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Understanding Traditional Chinese Medicine from a Systems Theory Perspective

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Abstract: The theory of the five elements, the yin-yang theory, the theory of qi and the meridian theory are the core components of traditional Chinese medicine. This paper attempts to integrate all of these theories under the framework of systems theory: the flow of the dynamical system is interpreted as the flow of qi; the structure of the dynamical system is understood as the structure of inter-promotion and inter-restraint of the five subsystems; the state space of the dynamical system is decomposed into two invariant sets which are similar to yin qi and yang qi; and the information system resembles that which controls the circulation of qi and regulates yin-yang. The result of integrating systems theory with traditional Chinese medicine is a more modern interpretation and understanding of traditional Chinese medicine.

Keywords: Systems theory; Dynamical system; Eigenvalue; Basic theories of traditional Chinese medicine.

Introduction

According to traditional Chinese medicine (TCM), the human body is an indivisible whole. Through the interconnection of qi, blood, body fluid secretion, nerves,

meridians and the various zang-fu organs, this indivisible whole forms an extremely complex system. According to systems theory, entities are composed of multiple functional subsystems which interconnect and interact with each other to form whole organic systems, each with a specific purpose. This paper attempts to use systems theory to describe the physiology of the human body (Xutian *et al.*, 2009; Dong and Dai 2003; Wang *et al.*, 2005) and to establish a scientific foundation for the basic theories of TCM (Chen and Xu, 2003).

The Five-Element Theory

The human body is a dynamical system that can be described by a set of nonlinear differential equations (Wagner, 1999):

$$\dot{x} = f(x) \quad x \in \Omega, \quad (1)$$

where f is a sufficiently smooth function and Ω is an open subset of R^n .

$x = (x_1(t), \dots, x_n(t))$ is the state vector in Ω . The state vector $x_0 \in \Omega$ is called the equilibrium point of the system if $f(x_0) = 0$.

TCM uses five basic substances, their abstract features and the relationships between them to describe the organic structure of the human body. Each organ and tissue is attributed to one of the five subsystems, as represented by the five zang organs (the heart, liver, spleen, lungs and kidneys). These five abstract functional subsystems, which are different from the anatomical organs, have characteristics similar to those of the five basic material elements, i.e., wood, fire, earth, metal and water. Practitioners of Chinese medicine believe that deficiency or excess in the material make-up of a zang-fu organ affects the function of that organ, which in turn promotes or restrains its material metabolism. According to the five-element theory, each abstract functional subsystem promotes and/or restrains the functions of other abstract

functional subsystems: wood promotes fire, fire promotes earth, earth promotes metal, metal promotes water and water promotes wood; meanwhile, water restrains fire, fire restrains metal, metal restrains wood, wood restrains earth and earth restrains water, thereby forming the five-element structure of the human body (Wiseman and Ellis, 1993) (Fig. 1).

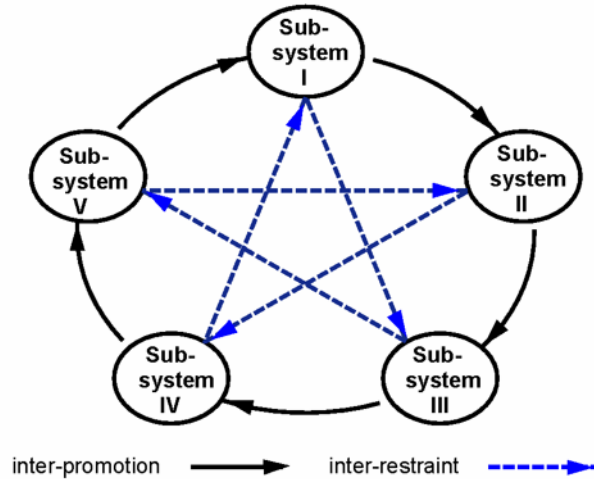


Figure 1: A causal diagram representing the interconnection and interaction of the five abstract functional subsystems of the human body.

