Pulse Wave Analysis: 
East Meets West

In Traditional Chinese Medicine (TCM), personal levels of energy are diagnosed and considered one of the most important – if not the most important – indicator of health. Indeed, poor energy levels are considered a precursor to potential affliction. In TCM, therapy is often based around boosting energy either in a general manner or in specific parts of the body. This white paper explores these factors in the context of modern western medicine. A fresh and objective look at TCM will help us better understand the processes behind personal energy. It will also help dispel some of the more mystic aspects of TCM and allow us to better apply these learnings in a pragmatic – useful – manner. Most importantly, it will motivate us to improve upon and better understand pulse wave analysis.
1 Introduction

Do you feel tired from time to time? Why are you tired? Will this feel of fatigue lead to other more serious medical ailments? Or, is this part of an already identified malady?

Just about everyone experiences energy lows. Most illnesses and many medications result in various levels of fatigue. An estimated 21 to 33 percent of patients seeking attention in primary care settings report significant fatigue [1]. Yet, very little is written about personal energy and fatigue. Usually it is considered a symptom of another medical ailment, so we ignore the fatigue and instead concentrate on the underlying disease or problem.

In Traditional Chinese Medicine (TCM), personal levels of energy are diagnosed and considered one of the most important – if not the most important – indicator of health. Indeed, poor energy levels are considered a precursor to potential malady. In TCM, therapy is often based around boosting energy either in a general manner or in specific parts of the body. What's more, an illness is identified and described as having an energy deficiency in a specified organ or part of the body.

This white paper explores these factors in the context of modern western medicine. A fresh and objective look at TCM will help us better understand the processes behind personal energy. It will also help dispel some of the more mystic aspects of TCM and allow us to better apply these learnings in a pragmatic – useful – manner. Most importantly, it will motivate us to improve upon and better understand pulse wave analysis.

There is a plethora of different solutions to boost low personal energy levels. The hope is that we gain consciousness of this critical health condition. In doing so, it is possible that many more chronic and serious maladies can be avoided. In the very least, maybe we will feel less tired and have more productive (and happy) lives. With more awareness, low energy levels can and should be addressed as part of one’s lifestyle.

2 Energy, fatigue

Fatigue, also referred to in such terms as exhaustion, weakness, lethargy, tiredness, describe a general physical and/or mental state of being or feeling weak, lacking energy, lacking vitality, zeal or zest, lacking strength, apathy, feeling “often tired”, etc. Fatigue is one of the most commonly encountered complaints in medical practice. In Western medicine, it is characterized by feelings of low levels of energy, a lessened capacity or motivation to work or be active, and often accompanied by sleepiness and weakness.

Although physical and mental fatigue can feel different, the two often exist together even though they arise from different causes. Stress, anxiety, worry, depression or emotional grief can result in physical feelings of exhaustion even though the main source of fatigue is not from physical exertion. Similarly, extended periods of excess physical activity can result in feelings of stress and anxiety. The result is that an individual will have a general feeling of tiredness of a more chronic nature than a short term feeling of exhaustion from, say, a lack of sleep or a lot of physical exercise. The general feeling that corresponds with low energy reserves can manifest itself in such emotional states as lethargy, lack of ambition or even have a direct effect physically such as a weakness of the immune system, making one more prone to colds, flu or other ailments.

Lack of energy takes many forms. Personal energy levels vary from individual to individual and from day-to-day. In this section, three hypothetical energy profiles for three different people are illustrated. The individual represented in Figure 1 has generally good personal energy levels as noted in the colors green and blues. The individual is probably not overly stressed and is living a healthy life style. The first orange-colored day or lower energy day may have arisen, say, from excess physical exercise or from not properly recuperating from an active training schedule. Further along, perhaps this same person caught a cold or had several less than optimal nights of sleep. Overall, however, the individual has solid energy levels and can re-gain his “pep” quickly. A lack of energy here is a lifestyle wellness concern. It is not fatigue, which could indicate future or current medical problems.

In the personal energy profile displayed in Figure 2 the overall energy levels are lower than in Figure 1. However,
the individual can recuperate. There are a host of reasons why personal energy levels sink: disruptive sleep, stress, poor diet, not enough exercise, medications, various health ailments, overconsumption of alcohol or caffeine, excess exercise, etc. Maybe in this case, the person is experiencing regularly stress, consuming too much caffeine or skipping needed sleep. He may feel tired some days but it is largely tentative. As noted by the green bars, the individual does recoup to a large extend personal energy levels perhaps from sleeping in on the weekends or taking breaks from a hectic work schedule, etc.

This scenario also depicts a wellness concern where the lower energy levels can and are re-compensated with the help of some concerted efforts at addressing lower energy through some therapeutic measures or lifestyle changes.

