paradigm' neutral and 'style of practice' neutral language that

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What might the information flows from each level involve? The skin contains 'polymodal receptors' that are likely to play a role in this information processing [52] and which will be present regardless of the level of stimulation. Touch is involved in all levels and can trigger different effects [33, 57, 71]. Gentle needling techniques can increase parasympathetic tone [76]. Evidence is gradually accumulating that healing intention can have positive physiological effects [86] which could occur regardless of needling style. Various studies have documented that acupuncture points and the acupuncture channels have electromagnetic properties. In particular there is a body of research documenting that acupuncture points have low electrical resistance or higher conductance than surrounding skin and some has found that the acupuncture channels also have lower electrical resistance or higher conductivity [2, 9, 10, 73, 74, 93, 99, 100, 111]. Various theories exist about the electrical properties, characteristics and their functions [12, 79]. The most common is that organisms use low-level energy signals as a mechanism for transmitting information within the body and as a mechanism for receiving and processing information from the environment. Various authors have speculated on the essential nature of these electro-magnetic fields and functions [23, 26, 79]. Others have drawn correlations between the electrical properties of the acupuncture systems (points and channels) and various bio-electrical systems such as the 'primitive DC electrical' system involved in growth and repair [9, 10], bio-informational signaling systems [62], in particular the X-signal system [70], point singularity theory [93], bio-coherence models [42, 43], signal transmission and reception [101]. In most of these models, the EM signals communicate information that helps change physiological behavior and are often regulatory in nature.

Boon *et al.* in a review of different whole systems and complex systems research approaches stated "both the human body and systems of healthcare have to be seen as complex, self-organizing systems that create new, emerging properties through the interplay of their component elements" [24]. Something like this seems to be appropriate to characterise TBSAs. In the TBSA, where the theories of action are not clear, there appears to be a complex model of potential action which depends in part on the nature of the treatment technique applied, in part on the selected locations for application of those techniques and various other factors guided by the TBSA theories that involve how the patient is engaged by the therapist, how the practitioner and patient interact [108], how practitioner perceptions influence and thus modify the application of the treatment, etc. These different factors participate in interactive processes in the treatment. Systems and information theory modelling appear to be helpful tools for capturing and modelling this. Likewise, complexity theory and the development of order out of disorder (chaos theory) also appear to be helpful ways of modelling these processes. Most likely acupuncture treatment involves multiple levels of biological actions including established biological pathways and potentially other emerging pathways related to EM signals in the body. How TBSAs engage these and how well TBSA theories approximate, match, describe these or have nothing to do with them remain unclear. As Manaka described, the factors involved are likely to be very subtle or operate at very low energy levels, which, without the right technology, can be very difficult to detect and map. Demonstrating measurable phenomena that match the theories is the first order of business. Reproducing these results and calibrating them to TBSA theories and established physiological mechanisms or models will take time. If such efforts are successful, then will it be possible to design studies to test the explanatory models of TBSAs.

Conclusions

The theories underlying the practice of TBSAs serve primarily as guides on how to assess, diagnose and treat patients. They are not by nature, 'explanatory models' in the sense that biomedicine uses this term, describing cause and effect relationships between identified 'diagnoses' and disease or symptoms or between selected treatments and change of those symptoms or diseases. Explanatory models of TBSAs thus remain unclear. Appropriate models, hypotheses and evidence have yet to be developed. A number of steps are needed to do this with little work done so far in this direction. This paper has reviewed this topic, identified problems in both clinical and basic science research on TBSAs in relation to testing their explanatory models and suggested models and ways of thinking that may help future research in this area.

