行政院國家科學委員會專題研究計畫　成果報告

子計畫二:禪定之生理訊號與健康機制之研究

計畫類別： 整合型計畫
計畫編號： NSC92-2218-E-009-021-
執行期間： 92 年 11 月 01 日至 93 年 07 月 31 日
執行單位： 國立交通大學電機與控制工程學系

計畫主持人： 羅佩禎

報告類型： 精簡報告

處理方式： 本計畫涉及專利或其他智慧財產權，1 年後可公開查詢

中　華　民　國 93 年 11 月 2 日

行政院國家科學委員會補助專題研究計畫成果報告

預防與診療機制—由身心靈工程探索人體生命系統之健康模型與免疫力指標— 子計畫二：禪定之生理訊號與健康機制之研究

A foresighted research on preventive, diagnostic, and therapeutic techniques— Investigation of the health model and immunity index of human life systems from the aspect of body-mind-spirit engineering—— subproject 2: Research on the physiological signals and health model in Zen meditation

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共同主持人：

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執行單位：國立交通大學　電機與控制工程學系

中　華　民　國　九十三 年　十　月　三十　日

行政院國家科學委員會專題研究計畫成果報告

預防與診療機制—由身心靈工程探索人體生命系統之健康模型與免疫力指標—子計畫二：禪定之生理訊號與健康機制之研究

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計畫參與人員：

一、中文摘要

隨著「禪定、打坐」不斷被證實其對健康的莫大助益，探究禪定之生理與健康機制更顯得意義重大。在本次九個月的前期研究中，我們的研究焦點在於禪修者的身心健康統計資料的建立。而統計分析結果明確顯示禪宗佛法之修行者在生理與心智等各方面都遠比一般正常健康受測者更為優質。再者，由腦電波所呈現之波形特性，亦反應兩組受測者間之顯著差異，禪定組的腦電波顯然更為「寧靜」。

關鍵詞：禪定、禪定之健康模型、統計分析、腦電波、禪定腦電波。

Abstract

As the Zen meditation has been proved to be of great help to the health, exploration of the physiological signals and health model under Zen meditation becomes more significant. In the nine-month pre-phase research, we have focused on the investigation of physiological and mental health statistics. Results of statistical analysis evidently demonstrate that Zen-Buddhist practitioners exhibit much better health states, both in physiological and mental aspects, than the normal, healthy subjects (non-practitioners). In addition, the brain wave patterns characterized by electroencephalograph (EEG) signals also reveal significant distinction between two groups of subjects. Meditation EEG apparently is much *quieter* than the normal EEG.

Keywords: Zen-meditation, health model under Zen meditation, statistical analysis, electroencephalograph (EEG), meditation EEG.

一、前言

As the complementary and alternative medicine (CAM) becomes more appealing to the public, researchers begin taking a more serious attitude toward this oriental approach for health maintenance and promotion (Barinaga, 2003; Fields et al., 2002**;** Litvak et al., 2001**)**. Zen-Buddhist practice has become not only the religion but also greatly improved physical and mental health. Zen-Buddhism originated about 2,500 years ago. The practice was handed down by Buddha Shakyamuni to the Great Kashiyapa. The same path towards Buddhahood was promulgated to mainland China in 527 by the 28th patriarch Bodhidharma(達摩祖師). The current patriarch is Zen master Wu Chueh Miao Tien（悟覺妙天禪師）, the 85th patriarch of the orthodox Zen-Buddhism Sect. The core essence is Zen-Buddhist *practice* rather than Sutra-texts *studying*. The questionnaire-based survey study was performed on members of the Taiwan Zen-Buddhist Association established by Zen master Wu Chueh Miao Tien. To the best of our knowledge, this is the first systematic and wide-scale statistical report on the health aspects of Zen-Buddhist practitioners in Taiwan. It was hoped that this study would provide some basis for further research into the benefits of Zen meditation.

二、研究目的

Since 1999, our research group has been continually investigating the biological and physiological aspects of the Zen-Buddhist practitioners based on various means (e.g., electroencephalography, electrocardiography, galvanic skin reflex, and visual evoked potentials; Lo et al., 2003)**. T**he study presented here aims at another direction. We surveyed a number of factors reflecting the subjective and objective judgment of health conditions. The frequency of usage of the Taiwan Health Insurance Card is considered as the point of reference. The subjects of this study are

divided into two groups: Zen-Buddhist practitioners (experimental subjects) and non-practitioners (control subjects).

An invaluable database was collected from a group of 860 Zen-Buddhist practitioners who filled up the questionnaires after a Zen meditation class. The main aim of this work was to investigate the effect of practicing the Zen-Buddhist meditation on the health promotion based on a few factors including the average number of using the Health Insurance Card (HIC). Statistical techniques were applied to the data collected from the field work. The results demonstrate significant effects of Zen meditation on the physical and spiritual health of the practitioners.