First, let us consider the systems of inter-promotion and inter-restraint operating within the five subsystems. For simplicity, let us suppose we have a system described by five variables which represent five abstract functional subsystems (Zhang *et al.*, 2011; Zhuang *et al.*, 2003). At the equilibrium point x_0 , the linearized system can be written as

$$\frac{dy}{dt} = Ay,$$

where A is the Jacobian matrix evaluated at x_0 , $A = Df(x_0)$. The linear system has the following structure:

$$\frac{d}{dt} \begin{pmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \end{pmatrix} = \begin{pmatrix} 0 & 0 & 0 & -\beta_1 & \alpha_1 \\ \alpha_2 & 0 & 0 & 0 & -\beta_2 \\ -\beta_3 & \alpha_3 & 0 & 0 & 0 \\ 0 & -\beta_4 & \alpha_4 & 0 & 0 \\ 0 & 0 & -\beta_5 & \alpha_5 & 0 \end{pmatrix} \begin{pmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \end{pmatrix},$$

where α_k and β_k are positive parameters, $k = 1, 2, \dots, 5$.

For simplicity, we will only consider the system of inter-promotion operating within the five subsystems. All values of $\beta_k = 0$ and the system has the following structure:

$$\frac{d}{dt} \begin{pmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \end{pmatrix} = \begin{pmatrix} 0 & 0 & 0 & 0 & \alpha_1 \\ \alpha_2 & 0 & 0 & 0 & 0 \\ 0 & \alpha_3 & 0 & 0 & 0 \\ 0 & 0 & \alpha_4 & 0 & 0 \\ 0 & 0 & 0 & \alpha_5 & 0 \end{pmatrix} \begin{pmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \end{pmatrix}. \quad (2)$$

The matrix A has eigenvalues $\lambda_k = \alpha e^{2k\pi i/5}$, $k = -2, -1, 0, 1, 2$, where

$$\alpha = (\alpha_1 \alpha_2 \alpha_3 \alpha_4 \alpha_5)^{1/5}, \quad \text{Re}(\lambda_k) > 0 \quad (k = -1, 0, 1) \text{ and } \text{Re}(\lambda_k) < 0 \quad (k = -2, 2).$$

The general solution of the linearized system (2) can be written as

$$y_k(t) = \prod_{i=1}^k \left(\frac{\alpha_i}{\alpha} \right) \left(C_1 e^{\alpha t} + C_2 e^{\lambda_1 t} \cos(\omega_1 t - 2k\pi/5) + C_3 e^{\lambda_1 t} \sin(\omega_1 t - 2k\pi/5) \right. \\ \left. + C_4 e^{\lambda_2 t} \cos(\omega_2 t - 4k\pi/5) + C_5 e^{\lambda_2 t} \sin(\omega_2 t - 4k\pi/5) \right),$$

where $k = 1, 2, \dots, 5$, $\lambda_1 = \alpha \cos(2\pi/5)$, $\lambda_2 = \alpha \cos(4\pi/5)$, $\omega_1 = \alpha \sin(2\pi/5)$, and $\omega_2 = \alpha \sin(4\pi/5)$.

The concept of qi is fundamental to TCM. Qi can be understood as the flow of energy through the human body (Low and Ang, 2010). All life activities result from movements and changes in qi. The flow of the dynamical system of the human body is the flow of qi. Qi can be categorized as either yin qi or yang qi. In this paper, we use mathematical operations to define yin qi and yang qi.

Yin-Yang Theory

The ancient Chinese concept of yin-yang describes the interrelationships between two apparently opposite sets of things or phenomena in the universe. Things and phenomena that are warm, active, excited, hyperactive and/or exhibiting an ascending motion are categorised as yang. Cold, passive and inhibited things or phenomena, and those showing a declining or descending motion, fall under the category of yin.