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Appendix 1

A number of authors have written about the philosophical differences between Western, scientifically influenced world views and their assumptions and more traditional East Asian world views and assumptions [e.g. 36, 55, 84]. Paul Unschuld captured some of these issues especially as they pertain to understanding the medical literatures [103, 105, 106]. Birch has recapitulated some of them [11, 13, 19, 22]. While there is a tendency to try to argue on the basis of 'paradigmatic' differences between East and West [e.g. 11] following the arguments of Kuhn [54], there are counter arguments about the inadequacy of that approach [53, 90, 104]. Unschuld argues that 'Thomas Kuhn's notions of 'scientific revolution' and 'periods of normal science' are hardly applicable to Chinese history of science' [104:6-7]. Scheid and others argue further that Pickering's 'mangle of practice' model [82] is more suitable to understand how East and West differences can be examined [53, 90]. We will thus not engage in arguments or discussions further about paradigmatic differences, instead focusing here on a number of important philosophical differences. For more detailed discussions of the following see the authors cited here and also Birch, Bovey [18].

- There has been a virtual lack of 'objectivity' in traditional East Asian thinking. The theory of objectivity proposes that the person observing and describing the world is able to separate himself from it and describe it independent of himself as observer [34]. This approach is based on the assumptions that the person observing does not influence what is observed and that they are able to separate themselves from their observations. The objective world is described

- There has been a virtual lack of 'objectivity' in traditional East Asian thinking. The theory of objectivity proposes that the person observing and describing the world is able to separate himself from it and describe it independent of himself as observer [34]. This approach is based on the assumptions that the person observing does not influence what is observed and that they are able to separate themselves from their observations. The objective world is described once individual experiences of the world are superseded. This trend did not happen in East Asia [36:15, 61:192-193] until the adoption of Western ways of thinking in recent centuries [19, 22]. Instead, the observer was always placed at the centre of observations and there was not a tendency to try to describe things objectively. The individual was conceived as part of a larger whole and thus individual experiences of the world could not be separated from the world that is experienced. On this issue Sivin and Lloyd said "objectivity did not become an issue" [61:192] and "Scientific pursuits in China thus did not aim at stepwise approximations to an objective reality but at recovery of what the archaic sages already knew" [61:193].

- There has been a virtual lack in traditional East Asian thinking of the 'either-or' thinking that is a hallmark of the scientific approach. In the either-or assumptive model, one cannot accept the validity of competing ideas; if one idea is considered right a contradictory one must be wrong. The scientific method for establishing 'truth' is a clear example of the either-or approach. Scientific truth is developed using methods that assume this to be axiomatic. While it has dominated modern Western scientific thinking, its virtual absence in ancient Asian philosophies is often overlooked. Evidence from the medical field clearly demonstrates a corpus of traditional literature that is full of contradictory ideas, even within the same texts, the absence of 'either-or' thinking is normal [96:81]. TEAM was fundamentally syncretistic, it has always employed a strategy of merging disparate ways of thinking and acting. This was not a problem for early authors since they did not assume that if one approach was right the other had to be wrong. Rather ideas and assumptions of all kinds co-exist at many different 'levels' of interpretation with no attempt or indeed any reason to derive an absolute truth. Of this Unschuld has written "The unique feature of the Chinese situation-and this should receive more attention from historians and philosophers of science-is the continuous tendency towards a syncretism of all ideas that exist (within accepted limits). Somehow a way was always found in China to reconcile opposing views and to build bridges" [103:57].

- There is a potential inapplicability of reductionist thinking to the primarily syncretistic thinking of traditional East Asian thinking. The reductionist approach is based on the assumptions that any whole system properties of a thing are nothing more than the simple sum of the parts of that thing and that the reduction of the thing to its component parts does not diminish the thing or our understanding of the thing itself. The opposite tendency has dominated in East Asian thinking due largely to the tendency to see things as part of an inseparable whole [75]. While this model of holism has not been universal in pre-medical and medical traditions in East Asia [105, 106] it has certainly played very significant roles in how the mind and body were viewed and how they are seen in relation to the world and others. Ames and Hall in a discussion of the "most crucial contribution of Chinese culture broadly" cite Tang Junyi saying it is "...the spirit of the symbiosis and mutuality between particular and totality. In terms of our understanding this means an unwillingness to isolate the particular from the totality, and in terms of feeling, it means the commitment of the particular to do its best to realize the totality" [6:11]. Reductionism is rather an antithesis to this basic approach.