三、方法與結果

Our group designed a particular questionnaire for the field study. A total of 1,050 survey forms were distributed to participants in the Zen-Buddhist meditation classes. Twenty minutes were allotted for completing the forms. Afterwards, we retrieved 890 forms, of which 860 were correctly filled as were requested. The statistical data were compared with the data reported by the Department of Health for all the Health-Insurance-Card (HIC) holders (a population of 21,869,478). The results of statistical analysis presented in this report are thus based on a bin of 860 cases with a wide range of ages (16~85 years). The mean age of the subjects is 40.2 years with a standard deviation (std) of 12.1. The male-to-female ratio is approximately 4:6.

I. *Psychological and mental health of the experimental subjects*.

1. Table 1 depicts the results of the everyday condition of the frame of mind, according to the self evaluation by the 860 experimental subjects.

Table 1 Results of self evaluation of the daily frame of mind (experimental subjects).

grade / item	1	2	3	4	5
Contentment (1 year ago)	0.1%	0.6%	11.9%	25.4%	62.0%
Contentment (currently)	0.3%	0.7%	8.5%	39.1%	51.4%
Feeling of stress	5.4%	13.8%	14.2%	46.1%	20.6%
Ability of moderating stress	0.0%	2.2%	8.5%	48.9%	40.4%

Note that the value of grade ranging from 1 to 5 scores the condition varying from the worst to the best, with the mid-value (grade=3) indicating the normal, average condition. In other words, better mental health is quantified by a higher grade for all the cases. More than 90 percent of the practitioners feel content and happy in their daily lives. Less than 20 percent feel the life stress. Most practitioners (~90%) are well capable of moderating the occasional stresses.

2. We further examine the effect of weekly practicing frequency and total practicing years on the mental health. Figure 1 illustrates the distribution (histogram) of *contentment* and *stress moderation* on the weekly practicing frequency (number of times) that, obviously, demonstrates a positive correlation between the mental health and the practicing frequency. Similar trend is observed in the histogram based on the number of practicing years (Figure 2). Nevertheless, we found that, to be totally released from the feeling of daily-life stress, most practitioner spent more than seven years in the intense and highly devoted Zen-Buddhist practice. As addressed in the *Diamond Sutra*, to disclose the enlightened wisdom, a Zen-Buddhist disciple should be detached—— that is, without regard to appearances, without regard to sound, odor, touch, mind and mood, …, without any attachment.

Figures 3 and 4 display the histogram $h(s_g)=n_g$, where $1\le s_g\le 5$ denotes the grade of ability of moderating the stress feeling, and n_g is the number of experimental subjects who are in the group of stress-moderation grade = s_g. Different gray-colored bars are used to illustrate the histogram of a group who practice the Zen-Buddhist meditation in a similar weekly frequency (Figure 3) or within the same range of number of practicing years (Figure 4). For example, the white-colored (black-colored) bar in Figure 3 illustrates the number of subjects that practice 1-3 (>7) times per week. It appears that the practicing frequency does little good to help the stress problem. On the other hand, length of meditation practice shows significant impact on improving the stress-moderation ability (Figure 4).

II. *Analysis of the HIC applications and health conditions in the experimental group.*

1. According to the 2002 statistical data provided by the Bureau of National Health Insurance in Taiwan, the average number of outpatient services requested by each person was 14.52 based on population 21,869,478. Table 2 lists the statistics of HIC applications in the experimental group during the year of 2002.

Table 2 Statistics of HIC applications in the experimental group of 860 subjects.

HIC usage (times)	0	1	2	3	4	5	6-10	11-15	>15
% of 860 subjects	21.7	11.3	13.3	8.0	6.7	4.0	26.6	3.5	5.0

Note that the number of using the HIC represents the number of attending a hospital or a clinic. In 2002, Zen-Buddhist practitioners used, on an average, 4.6 times each person, fewer than one third of the average HIC applications (14.52) reported for the entire population. The average number of HIC

applications for men and women is 4.1 and 5.1 times, respectively, in 2002 (P<0.01).

2. Table 3 lists the results of investigating the effects of meditation qualities and experiences on the average HIC applications. The following comments are based on the hypothesis that the average number of HIC applications is relevant to the health condition.

Table 3 Average number of HIC applications for various meditation experiences of the experimental subjects.