Invariant Manifolds

An equilibrium point x_0 is said to be hyperbolic if the Jacobian matrix $A = Df(x_0)$ has no eigenvalues with zero real parts. If the equilibrium point is hyperbolic, the solution of the linearized system can be written as a direct sum of the stable eigenspace E^s and the unstable eigenspace E^u . The stable eigenspace E^s is the space spanned by the eigenvectors whose corresponding eigenvalues have negative real parts, and the unstable eigenspace E^u is the space spanned by the eigenvectors whose corresponding eigenvalues have positive real parts.

We first analyze the local behavior of the dynamical system (1) near a hyperbolic equilibrium point. If the Jacobian matrix at the equilibrium point x_0 has exactly k eigenvalues with positive real parts, x_0 is called a type- k equilibrium point. There exists a neighborhood Ω of x_0 and local stable and unstable manifolds

$$W_{loc}^s(x_0) = \left\{ x \in \Omega : \lim_{t \rightarrow \infty} \phi_t(x) \rightarrow x_0 \right\}$$

and
$$W_{loc}^u(x_0) = \left\{ x \in \Omega : \lim_{t \rightarrow -\infty} \phi_t(x) \rightarrow x_0 \right\},$$

where $\phi_t(x)$ is the flow of the nonlinear system of (1). $W_{loc}^s(x_0)$ and $W_{loc}^u(x_0)$ are two invariant sets which have the same dimensions as those of the eigenspaces E^s

and E^u (Perko, 1996).

Energy Functions

If x_0 is a type- k equilibrium point, there exists a nonsingular matrix P such that the matrix A can be diagonalized to form the block diagonal matrix

$$P^{-1}AP = \begin{pmatrix} A_+ & 0 \\ 0 & A_- \end{pmatrix},$$

where $A_+ \in R^{k \times k}$ has eigenvalues with positive real parts and $A_- \in R^{(n-k) \times (n-k)}$ has eigenvalues with negative real parts. Let $y = (y_1, y_2)$, where $y_1 \in R^k$ and $y_2 \in R^{(n-k)}$.

The state vector $y = P^{-1}x$ satisfies the differential equation

$$\frac{d}{dt} \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = \begin{pmatrix} A_+ & 0 \\ 0 & A_- \end{pmatrix} \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} + \begin{pmatrix} f_1(y) \\ f_2(y) \end{pmatrix}.$$

We define an energy function $V(y)$. If x_0 is a type- k equilibrium point, there exist two positive definite matrices $B_1 \in R^{k \times k}$, $B_2 \in R^{(n-k) \times (n-k)}$, and the energy function

$$V(y) = y_1^T B_1 y_1 + y_2^T B_2 y_2.$$

The function $V(x)$ is a nonnegative function of the nonlinear system (1).

If $x \in W_{loc}^s(x_0)$ and $x \neq 0$, $\dot{V}(x) < 0$; if $x \in W_{loc}^u(x_0)$ and $x \neq 0$, $\dot{V}(x) > 0$. The energy function decreases in time along the orbit with state space in $W_{loc}^s(x_0)$ and increases in time along the orbit with state space in $W_{loc}^u(x_0)$.

Yin Yang of the Human Body

Consider the nonlinear dynamical system (1). The stable manifold $W_{loc}^s(x_0)$ denotes

the set of points that flow forwards in time to the equilibrium point, and the unstable manifold $W_{loc}^u(x_0)$ denotes the set of points that flow backwards in time to the equilibrium point. We take the concept of the stable manifold to define yin qi, and that of the unstable manifold to define yang qi. These two invariant manifolds are used to study the qualitative behavior of our bodies. Qi can be defined as ‘vital energy’ or ‘life force’.

Under normal conditions, the human body should maintain homeostasis. The local stable and unstable manifolds represent two opposite and complementary flows of energy: energy release and energy absorption. According to TCM, yin and yang should remain in a state of dynamic balance (Seki *et al.*, 2005). Diseases arise when their balance is destroyed. The stable and unstable manifolds represent two aspects of motion: contraction and expansion (Porkert, 1974). When these two aspects no longer counterbalance each other, the result is a surfeit of yin or yang.

