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Physiological Changes Accompanying Qigong and Acupuncture

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Introduction to Qigong, Acupuncture, and Related Practices

"Qi", the Chinese character for air, is a Chinese/Oriental term for an abstract form of energy that is considered vital to the mind and the body. Traditionally, Qi circulated through channels of the body known as "Meridians", is referred to as "Internal Qi". Proper flow of internal Qi is deemed to be important for good health, while blockage of Qi is associated with disease and dysfunction. When the energy is projected out from a certain part of the body (most frequently the hands) and transferred to another person or object, it is referred to as "External Qi". While the ideas of Qi and meridians remain unexplained in Western medicine, there is increasing scientific evidence that they may have great relevance to our understanding of human health and disease.

"Qigong" refers to the Chinese mind/body training and exercises that leads to enhancement and control of Qi and its direction to different parts of the body for improvement of physical and mental health. There are many styles or schools of Qigong, but they all share the following essential components. (1) Body regulation: the body is held in a stationary position (e.g., Sun Yi Standing Meditation) or goes through a series of motions (e.g., Tai Chi). (2) Mind regulation: the mind is cleared of all distractions and is usually focused on a single thought (e.g., imagining a moving object or Qi circulating in the body). (3) Respiratory regulation: slow and deep breathing cycles some times including breath-holding steps, with emphasis on abdominal breathing using the diaphragm more than chest muscles.

"Qigong Therapy" refers to the transfer of external Qi from a Qigong practitioner or healer to a patient's body to increase the quantity and the flow of Qi in the recipient to cure a variety of disorders. This type of therapeutic effect is supposed to be similar to that produced by acupuncture therapy, in which the flow of Qi in the patient is enhanced by stimulation of specific points (acupoints) by needles along the meridians.

Present Status of Acupuncture and Qigong in the United States

Following its broad exposure in the U.S. in the early 1970's with Nixon's visit to China, acupuncture is now a well established medical treatment in this country. In California, there are over 10,000 state licensed acupuncturists, and acupuncture therapy is covered by several major medical insurance companies. However, while the medical benefits of acupuncture are now well recognized by the Western medical community, a clear picture of

the biological basis of acupuncture is only now emerging as a result of research in recent years. By comparison, Americans have little or no understanding of Qigong practice and therapy. The barrier to the integration of Qigong into Western society has stemmed from the difficulty in differentiating the plethora of such practices, the absence of formal training programs and licensing agencies, and the lack of rigorous research by the scientific and medical establishments.

Research on Qigong Practice

While there has yet been a clear demonstration of internal Qi using modern instrumentation, the following studies indicate that Qigong practice produces a number of measurable physiological changes.

Effects on the Immune System. Published research conducted by Dr. Brian Jones of Hong Kong University showed that 14 weeks after starting practice of Guolin Qigong (a style popular among Chinese cancer patients), a group of normal subjects had a substantial decrease in stress hormone (i.e., cortisol) and white blood cells secreting Interleukin 10 (suppresses anti-cancer immunity), and an increase in white blood cells secreting Interferon gamma (protects against cancer) in the blood stream (Ref. 1).

Effects on Acupoints and Meridians. On-going studies performed on Qigong and Tai Chi experts (over a dozen subjects to date) at the California Institute of Human Science by Dr. Gaetan Chevalier and at the University of California, Irvine (UCI) indicate that following a 15-20 minute practice session, the electrical conductance and capacitance measured with the "single square voltage pulse" method at acupoints at the terminals of meridians increase very substantially. In control experiments, riding a stationary bicycle and lifting weights produce little or no effect. Since there is some evidence that a decrease in these parameters is associated with physiological dysfunction and diseases, these results could be interpreted as a reflection of the enhancement of the flow of Qi through the corresponding meridians and the strengthening of associated organs in the body as a result of Qigong/Tai Chi practice.