(i) Correlation between weekly practicing frequency and average number of HIC applications				
Weekly practicing frequency (times)	1-3	3-5	5-7	>7
Average HIC (male / female)	4.1 / 5.2	4.9 /4.9	3.9 /4.7	3.8 /4.2
(ii) Correlation between meditation duration and average number of HIC applications				
Meditation duration (minutes)	≤30	30-50	50-80	>80
Average HIC	6.6	5.4	4.4	6.6

(iii) Correlation between meditation posture and average number of HIC applications			
Meditation posture	Free style	Half lotus	Full lotus
Average HIC (male / female)	5.2 /10.7	5.1 /5.2	2.8 / 3.5

Part (i) manifests that increasing the weekly practicing frequency up to 7 times (that is, once per day) results in the optimal health state. According to (ii), practitioners already saw great improvement in their health when they were able to meditate for approximately one hour each time. Regarding the effect of meditation posture, significant reduction in the average HIC applications (2.8/3.5 for male/female) is observed in the practitioners capable of meditating in the full-lotus position. In fact, the meditation posture is not the only factor causing this improvement. As addressed previously, practitioners in this particular subset (the *full-lotus* column) have more than seven years of meditation experiences and practice more than five times per week. It might be due to their diligence and intensive practice that enable the practitioners to sit in the full-lotus position. On the other hand, the full-lotus position is the optimal meditation posture for pushing the physiological and mental activity into the state of transcendental consciousness.

四、結論與討論

In these financially stressed times, Zen meditation can be considered an effective means of promoting health of the citizens and reducing the government expenditure on health insurance. According to our survey and statistical analysis of the results, Zen-Buddhist practitioners indeed exhibit better health in both physiological and mental conditions in comparison with the conditions before their practice. Particularly, the data of HIC applications demonstrate an impressively reduction of the average number of clinical visits by the practitioners, that helps the community save an enormous amount of expenditure on health insurance

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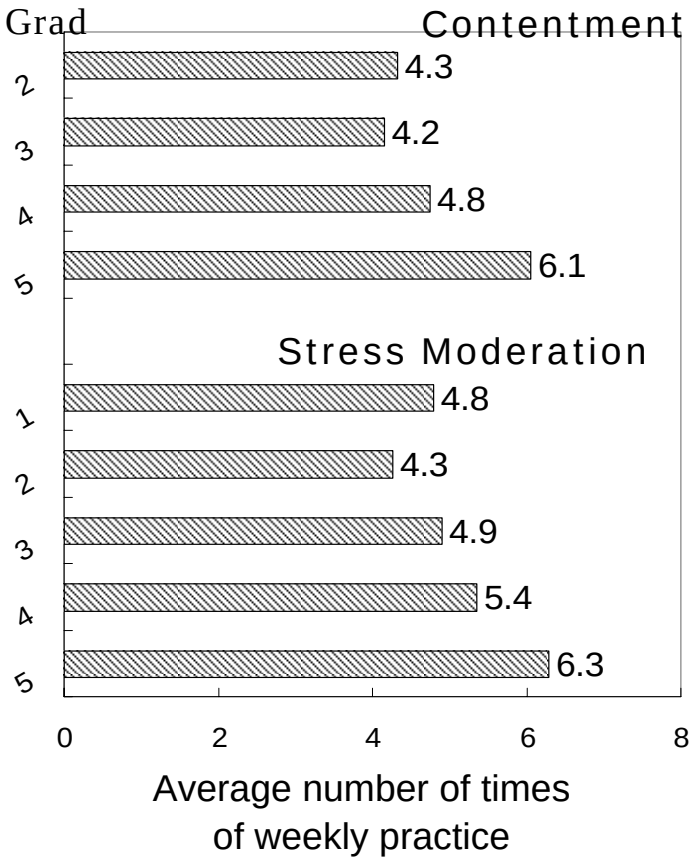

Fig. 1 The distribution (histogram) of *contentment* and *stress moderation* on the weekly practicing frequency (number of times).

