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Short Communications

Qi-therapy, chaotic characteristics of peripheral blood pressure and biochemical variables

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SUMMARY

We investigated the effect of Qi therapy (QT) on peripheral blood pressure (PBP), glucose, lactate dehydrogenase (LDH) and cortisol concentrations. Fourteen college students participated in receiving QT and placebo treatment. There were significant differences in embedding dimension of PBP. Plasma cortisol concentrations during QT were significantly lower than during control sessions ($P<0.05$). These findings suggest that QT may reduce stess level and stabilize the autonomic nervous system. Whether QT have permanent effects and effects in patients need controlled and prospective studies.

Key words: Qigong; Qi-therapy; Chaos; Peripheral blood pressure

The analysis of peripheral blood pressure provides quantitative information on relation between autonomic nervous system and cardiovascular. Peripheral blood pressure (PBP) fluctuations occur preferably within a certain range (under physiological conditions). Generally, the changes of emotion have been affect the autonomic and sympathetic nervous systems and then these influence the changes of peripheral blood pressure.

Qi-therapy (QT) refers to the process by which Qigong practitioners direct or emit their Qi energy with the specific intention of helping patients clear Qi blockages and move the bad Qi out of the body so as to relieve pain, or to balance the Qi flow in the body and help eliminate or reduce diseases.

Recently we have found several beneficial effects of QT compared with placebo treatments with randomized controlled trials (Lee *et al.*, 2001; 2003a; 2003b). Elderly subjects receiving QT showed significant decreases in systolic and diastolic pressure, and reduced anxiety, depression, pain and fatigue levels compared with placebo-treated controls (Lee *et al.*, 2003a). QT has proved to be useful in reducing heart rate and stabilizing the autonomic nervous system (Lee *et al.*, 2003b). Another randomized placebo-controlled study showed that QT modulated hormone levels, and improved immune functions and mood (Lee *et al.*, 2001). However, there is no report comparing PBP in response to QT.

The aim of this study was to determine the possible mechanisms underlying these effects, using chaotic methods and biochemical variables in subjects receiving placebo therapy or real therapy.

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Fourteen healthy male volunteers were recruited at University with verbal requests for volunteers (28.2 ± 7.4 years). The subjects had no history of cardiac or vascular disease, and at the time of enrolment were physically normal, with normal blood pressure. They were not taking medication, such as steroid hormones, that might affect physical activity. The experimental protocol was approved by the Human Subjects Review Board at University Hospital and University School of Medicine. All subjects agreed to participate in the study and signed the informed consent form of the Human Subjects Review Board of University Hospital and School of Medicine.

Investigations were conducted at the Emotion & Sensibility Laboratory of University, following a period of habituation in the experimental environment.

Each subject was tested with both interventions. Their peripheral blood pressure were recorded while they received real Qi-therapy (QT) and placebo treatment after 10 minutes of resting. Because QT is administered from behind the subjects, they were not aware which intervention they were receiving. They were also unaware of the significance of these interventions in that they were not exposed to any promotional literature. Nor was the experimental hypothesis explained to them.

In this experiment, external Qi-therapy was performed by Qi master of Ki Health International. QT was administered behind the subjects, from head to body, and there were no differences between subjects. Sham QT was administered by the same Qi master, who aimed to mimic the gestures used in the actual QT with no effort or intention to emit real Qi. Only one QT practitioners was used in this study to maintain the consistency of the intervention protocols and to minimize practitioner bias. They were unaware of any methods, materials, or procedures of the experiment and simply emitted Qi with positive thinking to restore harmony and balance to the energy systems of the subjects.

The subjects received attention for 5 min according to the procedures described in the following sequence. (1) The Qi master centers himself, and forms a conscious intention to help the subject while becoming mentally aware of himself as one with the cosmos. (2) The hand is moved about 310 cm from the subject's body in a pattern behind the subject, with the master becoming aware of changes in sensory cues. (3) The Qi master concentrates on areas of perceived accumulated tension in the subject's body and subjectively 'projects' Qi from the hand.

The experiments were performed in an air-conditioned (18-22 ℃), sound-attenuated room. The PBP were measured with photoplethysmogram amplifier (PPG100B, BIOPAC System, Inc., Santa Barbara, CA) in MP100system (BIOPAC System, Inc., Santa Barbara, CA).

The correlation dimension (CD) was estimated using the approach of Grassberger and Procaccia (1983). The correlation integral was calculated from the reconstructed vectors by embedding as follows:

$$C(l) = \frac{1}{m(m-1)} \times [\textit{Number of vector pairs(i, j) where } i<j \textit{ with a distance each other } <l]$$

where m is the total number of vectors. $C(l)$ is computed as a function of l and when $\ln[C(l)]$ is plotted against $\ln(l)$, the CD is estimated from the slope of the regression curve. Because CD is not known at first, a series of computations with increasing an embedding dimension (ED) has to be performed until the slope tends not to increase. This plateau corresponds to the CD. In detail, see the review by Denton *et al.* (1990).

Lyapunov exponents (LE) are quantitative measures of the rate of exponential separation of trajectories in phase space. A positive Lyapunov

exponent indicates a sensitive dependence on initial conditions and is considered the most relevant index of the presence of chaos in data analysis (Eckman and Ruelle, 1985). Our estimation of the maximal Lyapunov exponent l_{max} is based on the algorithm developed by Wolf *et al.* (1985), and modified by Tsuda *et al.* (1992) which computes the distance between two adjacent points of the attractor in phase space as follows: where n is the number of points where Lyapunov exponents could be calculated, l_i is the distance of the ith initial condition and l is the distance at a time $\Delta\tau$. We defined $\Delta\tau$ as 1.25 s based on normotensive subjects.