Effects on the Cardiac System. In a published study that has been subsequently confirmed and extended by on-going studies at UCI, Dr. Zhong-Yuan Shen and collaborators at the Qigong Research Institute of the Shanghai University of Traditional Chinese Medicine showed that regulation of respiration by a group of Qigong experts produced cycles of increase and decrease in heart rate corresponding to slow and deep breathing cycles as indicated by computerized Heart Rate Variability analysis of electrocardiograms (EKG) (Ref. 2). This effect shows that conscious control of breathing can lead to indirect control of cardiac function, which is normally regulated only by the autonomic nervous system. In a related study at the Institute that has also been confirmed and extended by on-going studies at UCI, Qigong and related types of meditation were accompanied by fast cycles of heart rate variability (Ref. 3). Because this type of variability pattern is normally seen during deep sleep, this result supports the notion that meditation is a very effective way to deeply refresh the mind and the body.

Effects on the Circulatory System. In on-going studies at UCI, Laser Doppler Flowmetry is used to measure peripheral blood flow at the palm of the hands. During practice of either

deep breathing cycles or a certain group of Qigong/Tai Chi movements, a substantially increase in blood flow is detected by this method. When the movements are performed in coordination with proper deep breathing cycles, the effect is greatly enhanced. On the other hand, the effect is diminished by factors that lead to constriction of blood vessels, such as exposure to cold temperature or consumption of caffeine (a vasoconstrictor). These results are consistent with the traditional believe that combining regulation of body movement and respiration during Qigong/Tai Chi practice increases blood circulation, and that mental and physical stress, which leads to vasoconstriction, reduce the benefit of the practice. In related preliminary studies conducted at UCI in collaboration with Dr. Antonios Michalos from the University of Illinois, Qigong deep breathing and breath-holding exercises produced a large increase in oxygen content in capillaries of the forebrain as measured by the chemical absorption of laser light shone through the skull (i.e., transcranial Photon Migration Spectroscopy). This could be taken as another indication of the beneficial effects of Qigong breathing exercises.

Effects on Brain Function. In on-going experiments conducted on experienced Qigong and related practitioners by collaborators from UCI (includes Professor Ramesh Srinivasan of the Cognitive Science Department) and the University of California, San Diego (Dr. Tzyy-Ping Jung of the Swartz Center for Computational Neuroscience), the distinct changes in brain wave pattern revealed by Independent Component Analysis of 128-channel electroencephalograms (EEG) suggest that the brain is both relaxing and concentrating during meditation. This demonstration of a state of "relaxed concentration" explains why meditation is not only an excellent way to achieve deep rest, but also an effective training to enhance the ability of the mind to relax and to focus in every day activities.

Effects on Bioenergy. In preliminary experiments conducted by Dr. Gaetan Chevalier of the California Institute of Human Science in collaboration with UCI scientists, a single photon counting system detected changes in emission of visible light from the hands when Qigong experts focused their intention on this part of their body. Since infra red thermography for quantifying temperature changes and Gas Discharge Visualization (Digital Kirlian Photography) for imaging bioenergy fields have also detected changes under similar situations in pilot experiments, detailed studies on the effects of Qigong practice on bioenergy fields using all three of these methods are now in progress at UCI.

Research on Qigong Therapy

As in the case of internal Qi, there has been no convincing demonstration of external Qi as a type of measurable energy other than as small amounts of heat or light emitted from the body. To investigate the effects of external Qi on biological systems, recent research has focused on targeted cell cultures rather than human subjects to avoid complication arising from psychological effects (i.e., placebo effect).

Effects on Cell Cultures. A recent study conducted by Professor Tiing Yu and collaborators at the National Chiao Tung University in Taiwan (Ref. 4) showed that cancer cells grown on culture plates had a slower growth rate following exposure to external Qi emitted by a top Zen meditation master. Furthermore, biochemical analysis indicated that the treated cancer cells exhibited more of the characteristics of normal cells.