In Figure 3, we have a profile of someone who has relatively low energy levels. This is a clarion call screaming “be careful”, “take better care of yourself!” Here there are quite a few low energy days. Regular or persistent low energy can lead to further drops in energy and perhaps to other more serious ailments, if they are not already present. It can become a vicious circle: exhaustion, then burnout. People who are experiencing, for example, depression may in fact be enduring intensive fatigue rather than the emotions generally coined genetically as “depression” [2]. Not being able to get out of bed or the feeling of emptiness so often reported among those experiencing depression may in some cases reflect more their low levels of energy than a particular emotional feeling or view of the world.

Since fatigue – especially chronic fatigue – can be a result of a large variety of factors including disease, lifestyle, stress, etc., diagnosis can be extremely difficult. There is no single overall cause of fatigue. In Western medicine there is a tendency to seek out and try to cure specific physical ailments rather than try to cure more general...
health conditions such as low energy. Fatigue is generally considered a sign of an underlying disease. As a result, fatigue may be considered as a secondary health problem. Yet, fatigue may in fact be one of the causes of illness and not the result of illness. Are we not “putting the cart in front of the horse”? Shouldn’t it be the other way around? Maybe we should take a more preventive approach to our health by ensuring we have the personal energy to back our immune system, to ensure sound sleep, to stay physically fit, etc.?

Promoting good and sound personal energy levels should be a wellness concern. It should be the focus before bad health arises. If not, low energy levels become a problem. Low energy becomes fatigue, a precursor to further medical health issues, or even leads to more serious underlying diseases. Once in the more serious fatigue stage, diagnosis becomes difficult as fatigue usually gets bundled together with other medical complications.

Fatigue is associated with various conditions such as exertion, inanition, or lack of sleep; an imbalanced or inappropriate diet; acute or chronic stressful states; and can be a concomitant of aging. Indeed the Mayo Clinic lists 25 groups of illnesses where fatigue is a major symptom. These do not include life style causes, nor any of the mental health causes of fatigue. Nor does it include the secondary effects from taking various medicines, or from being treated for other maladies. The degree of an individual’s fatigue varies with the causative factors and the duration they have been present. There is also a variance in how each individual person deals with or tolerates fatigue. Up to one in every five Americans claims to have fatigue that is severe enough to interfere with daily normal life. According to the Centers for Disease Control and Prevention, roughly 12 percent of the adult population felt either very tired or exhausted in the past three months.

A doctor or therapist has no objective means of identifying fatigue and determining the level of fatigue compared to others or compared over a period. Currently, a doctor or therapist will typically interrogate the patient to try to find the cause of fatigue. This might include eating and drinking habits, work related problems, emotional drama, sleeping patterns, etc. A more thorough investigation might include blood tests to try to identify body imbalances such as iron deficiency, hormonal problems, diabetes, infections, etc.

Compounding this phenomenon is the fact that personal energy levels will vary significantly from individual to individual. Everyone manifests their energy levels in different ways and at different levels, which invariably varies from day-to-day, week-to-week. Accordingly, energy or fatigue needs to be looked at on a relative basis per person. A person’s energy state should be compared over periods of time rather than be compared in absolute terms with others.

In short:

Ensuring stable and good personal energy levels should be a wellness concern.
Otherwise, low personal energy becomes fatigue. Fatigue is a medical issue which is often part of or even leads to other health ailments.
3 East Meets West

Traditional Chinese Medicine (TCM) is a broad range of medicine practices based on traditions from China from well over 2,000 years ago. Similar practices were found starting from roughly the same period in many other regions, notably India, Japan, South Korea and the Middle East. While the practices vary somewhat, this body of knowledge and experience shares many common concepts including the use of acupuncture, meditation, herbal medicine, massage and other therapies. Still widely used in these countries, it has grown rapidly as a complementary alternative medicine approach in the West.

The central notion of TCM revolves around the all-important concept of Qi (or CHI). Without a basic understanding of Qi one in fact cannot even begin to penetrate the profound, complex and vast world of TCM. Qi has many meanings. At the larger metaphysical level, “Qi is the thread that connects all being [...] Qi is the common denominator of all things [...] It is the fundamental quality of being and becoming” [4].

Qi, in its more practical, narrower and clinical sense, means simply “energy” or “vitality”, or the strength to undertake either physical or mental exercise. The beauty of this aspect of Qi cannot be overstated or ever given the justice it deserves through a few sentences or descriptions. This is especially difficult given the fact that there are many different types of Qi. For our purposes, we will recognize Qi as a general phenomenon as it pertains to overall vitality. We will not examine more specific body energies such as “stomach Qi” or “kidney Qi” commonly described in TCM.