- There has been a virtual lack of mind-body dualism in traditional East Asian thinking. In the 1600s the philosopher-mathematician Rene Descartes proposed that it is possible to view the mind and body separately with his famous 'cogito ergo sum', 'I think therefore I am', creating the movement known as Cartesian dualism [34]. This dualism did not start with Descartes, it had its origins with the ancient Greeks, further ramified by Christian theologians to become "one of the most influential problematics of modern philosophy" [36:29] following Descartes. This has been very influential in Western thinking since he first proposed it with a strong trend in the Western view and in science to see the mind and body as separate, creating a kind of dualism. This has become an embedded part of the Western world view that is difficult to dislodge despite growing evidence in science that it is invalid [34]. In contrast to this, the ancient Chinese and TEAM perspective sees the mind and body as being completely inseparable "the Chinese in contrast, accepted that the mind was part of the body, more refined and essentialized but of the same substance" [59:20]. While there have been occasional references that discussed mind and body as separate in the pre-medical [30:152] and early TEAM literature [28:165] and other discussions that seem to imply a similarity to the duality found in the West [55:180], the bulk of the pre-medical and medical literature discusses them as inseparable [3, 6, 30, 45, 59, 84, 107]. We can thus reasonably take the continuity or inseparability of mind and body as typically but not exclusively representative of the early Chinese and TEAM traditions. Both are seen as different manifestations of qi.

- Hypothesis testing in scientific studies. An important aspect of all hypothesis testing approaches relates to the underlying methodology that has to be used: *in all hypothesis testing experiments, one never proves anything, one can only ever disprove competing, alternate or opposite hypotheses*. Hence in all hypothesis testing studies the 'null hypothesis' (the opposite to the hypothesis) is tested. When it is proven to be wrong, it is assumed that the hypothesis was correct. But a fundamental limitation of this method is that it is entirely dependent on the starting assumptions and theories of the researchers [22:30-31]. In order to properly investigate TEAM concepts and methods it is necessary to have a detailed knowledge of the theories and methods of TEAM to ensure that valid and relevant ideas or methods are being investigated. Kim showed how a study of acupuncture began with a naive understanding and ultimately investigated models incapable of testing theories or concepts in acupuncture [53]. Accidentally or inadvertently substituting biomedical ideas or models into studies that attempt to test TEAM will be problematic.

- Taking the philosophical issues of the lack of objectivity and the lack of the 'either-or' assumption in traditional East Asian thinking, we are confronted with the question: 'What role does theory play in such a world view?' The philosophical argument regarding this perspective is that knowledge in ancient Chinese thinking was more 'skill-knowledge' rather than 'representational knowledge' [97:4] or 'how-priority' knowledge rather than 'what-priority' knowledge [36:149-150]. Hall and Ames state it clearly in different ways: "'Knowing,' then in classical China is not a knowing *what* that provides some understanding of the environment conditions of the natural world, but is rather a knowing *how* to be adept in relationships, and *how* in optimizing the possibilities that these relations provide, to develop trust in their viability" [36:150]. Kuriyama shows that in classical Chinese thinking "asking 'what' was inseparable from asking 'how'" [55:96]. The Western model of 'practice-knowledge' that seems to approximate this and which is commonly referenced is Polyani's 'tacit knowing' [97:4]. Slingerland explains it thus: "For the early Chinese thinkers...the culmination of knowledge is understood not in terms of a grasp of abstract principles but rather as an ability to move through the world and human society in a manner that is completely spontaneous and yet still fully in harmony with the normative order of the natural and human worlds - the Dao or 'way'" [97:4]. We can thus see that there are important differences of world view between the ways that TEAM thinkers conceived of the world, the body, disease and treatment compared to modern scientifically influenced world views and their subsequent methods of investigation and practice. If we are to investigate TEAM theories, methods and practices we must be mindful of these differences and seek out approaches that do not ignore or bypass important features of the methods we attempt to investigate.

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Endnotes

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