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Physiological Crosstalk, Taijiquan, Qigong, And Traditional Chinese Medicine

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Abstract: Taijiquan (TJ) and Qigong (QG) are part of the Traditional Chinese Medicine (TCM) therapeutic arsenal, together with acupuncture, moxibustion, Tui Na, pharmacology, dietetics, and surgery. In the Chinese Warring States Period (475-221 BC), physical exercises were already practiced for maintaining health, and represent the fundamentals of QG while TJ was created as a martial art and later practiced as a therapeutic method. They differ from western physical education because they intend to make beneficial modifications in the Qi (energy), the blood, the body fluids, and promote the harmonious flow of the Qi in special channels and collaterals named Jing-Luo, which are concepts quite different from Western physical education. Nowadays researchers have been demonstrating the existence of the Jing-Luo, although they still don´t know the nature of the Qi. Ancient Chinese theories explain this energetic physiology. According to modern science, Exerkines are humoral factors secreted into circulation in response to exercise, which is responsible for the interplay between distant organs and systems. The intercommunication exerted by these biomolecules resembles parts of Chinese theories and could be a reference to evaluate the Chinese theories, and/or, the Chinese theories could be tested as a guide for searching for new biomolecules.

Keywords: Oriental medicine, martial arts, Tai Chi Chuan, meditation, mindfulness

Introduction

Taijiquan (TJ), Qigong (QG), and Traditional Chinese Medicine (TCM) are health preservation methodologies. Although QG's origins are related to ancient dancelike imitations of the animals' movements and TJ was born from a combination of Chinese martial arts and Taoism, both were incorporated as part of the TCM therapeutic arsenal, together with acupuncture, moxibustion, Tui Na, pharmacology, dietetics and surgery (Zhang et al., 2020; Guo et al., 2016, 2013; Zixin et al., 2000; Xu et al., 1992; SATCM, 1990; Feng et al., 1984). Their basic theories were already mature in Chinese civilization thousands of years ago (1150-221 BC) and were widely discussed in books such as Huang Di Nei Jing, I Jing, and Dao De Jing (Yellow Emperor Classic of Internal Medicine, Classic of Changes, The Classic of the Way and Virtue, respectively). The ancient illustration Dao Yin Tu (Illustrated Breathing Exercises), from the Warring States Period (475-221 BC) shows that special physical exercises were already practiced for maintaining health and for treating different pathologies in men and women. Three categories of exercises: respiratory, body and limbs, and apparatus exercises were indicated for dredging and supplying the body´s energy,

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defined as Qi, in Chinese culture (Zhang et al., 2020; Zixin et al., 2000; Ping et al., 1999; Burton Watson,1992; Yu et al., 1991; Wilhelm,1988; Feng et al., 1984; Lima, 1983; Wang & Zeng, 1983).

The theoretical basis of TJ, QG, and TCM deals with the relationship between the human being and the universe, explaining the Qi - the energy that forms all the universe, and the laws which drive the Qi manifestation and differentiation, mainly the Yin-Yang and Five elements' theories. In the human body, the digestion of food and drinks generates the Qi, blood (Xue), and body fluids (Jing-ye). The Qi in our body can be differentiated into many forms: the pectoral Qi, the nutritive Qi, the defensive Qi, and the primordial Qi. All of them together form a new kind of Qi: Zheng Qi - The Qi of the channels and collaterals (Jing-Luo) and circulate through the body, connecting all parts of the body. They are commonly named "acupuncture meridians" (Li, 2014; Kit, 2001; Zixin et al., 2000; Ping et al., 1999; Chai, 1998; Cheng et al., 1997).

TJ, QG, TCM, and western science – the physiological crosstalk

TJ and QG are Chinese methods of physical exercises, breathing techniques, and mental training, practiced in combination for health preservation and/or martial purposes. They differ from western physical education because they intend to move, tone, calm, dredge, supply, and make many beneficial modifications in the Qi, the blood, and the body fluids, to promote the emotional balance of the practitioner, prevent and cure diseases, and prolong life. Many of the qigong styles are targeted prescriptions to treat specific organs and systems (Zhang et al., 2020; Guo et al., 2016, 2013; Li, 2014; Zixin et al., 2000; Ping et al., 1999; Mingwu & Xingyuan, 1985). Western science is also looking for answers about the physiological processes that could make exercises become targeted prescriptions, mimicry pharmacologic interventions, and identify molecular targets that can be synthesized to artificially produce the effects of exercise in people physically and/or mentally unable to practice them (Sanford et al., 2020).