Evaporation and condensation are processes of change in the state of matter. The human metabolism can be divided into two main categories: catabolism and anabolism. Together, evaporation, condensation, catabolism and anabolism constitute the processes of energy release and absorption (Adams, 2007; Goldberg *et al.*, 1976; Ni, 1995). Under normal conditions, the human body should maintain a dynamic balance in its metabolism and energy flow. Anabolism uses energy to construct cells and living tissues, while catabolism breaks down organic matter to release energy for physiological activities. The organs promote material metabolism and produce the substances necessary to maintain the body’s physical form, e.g., amino acids, proteins and enzymes. These fundamental substances are also the material bases for the body’s activities. Chinese medicine holds that the body’s physical forms pertain to yin, and its activities or functions pertain to yang (Porkert, 1974).

The internal organs show different qualities associated with yin and yang. The five zang organs are solid, and their main activities are the synthesis and storage of essential substances and qi. The six fu organs (gallbladder, stomach, large intestine, small intestine, bladder and 'triple burner') are hollow organs, chiefly responsible for transforming, transporting, digesting and excreting bodily fluids. Chinese medicine holds that the zang organs pertain to yin and the fu organs pertain to yang (Ni, 1995) .

Theory of Qi

In the context of TCM, system openness describes the interaction between the human body and its external environment that takes place in the exchange of materials, energy and information. As an open system, the human body must constantly exchange substances, energy and information with nature to maintain its metabolism. People obtain nutrition from nature through breathing and eating, which supply materials and energy for consumption. Through a series of digestive processes, nutrients are converted into the substances necessary for the human body to sustain its life activities.

According to TCM, qi is both the essential substance of the human body and the vital energy which drives the circulation of essential substances among the five subsystems. This flow of energy is derived also from the essential substance for various physiological processes. Qi is the flow of energy that is gained or released during circulation.

'Qi transformation' refers to the various processes by which materials are generated and transformed in the movement of qi (Maciocia, 1989). For example, food and water are transformed into qi, blood and body fluids, which are in turn converted into the essential substances of the five zang organs. This entails the metabolism and transformation of substances, as well as the process of energy conversion. The energy

required for the conversion process is provided by yin qi and yang qi.

The movement of qi is known as 'qi activity', which can be divided into four basic patterns: ascending, descending, exiting and entering. Energy conversion occurs during the collision and interaction of yin qi and yang qi. The kinetic energy of yang qi is reduced, resulting in downward movements, while the kinetic energy of yin qi increases, resulting in upward movements. For this reason, it is also called 'yin ascending and yang descending' (Kaptchuk, 1991).

In the context of the human body, qi is the flow of energy gained or released during qi transformation and qi activity. The processes involved in qi transformation and qi activity must take place in a coordinated manner to maintain a dynamic balance of energy. In other words, the coordination and orderly interaction of yin-yang in the human body is important to sustain normal life activities.

Balance between Yin and Yang

Metabolism, homeostasis and adaptation are central to the functioning of all living systems. Human life is affected by the structure of the body, eating habits and changes in the external environment. The body transforms food and air into qi and blood, and then converts qi and blood into substances necessary to maintain metabolism. The movement of qi is dependent on energy transformations which drive the flow of qi and blood through the whole body.

The external environment changes constantly. During the exchange of materials, energy and information between the body and its surroundings, the body must maintain a dynamic balance in its physical form and kinetic energy. Yin and yang play important roles in qi transformation and qi activity. The human body must maintain a dynamic balance between yin and yang. According to TCM, maintaining this balance ensures that our bodies are healthy and disease-free (Ni, 1995).

Rhythmic Changes

Rhythm of the Five Zang-Organs

Human beings have a very close relationship with nature. The human body must adapt to changes in the external environment. The Earth's rotation and orbit produce, respectively, a twenty-four-hour cycle of day and night, and a four-season cycle. These cyclical changes directly affect the human body's biological clock. In TCM, each of the five zang organs has a corresponding season, with periods of heightened activity and, conversely, rest.