An important aspect of TCM is to examine a patient to assess both their general state of Qi or energy and Qi as it pertains to specific organs of the body. A deficiency in Qi is an important indicator of a health ailment or a precursor of a health problem, a sign that one’s health is deteriorating and requires remedy. Whereas in Western medicine, fatigue is generally considered a symptom of a malady rather than a precursor to a potential health problem. In other words, a Western doctor will find you “tired” as a result of a medical ailment such as cancer, diabetes, etc. Whereas, in TCM, fatigue is used as an important indication of fragility or a propensity to get a specific sickness. If TCM has indeed the “horse before the cart” – unlike in Western medicine – the implications for wellness are nothing short of huge.

Unlike in Western medicine, a good TCM practitioner can ascertain a patient’s general level of vitality or fatigue through examination. Instead of relying solely on a patient’s often subjective response to an enquiry about how he or she feels, in TCM a relatively objective state of fatigue or energy is ascertained. This is primarily done by asking a patient how they feel. But, the real answer to this question is verified and supplemented with an examination of a patient’s tongue and pulse. In a TCM session, the patient is typically requested to stick out his or her tongue and the TCM therapist will examine the general color and surface of the tongue to help make a judgment on a patient’s vitality level. In this same session, one or several pulse locations are felt usually on both wrists by the therapist placing his finger(s) on specific locations along the radial artery and pressing down at several levels to feel the pulse. Opening the hood and seeing if there is pep in the engine – so to speak – is an essential element in medical diagnosis. In both the case of tongue examination and especially pulse reading a status check is made of the person’s general level of energy. From this general fatigue assessment, further diagnosis is then pursued, if needed, to identify the source of the medical ailment based first to a large degree on an assessment of a patient’s general level of Qi, energy or vitality.

The pragmatist seeking to gain from this in-depth knowledge and experience of several thousand years of TCM is faced with a daunting task. The wealth of knowledge here is huge and covers every aspect of the human condition from the metaphysical down to the more banal diagnosis and cure for common day-to-day maladies such as the flu or abdominal pain. Many Westerners have sacrificed many years studying TCM by often going to China and elsewhere and plunging deep into the vast knowledge base of TCM by pouring over lots of literature on the subject and/or attending schools devoted to acupuncture and other TCM practices. The first wave of eager learners descended on China during the Maoist period. Since then there has been an exponential growth in the number of teachers of TCM practice in not only Asia but more and more in the West. It is now virtually impossible to pick up a local paper and not see some reference to TCM or an aspect of TCM which has grown in tremendous popularity such as meditation, acupuncture and herbal remedies. However, the student of TCM must be aware of the many difficulties of cultivating the jewels of this vast ocean of knowledge.
There is a huge gap in understanding between the TCM way of thinking and the fundamental ways of looking at things from the Western point-of-view. Language is especially an important barrier. There is of course the Chinese language to contend with. Written Chinese is a logographic system where symbols represent the words themselves. The word order is different, articles are not used and verb usage is very different. The oral language has its equally difficult challenges including intonation, which varies considerably per intended meaning. Perhaps the biggest language barrier are the thoughts and concepts themselves. Carl Jung, a Swiss psychiatrist and psychoanalyst and whose work was influential in the fields such as philosophy, “it all depends on how we look at things, and not on how they are in themselves” [7]. Since many of these Eastern concepts do not exist in Western language, it is difficult to conceptualize – let alone verbalize – these ideas. Accordingly, it is challenging to fundamentally understand an idea if the words are not even there to describe or mentally envision it. Alas, we are stuck with the more prosaic words “fatigue”, “energy” and/or “vitality” to describe something far more encompassing and profound: “Qi”. It is like describing a meal as “good” rather than “delicious”, “delectable” or “flavorful”.

The doctrines of Chinese medicine are rooted in books such as the “Yellow Emperor’s Inner Canon” and the “Treatise on Cold Damage”, as well as in cosmological notions such as yin-yang and the five phases. Written in the form of dialogues between an imaginary Emperor and his ministers, this text from around 100 B.C. offers explanations on everything from the cosmos to human vitality and pathology. Other books followed including the “Canon of the Pulse” (around year 280), which offered a more comprehensive handbook on diagnostics and therapy. Clearly, the Chinese language has evolved considerably along with its interpretations and meanings.