As mentioned before, the Chinese theories related to TCM, TJ, and QG are based on the observations of the human being´s relationship with the Universe and how it influences one´s health. According to these theories, one must follow the universal laws to maintain health and prolong life, to live in syntony with the changes of Yin-Yang, receive and balance the energies of Heaven and Earth, air and food in the body. To preserve the Qi and promote the harmonious union of the Yin and Yang in the body is the way for strengthening health and prolonging life. Emotional balance and wisdom are also considered essential for a healthy life. Taoism and other philosophical schools such as Buddhism and Confucianism also took part in this historical process beside Yin-Yang and Five elements theory and influenced TJ, QG, and TCM (Zhang et al., 2020; Guo et al., 2016; Li, 2014; Zixin et al., 2000; Ping et al., 1999; Mingwu & Xingyuan, 1985; Jwing-Ming, 1989).

In the 1970s, TCM and Kung Fu (Wushu) gained popularity in the West. In the 1980s, Qigong also began to grow fast outside China. The benefits of Taijiquan and Qigong were explained under the complexity of the Chinese theories and making them incomprehensible and almost unbelievable for western practitioners and scientists despite their success (Zixin et al., 2000; Jwing-Ming, 1989). The concepts of Dao (Tao) and Qi are unique in Chinese culture, which makes these terms impossible to translate perfectly. According to this traditional knowledge, the body is seen as an integrated system of production, storage, functions, and substances, where the organs (Zang-fu) and tissues are interconnected by a network of Jing-luo –

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acupuncture meridians (Ping et al., 1999; Chai, 1998).

Researchers have been demonstrating the existence of these channels and collaterals in animals, although they still don´t know the nature of the Qi (Zhang et al., 2015; Li et al., 2012; Wang et al., 2010). Li et al., 2021 introduced fluorescent contrast agents in humans' forearms acupuncture points (pericardium points) and investigated the morpho-physiological processes through diagnostic imaging techniques, such as ultrasound and infrared vein detectors. The fluorescence was observed in the forearm with a laser beam. Photographic images were obtained and recorded with special filters and images were taken. They observed fluorescent lines and some acupoints proximately along the pericardium channel that cannot be attributed to blood vessels or lymphatics. The third point of the channel (pericardium 3 – PC3) was detected in the traditional location demarcated before the experiment. This evidence may help to demonstrate to the west an unknown interconnection between different organs and tissues, in the following years.

Nowadays, western science has discovered an intercommunication system between organs and tissues (crosstalk) performed by different classes of biomolecules that are responsible for the interplay between distant organs. During exercising, the crosstalk is mediated by many biomolecules secreted in response to exercise. "Exerkine" is the general term covering any humoral factors (peptides, metabolites, and RNAs) secreted into circulation in response to exercise, promoting modifications in the functions of the brain, liver, pancreas, fat, heart, skeletal muscle, bone, and immune system. The skeletal muscle is considered the largest secretory organ that exerts paracrine, autocrine, and endocrine effects through the release of specific cytokines, named myokines (Magliulo et al., 2021; Severinsen, Pedersen, 2021; Whitham, Febbraio, 2016).

Myokines were mostly identified in human skeletal muscle biopsies and blood plasma after physical training or following one acute bout of exercise, however, the published data only suggests the existence of several exercise-regulated cytokines (myokines). Current laboratory methods limitations, and a wide variety of cells that produce cytokines, growth factors, and regulators or components of the extracellular matrix (ECM) represent a challenge in this field of physical exercise science (Hoffmann, Weigert, 2017).

In the context of TJ and QG, which are physical exercises characterized by low or moderate intensity, the systemic cytokine responses may not follow the same pattern the myokines identified after intense modalities as downhill running, eccentric exercise, and resistance training (Paulsen et al. 2012). Perhaps, the crosstalk between these cytokines, produced under different exercise intensities, may elucidate the physiological crosstalk described in TCM theories, by the five elements theory and/or Jing-luo physiology.