The five elements also represent five phases or five activities in the cycle of the seasons. According to TCM, the five zang organs of the human body – liver, heart, spleen, lungs and kidney – correspond to spring, summer, long summer, autumn and winter, respectively (Kendall, 2002). Due to their cyclical structure of inter-promotion and inter-restraint, the five zang organs of the human body show a regular annual rhythm correlating with the four seasons of a year. There are also mathematical grounds for this phenomenon from the mathematical model. According to the solutions of system (2), $\sin\left(\omega_1 t + \frac{2k\pi}{5}\right)$ and $\cos\left(\omega_1 t + \frac{2k\pi}{5}\right)$, $k = 1, \dots, 5$ have the same phase shift, which equals one fifth of the period 2π ; and $\sin\left(\omega_2 t + \frac{4k\pi}{5}\right)$ and $\cos\left(\omega_2 t + \frac{4k\pi}{5}\right)$, $k = 1, \dots, 5$ have the same phase shift, which equals one fifth of the period 4π .

Rhythm of Yin and Yang

The waxing and waning of yin and yang describe the alternating changes in yin and yang, wherein one progresses as the other declines, and vice versa. Yin and yang are never static. In nature, yin and yang change periodically on a daily and yearly basis.

Correspondingly, the yin-yang balance in the human body changes according to natural circadian rhythms (Ramsey *et al.*, 2007; Moore-Ede, 1986; Habbal and Al-Jabri, 2009).

The human body is an open system. As materials and energy are exchanged with the external environment, the human body must maintain a dynamic internal balance of matter and energy. One of the most important functions of qi is to provide sufficient power to mobilize both qi and blood to sustain the metabolic process.

During the day, the body's physiological functions are more active. Greater energy consumption is required to supply the demands of physical and intellectual labor during the daytime. The catabolic process, which releases energy from the breakdown of large molecules, is one illustration of the decline of yin as yang increases. However, yin and yang must work in a complementary fashion. Consuming excessive amounts of basic substances leads to a loss of qi, which is essential to the functioning of the five zang organs. At night, the body's physiological functions are comparatively suppressed. During this time, the human body expends more energy on anabolism, which constructs molecules from smaller units. This process is an illustration of the decline of yang as yin increases. In the human body, yin and yang exhibit a regular alternating cycle corresponding to the natural rhythm of day and night.

The Orderliness of the System of the Human Body

TCM emphasizes the correspondence between nature and humankind. In other words, the human body and nature are understood to exhibit similar rhythmical changes. The five-element system in the human body changes in a regular fashion according to the earth's rotation and orbit. Similarly, yin and yang undergo orderly changes in the human body which correlate with changes in the external environment: yin waxes as

yang wanes, and vice versa.

As an open system, the human body must maintain a constant exchange of substances, energy and information with its natural environment. To operate effectively, the body must also have an information system to coordinate the interaction of the body with its external environment, as well as the interaction between the body's five abstract functional subsystems and their various organs and tissues. By this means, an orderly and self-organizing system is constructed to maintain the proper functioning of the human body.

In the context of TCM, 'governing the exterior to infer the interior' refers to the process by which the operation of the zang-fu organs and the mechanisms of qi and blood, yin and yang can be deduced from the external conditions of the body (Kaptchuk, 1991), because the information available on the surface of the body is understood to reflect physiological and pathological changes inside the body.

The bio-holographic law (Schjelderup, 1992) refers to a certain relationship of correspondence between the component and the whole. The health of qi and blood is reflected in local parts of the body. When a disease occurs inside our organs, related information can be obtained from the eyes, ears, nose, tongue, pulse, acupuncture points, etc. The site of disease can thus be inferred. There is a close relationship between acupuncture points and the zang-fu organs (Vickers and Zollman, 1999). Acupuncture points are the input and output terminals of messages relating to the interior of the human body (Gao and Gao, 2008). When an acupuncture point is stimulated, a signal is transmitted to its corresponding zang-fu organ(s). By this means, we can obtain information about the health of particular organs, and adjust their functioning. The signal also spreads to other acupuncture points.