All these medical descriptions use analogies usually connected to nature for explaining a particular medical phenomenon. The Five Phases theory – an important aspect of TCM – is an example of the use of natural metaphors to explain health. They are Five Phases, also referred to as the Five Elements, which are: Wood, Fire, Earth, Metal and Water. Those with “strong Fire Qi” tend to be good at commanding others whereas those with “weak Fire Qi” are considered bland or lackluster. Some common illnesses associated with a “weak fire Qi” include palpitations, hypertension and heart problems. TCM is replete with these types of vague analogies, making pragmatic medical references challenging.

Besides, the prevalent use of vague analogies, often these Chinese terms are more holistic in their general sense of meanings and often tend to describe a function rather than an actual object. In Western language, there is the invariable cause and effect in word usage. The nouns are linked to a verbal action, which often concludes in a specified result. A chair is used to sit in. Whereas, in Chinese, the notion can be more based on the function of sitting rather than on the chair itself. Even when homing in on Qi in the narrower clinical aspect of vitality, the notion is based more on the function of Qi rather than an existing physical form of Qi. In short, one cannot touch or see Qi. Rather, it describes largely the process of creating energy i.e. more like a flow or a process, not a static physical phenomenon.

What’s more, the interpretations of these ancient texts have also changed considerably. The Five Phases has moved from the narrower definitions of actual constituents of matter – the Five Elements – to a more flexible set of distinctions used now in complementary and alternative medicine to depict interactions and relationships between phenomena. “Fire”, “wood”, etc. describe a process more than a physical property [6]. Similarly, how does one objectively quantify a “choppy pulse”, which Chinese text liken to “a knife scraping bamboo” or a “silk-worm eating a mulberry leaf” [6].

Considerable effort has been placed in defining the techniques of TCM pulse reading to better accommodate the exponential growth in the number of acupunctures in the West and elsewhere. The quality of the pulse is judged according to 28 different variables commonly recognized in TCM [8]. There is the “slippery pulse”, the “wiry pulse”, the “hollow pulse”, the “thread pulse” and many more. How can TCM practitioners stratify results among patients through the use of these metaphors? Is one pulse more slippery than another? How can clinical trials cross reference “rapid” and “long” pulses with those that have a “running” pulse but considered “hollow”?

Without more standardized ways of identifying pulses, it will be considerably difficult to create a scientific framework to allow for further medical development and progress. In modern Western medicine, medical breakthroughs arise typically not so much from one single discovery but rather as a result of an accumulation of smaller contributions from a large medical scientific community supported by peer reviews, regulatory requirements, etc. Conversely, in TCM there is little transparent medical debate among practitioners or researchers. As a result, the
knowledge and experience is fragmented and open to many different interpretations. As a result, there are pockets of knowledge based primarily on the therapists own empirical experience, which is usually not shared on the likes of PubMed, medical journals, etc.

It is also self-evident that TCM – at least for the lion’s share of its core knowledge base – did not have the advantage of modern technology and science for its development and refinement. No microscopes, CT scanners, ultrasounds, electrocardiography, MRI machines, sensors... Surely, these earlier findings need to be taken into account within the context of modern science. Otherwise, one might be tempted to negate this rich body of knowledge accumulated over thousands of years for the remarkable progress made in Western medicine.

All these challenges to understanding and applying TCM need to be considered when harboring the wonderful discoveries of these many centuries of discovery. Otherwise, this body of knowledge is interpreted either arguably in an overly mythical, quasi-religious, manner or, in a diametrically opposed way as purely “hocus-pocus” from the past. Neither of these two schools of thought will take advantage fully of this wealth of information. If modern science is not used to leverage off this know-how, it risks becoming negated or simply ignored. Instead, we are beseeched to take a more opportunistic approach and ferret through the wealth of information given to us by these earlier masters and selectively pick the crown gems from earlier discoveries and use them in today’s modern health practice.

4 Conclusion

In conclusion, Traditional Chinese Medicine offers a deep and broad understanding of a narrower focus of the subject – personal energy or Qi. We have explored why this is so important in our daily lives and how these levels of energy are regularly changing. Promoting good and sound personal energy levels should be a wellness concern. It should be the focus before bad health arises. If not, low energy levels become a problem. Low energy becomes fatigue, a precursor to further medical health issues, or even leads to more serious underlying diseases.

In the next white papers, we will explore how energy level indications can be obtained through pulse wave analysis. Modern pulse wave techniques are heart rate-based, as witnessed by the many wearables currently available. Heart rate frequencies are pervasively used by physicians for indications of heart health, and used equally extensively as an indication of sports intensity. However, to obtain a wider group of wellness and health indications, it is also necessary to examine the full pulse wave form. Pulse wave analysis is a complimentary tool to heart rate analysis to get a better and fuller understanding of personal energy and fatigue. Big data and math techniques such as machine learning provide us with an enormous advantage in taking pulse wave analysis beyond feeling the pulse with several fingers.
References