Effects on Intracellular Calcium Concentration. Because calcium ions play such an important role in the regulation of many cellular processes, Dr. Wayne Jonas and collaborators at the Walter Reed Research Institute studied the effect of external Qi on this parameter. In a recently published report, they described that exposure to external Qi caused a substantial increase in intracellular calcium concentration in cancer cells grown in culture as measured with a fluorescence indicator dye assay (Ref. 5).

Research on Acupuncture

While a large number of clinical studies have demonstrated the efficacy of acupuncture for treatment of various disorders, the following are examples of the relatively few studies focused on the mechanism of action of this type of therapy.

Effect on Brain Function. In published studies, UCI radiologist Dr. Z. H. Cho and collaborators showed that stimulation of specific acupoints resulted in changes in activity at specific locations in the brain as measured by local oxygen consumption measured by functional magnetic resonance imaging (fMRI) (Ref. 6, 7). For instance, stimulation of foot acupoints commonly used to treat eye disorders (BL60-67) increased activity at the visual cortex while treatment of a foot acupoint used for pain relief (LR3) deactivated the activity at pain centers at the cingulate cortex of the brain.

Effect on Cardiac Disorder. To minimize complication due to psychological effects (i.e., placebo effect), UCI researchers Dr. John Longhurst, Dr. Peng Li, and their collaborators studied the effects of acupuncture on cats. In a series of published papers, they described that treatment of an acupoint commonly used for treating heart disorders in humans (PC6) effectively relieved chemically induced symptoms similar to those encountered during a heart attack (Ref. 8-10). Moreover, this effect can be blocked by prior treatment of the animals with an opiate antagonist, implicating the release of endorphins (endogenous opiates) by the acupuncture treatment.

Effect on Nitric Oxide Concentration. Dr. Sheng-Xing Ma at the Harbor-UCLA Medical Center recently reported that stimulation of hindlimb acupoints (LB 64, 65) resulted in increased synthesis of the signaling molecule nitric oxide at a specific location of the brain stem of rats (Ref. 11). In related studies, increased concentration of this molecule was found on the skin adjacent to meridians and acupoints relative to surrounding areas (Ref. 12). These results suggest that at least some acupuncture effects involve transmission of biological information by nitric oxide.

Conclusions and Future Plans

The above studies suggest that:

- Qigong practice affects the autonomic nervous system and other brain functions, leading to subsequent effects on the cardiovascular system, immune response, etc.
- At least some acupuncture effects are mediated by changes in activity at specific locations of the brain and some effects can be explained by the release of endogenous opiates.

- External Qi can affect cancer cells grown in the laboratory in experimentally measurable ways.

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About the Author

Starting when he was a teenager in Hong Kong, Dr. Lin has trained with a dozen international leaders in different schools of Kung Fu and Qigong and Tai Chi. He has received such titles as Hon. President of the Tai Shing Pek Kwar Martial Arts Association (Hong Kong), highest degree black sash at the Chinese Martial Arts Training Center (Taipei), and 9th degree gold sash at the Wing Chun Academy of Maryland (Baltimore). After receiving his Ph.D. in Biological Chemistry from UCLA and postdoctoral training in Biochemistry and Biophysics at University of California at San Francisco, he has served as Chairman of Biophysics at the Johns Hopkins University, and Dean of the School of Biological Sciences and Associate Vice Chancellor for Biomedical Initiatives at University of California, Irvine (UCI). For over three decades, Dr. Lin conducted research on cellular factors and drugs affecting the regulation of the cytoskeleton and cellular movement and contractility. In recent years, his research interest is focused on physiological changes associated with Oriental Mind/Body practices and therapies and acupuncture. He is presently Professor of Cell Biology, Physiology, and Biomedical Engineering, a member of the Scientific Board of the Susan Samueli Center for Integrative Medicine at UCI. Dr. Lin currently holds the positions of Founding Director of the International Alliance of Mind/Body Signaling and Energy Research, Chair of the Research Council of the World Congress on Qigong, a member of the Editorial Board of the Journal of Alternative and Complementary Medicine, and a member of the Energy Medicine strategic planning group of the National Center for Complementary and Alternative Medicine at the National Institutes of Health.

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