Practitioners of traditional Chinese medicine believe that the meridians are responsible for the circulation of qi and blood, thereby regulating yin and yang

(Wiseman and Ellis, 1993). The flow of qi and blood in the human body are observed to follow the direction of the meridian lines. The operation of qi and blood follows some of the basic principles of yin and yang. Their sequential operation should meet the energy needs of zang-fu organs and tissues. At the same time, their proper functioning ensures that yin and yang remain balanced within the human body despite changes in the external environment.

Synergetics

The theory of synergetics was proposed by H. Haken in 1969 (Haken, 1997). Each system under study is composed of many subsystems. Synergetics is the study of the interaction and collaboration of these various subsystems. At a fundamental level, it addresses the concepts of stability and instability, control parameters, order parameters and the enslavement principle. The behavior of an open system is affected by aspects of the external environment (control parameters). Driven by its order parameters, the system moves from a disorderly to an orderly state, forming a new structure and functionality and ultimately evolving into a self-organizing system.

The Processes of Evolution

Nature is not static. Living systems are constantly evolving. The ancient Chinese philosopher Lao Tzu said: “All things connote the yin and yang. The yin and yang keep acting upon each other. And thus things keep changing and unifying themselves” (Lao, 1990). Yin and yang represent two aspects of motion: contraction and expansion. When a system is in a state of balance between yin and yang, it is able to maintain homeostasis. When homeostasis is lost, due to the failure of yin to restrict yang or excessively rapid changes in the external environment, the system becomes unstable, which damages its components and functioning (Arthur, 1990; Crespi, 2004). As a

result, the structure of the system is no longer conducive to its development. The system moves from one equilibrium point to another equilibrium point and thus enters a process of evolution by which its structure is created anew (Corning, 1995). Figure 2 shows the system transition from one equilibrium point to another equilibrium point. The yin-yang of the system also changes from yin into yang and yang into yin (also called ‘mutual transformation between yin and yang’).

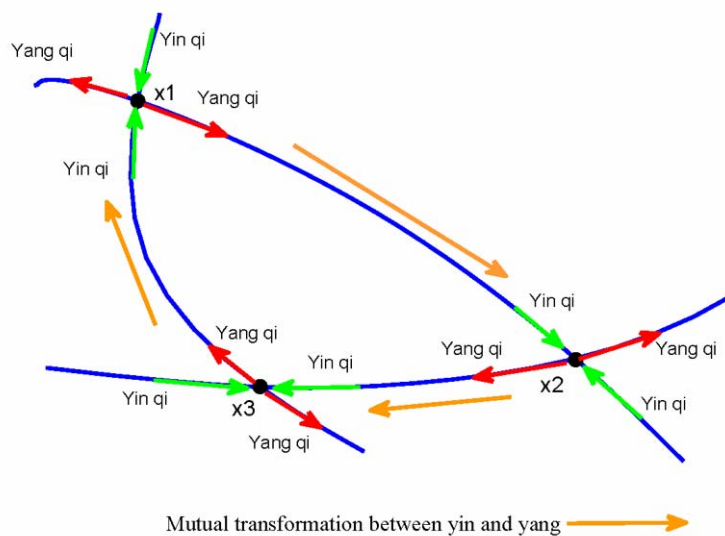


Figure 2. x_1, x_2 and x_3 are equilibrium points. The system moves from one equilibrium point to another equilibrium point through the mutual transformation between yin and yang.

Order Parameter Principle

To establish a structure for a system is to establish relationships of mutual coordination and cooperation between the subsystems. The order parameters determine the behaviour of each subsystem, and thus the behavior of the whole system.