For example, studies in rodents demonstrated that bone response to exercise can regulate the production of myokines. The release of the bone-derived hormone osteocalcin affects the muscle substrate oxidation capacity and its production of Interleukin-6 (IL-6), which in turn stimulates osteoclast differentiation and the release of osteocalcin (Sims, 2021; Chowdhury et al., 2020; Lee et al., 2019; Mera et al., 2016).

Osteocalcin is an osteoblast-specific protein, a marker of osteogenesis, and promotes muscle adaptation to exercise. The uncarboxylated osteocalcin increases the pancreatic insulin secretion and testis testosterone production by mechanisms of

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cell proliferation while circulating osteocalcin is also regulated by insulin. During aging, a decrease in osteocalcin secretion coincides with a decline in cognitive and exercise capacity, but physical exercise can increase the levels of osteocalcin (Gerosa, Lombardi, 2021; Sims, 2021; Lee et al., 2019; Mera et al., 2016, Zoch et al., 2016). Fulzele et al., 2010, 2007, suggested that osteocalcin influences glucose metabolism, reproduction, and cognition through endocrine loops between bone and the pancreas, brain, and testes.

In the context of TCM theory, the bone is related to the kidney, which is the organ responsible for sexual reproduction, growth, development, and production of marrow to fill up the brain. In Huang Di Nei Jing, they state that the brain is the sea of the marrow. According to the Five Elements theory, kidneys belong to the element "water", which makes the brain, bone, and reproductive organs related to this element. The water has the functions of interacting, overacting and counteracting with the "earth" element, which includes the muscles, pancreas, stomach, spleen, and mouth (Wu, Wu, 1997; Cheng et al., 1997). When we compare the cited scientific published data related to osteocalcin, with Chinese theories, the following figure can be seen:

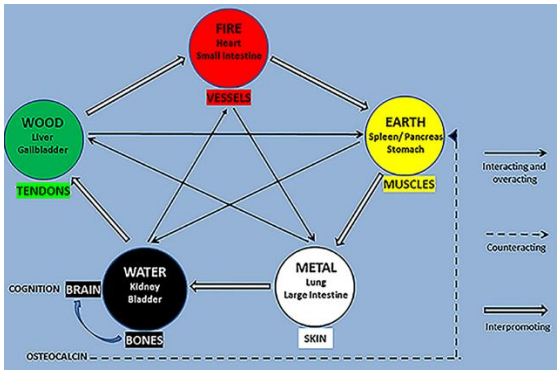

Figure 1. Water: Osteocalcin influences cognitive capacity and testosterone production. Water- - - -▶Earth: Osteocalcin influences muscle adaptation to exercise and the pancreatic insulin secretion.
Earth ⟶ Water: insulin regulates the circulating osteocalcin.

The exposed relationships between modern science and Chinese theories need to be investigated deeper but this preliminary evaluation shows interesting common points and stimulates the investment in research. The concepts of inter-organ relationships in Five Elements can be better understood when combined with Yin-Yang, Zang-fu (internal organs), and Sanjiao (Triple Warmer) theories, among others.

Zhang et al., 2019, published a meta-analysis and trial sequential analysis on Tai chi for treating osteopenia and primary osteoporosis. They concluded that current evidence is insufficient due to the low methodological quality of the randomized controlled trials that compared TC with a control group. However, TJ may improve bone mineral density (BMD) values and relieve osteoporotic pain in patients. Effects in the osteocalcin production were not identified but benefic effects on the level of bone GLA protein, which can bind calcium and hydroxyapatite, and accumulate in bone have been found (Cancela et al., 2014). Current evidence for treating osteopenia and primary osteoporosis through TJ is insufficient. A systematic review of evidence on the health benefits of traditional Chinese sports and physical activity for older adults (Guo et al., 2016) described similar results for TJ on bone health and concluded that QG also improved bone mineral density in menopausal women (BMD), although they cited few references for both.

Conclusion

The approach to developing a combination of Eastern and Western medical science is in the beginning, compared to the long history of Chinese medicine, and the

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advance of modern science will prove or disprove the ancient theories. Other exerkines and biomolecules responsible for the crosstalk between different organs and systems could be a reference to evaluate the Chinese theories, and the contrary is also valuable, the Chinese theories could be tested as a guide for searching for new biomolecules.

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Conflict of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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