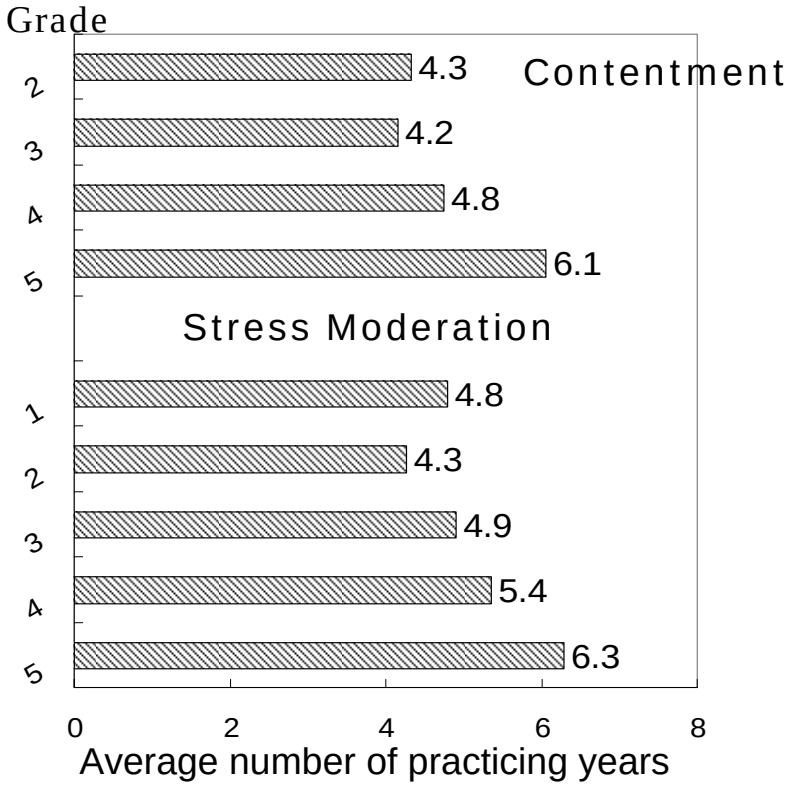

Fig. 2 The distribution (histogram) of *contentment* and *stress moderation* on the number of years of Zen-Buddhist practice.

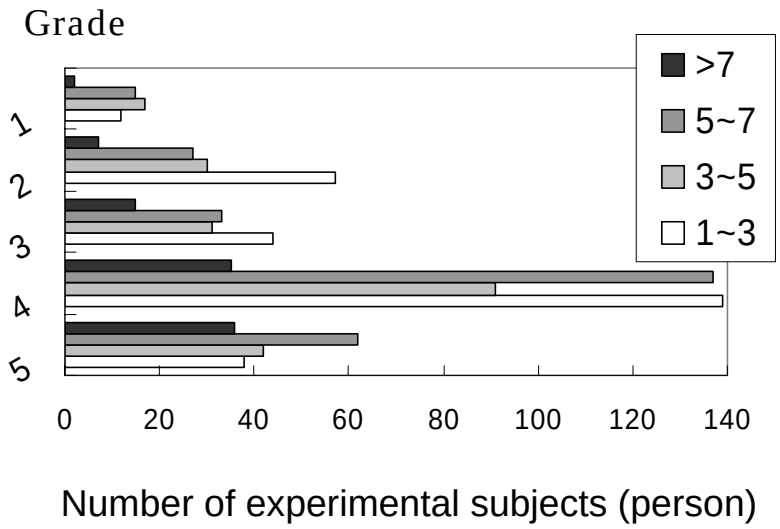

Fig. 3 The histogram of stress moderation: distribution of the number of experimental subjects under the same *stress moderation* grade. Different bar colors are used to identify various weekly practicing frequencies.

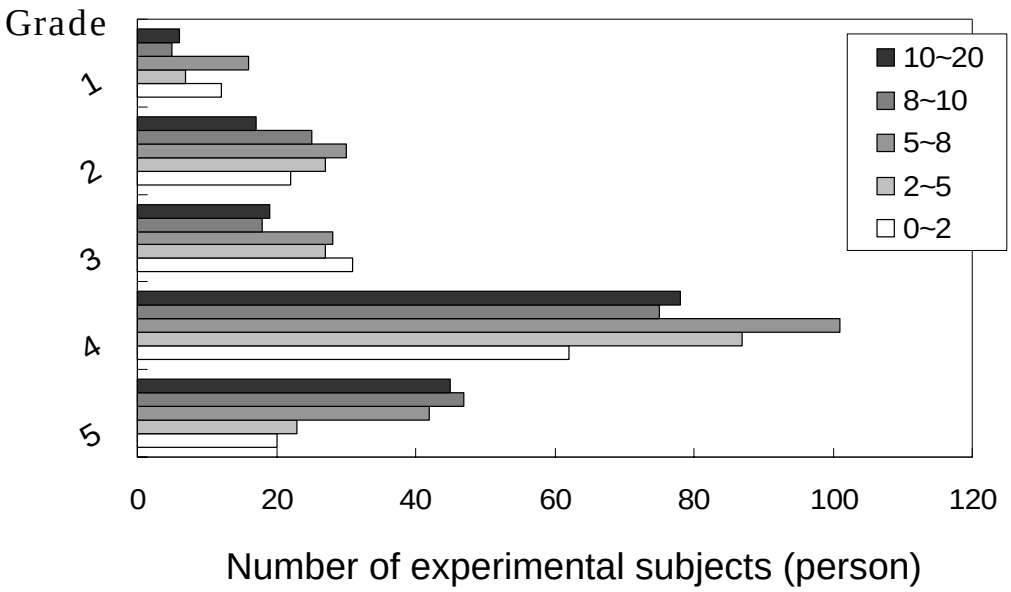

Fig. 4 The histogram of stress moderation: distribution of the number of experimental subjects under the same *stress moderation* grade. Different bar colors are used to identify various lengths of meditation experiences (in number of years).