The human body is composed of five abstract functional subsystems, $S = \{S_1, S_2, \dots, S_5\}$, where S is the system of the human body, and

$S_k, k=1,2,\dots,5$ refers to each of the five abstract functional subsystems. Relationships of inter-promotion and inter-restraint operate between these five subsystems. Each abstract functional subsystem is composed of its corresponding zang-fu organs and tissues:

$$S_k = \{S_{k,1}, S_{k,2}, \dots, S_{k,n_k}\}, k=1,2,\dots,5,$$

where $S_{k,j}, j=1,2,\dots,n_k$ is the sub-subsystem of the k -th abstract functional subsystem. The system of the human body is the result of long-term evolution. In the course of evolution, the human body continuously improves its information systems. Controlled by order parameters, the body regulates resource allocation and the structure of each subsystem, including the zang-fu organs and tissues, so that the human body becomes a self-organizing system.

Order parameters play a role in coordinating internal operations. TCM places a great emphasis on the coordinated and orderly behavior of qi and blood. In physiological terms, the five abstract functional subsystems are linked by interrelationships of promotion and restraint. However, the zang-fu organs and tissues of the human body are incapable of operating independently. All organs must be linked together as a whole before they can carry out their proper functions. The qi of the human body is also the qi of the five abstract functional subsystems, which are highly coordinated and cooperate closely. The distribution and excretion of body fluids depend on the movement of qi, which should circulate smoothly and in an orderly manner. When qi and blood flow too fast, the human body is over-stimulated, and behaves in an uncontrolled fashion; when supplies of qi and blood are inadequate, the body collapses. The circulation of qi and blood must, therefore, be coordinated and proceed in an orderly fashion. An intermediary is required to provide the information necessary to coordinate their operation.

During the exchange of energy and matter between the human body and the external environment, the body must maintain a dynamic balance in both its kinetic energy and its physical form. The five abstract functional subsystems of the human body must be synchronized with nature's rhythms. Again, the body requires information to set its biological clock so that various organs can conduct their activities in an orderly manner (Albegov, 2010).

Order parameters also play a role in coordinating the body's yin and yang. The human body carries out different physiological activities at different times. According to TCM, its yin and yang should be synchronized with the yin and yang of nature. The zang-fu organs exhibit different yin and yang properties, and require different amounts of energy to operate. The zang-fu organs also need information to regulate their operation and thereby ensure that yin and yang remain coordinated and orderly. This in turn enables qi to flow smoothly and maintain a harmonious balance within the body.

The 'spontaneous harmonization of yin and yang' refers to the yin and yang of the human body: under normal conditions, these two aspects maintain homeostasis automatically; and in a pathological state, these two aspects have the ability to restore their balance (Wang, 2012). Yin and yang must work complementarily, via mutual interaction and restriction, to achieve a state of harmonious balance. The spontaneous harmonization of yin and yang means that in the long-term evolutionary process, the human body continuously optimizes its system structure and its information systems to ensure that yin and yang maintain the best conditions for homeostasis and self-recovery.

Conclusion and Perspectives

TCM can be characterized as holistic, addressing the essence of human life. TCM has

a unique theory and methodology. After thousands of years of evolution, TCM has gradually formed a unique theoretical system. Systems theory also emphasizes the holistic: linkages between internal elements of the system, and between the system and its external environment. This paper uses systems theory to interpret the basic theories of TCM.

TCM is based on the theory of the five elements, the yin-yang theory, the theory of qi and the theory of the meridians. Each of these theories has its own specialty, but integration under a single framework provides a more modern interpretation that facilitates scientific understanding. We show in this paper that systems theory can explain the structure of the human body through the theory of the five elements; physiological activities and pathological changes through the theories of qi and yin-yang; and information and control mechanisms through the theory of the meridians.

With the rapid development of science and technology, Chinese medicine should make use of modern science and technology to promote the modernization of technology as well as its theoretical system. The basic theory of TCM comes from the long-term observation and summarization of all experiences and practices. TCM offers a thorough explanation of the physiological and pathological changes of the human body in various capacities, and has very important scientific implications nowadays. Systems theory makes the integration of TCM and Western medicine a reality.

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