Table 1. Mean values of correlation dimension, embadding dimension and Lyapnov exponents of PBP during Qi-therapy sessions and placebo sessions

	Placebo	Qi-therapy
Correlation dimesion	4.11 ± 1.09	4.46 ± 0.93
Embadding dimesion	7.20 ± 1.79	9.00 ± 2.35*
Lyapunov exponents	0.022 ± 0.008	0.023 ± 0.008

Values are expressed as mean ± S.D. *P<0.05.

The results were statistically analyzed using SPSS, with a paired t test for statistical evaluations of differences between control and experimental sessions.

The mean CD during the QT session was higher than that recorded during the placebo control sessions, but there is no significance. There were significant differences between placebo therapy and QT in ED ($P < 0.05$). With respect to nonlinear analysis, the LE was larger for the QT session than for the placebo control session without significance.

Plasma cortisol concentrations were also significantly lower during QT than during placebo sessions (Table 2). There was no significance in LDH and glucose level.

Table 2. Mean values of biochamical variables during Qi-therapy sessions and placebo sessions

	Placebo	Qi-therapy
Cortisol (mg/dl)	7.95 ± 3.29	7.25 ± 3.14*
LDH (IU/L)	106.3 ± 9.2	102.9 ± 13.3
Glusose (mg/mL)	211.3 ± 28.7	204.0 ± 36.3

Values are expressed as mean ± S.D. *P<0.05.

This study examined the effects of QT on peripheral blood pressure and biochemical variables with chaotic analysis. The results showed that lower cortisol concentration and higher ED during the QT session relative to those parameters measured during placebo therapy.

It has been reported that mean CD, ED and LE increases when subjects are exposed to pleasant or relaxing stimuli (Kim, 1997; Kwon *et al.*, 1998). It has been also reported that CD, ED and LE are higher during resting state compare with psychological stress states (Lee and Lee, 1994). QT seemed to make the experimental session more comfortable than the control session. These relaxation factors stabilized the autonomic nervous system, with a corresponding increase in ED, CD, and LE during the experimental sessions compared with the control sessions.

The lower plasma cortisol concentrations measured during the experimental session also suggest that objective physiological stress was lower during QT than during the control sessions. Lindfors and Lundberg (2002) have suggested a link between positive psychological functioning and reduced cortisol release. Our previous reports have also showed that QT reduced the cortisol concentration more than placebo sessions in healthy young adults when lying down (Lee *et al.*, 2001). Thus, the improved emotional state reported by subjects during QT may be reflected in reduced cortisol concentrations.

In summary, our study reveals that QT

induced more relaxed state than were induced by placebo therapy. These psychological effects may assist in stabilizing the autonomic nervous system and reducing plasma cortisol concentrations. However, whether QT have permanent effects and effects in patients need controlled and prospective studies.

REFERENCES

Denton TA, Diamond GA, Helfant RH, Khan S, Karagueuzian H. (1990) Fascinating rhythm: a primer on chaos theory and its application to cardiology. *Am. Heart J.* **120,** 1419-1440.

Eckman JP, Ruelle D. (1985) Ergodic theory of chaos and strange attractors. *Rev. Mod. Phys.* **57,** 617-656.

Grassberger P, Procaccia I. (1983) Measuring the strangeness of strange attractors. *Physica D. Amsterdam* **9,** 189-208.

Kim DS. (1997) Human sensibility measurement for the visual picture stimulus, in *Department of Biomedical Engneering,* Yonsei University, Seoul, Korea.

Kwon EC, Kim DY, Kim DS, Rim YH, Sohn JH. (1998) Sensibility measurement for visual picture stimulus using heart rate variability analysis. *Kor. J. Sci. Emotion & Sensibility* **1,** 93-103.

Lee BC, Lee MH. (1994) Nonlinear time series analysis of biological chaos. *J. KOSOMBE.* **15,** 347-354.

Lee MS, Huh HJ, Hong SS, Jang HS, Ryu H, Lee HS, Chung HT. (2001) Psychoneuroimmunological effects of Qi-therapy: preliminary study on the changes of level of anxiety, mood, cortisol and melatonin and cellular function of neutrophil and natural killer cells. *Stress and Health* **17,** 17-24.

Lee MS, Jang HS, Jang JW, Moon SR. (2003a) Effects of Qi-therapy on blood pressure, pain and psychological symptoms in the elderly: a randomized controlled pilot study. *Complement. Ther. Med.* **11,** 159-164.

Lee MS, Jang HS, Woo WH, Moon SR. (2003b) Effects of external Qi-therapy on cardic autonomic tone: a randomized placebo controlled study. *FACT.* **8,** 512.

Lindfors P, Lundberg U. (2002) Is low cortisol release an indicator of positive health? *Stress and Health* **18,** 153-160.

Tsuda I, Tahara T, Iwanaga H. (1992) Chaotic pulsation in human capillary vessels and its dependence on mental and physical conditions. *Int. J. Bifurcations Chaos* **2,** 313-324.

Wolf A, Swift JB, Swinney HL, Vastano JA. (1985) Determining Lyapunov exponents from a time series. *Physica D Amsterdam* **16,** 285-317.