

SCIENCE OF ZAZEN

Akira KASAMATSU & Tomio HIRAI

Tokyo University

This film has been produced chiefly upon the bases of the following two types of studies:

I. The results of *A Study of Medical and Psychological Aspects of Zen Buddhism* by an organization subsidized by the Ministry of Education. The group studies were carried on for two years period covering 1961 and 1962 by the following members;

Prof. Kanae Sakuma	(Toyo University) Psychology
Prof. Yoshiharu Akishige	(Kyushu University) Psychology
Prof. Hitoshi Kataoka	(Kyoto University) Education
Prof. Koji Sato	(Kyoto University) Psychology
Prof. Takehisa Kora	(Tokyo Jikeikai Medical College) Psychiatry
Prof. Kentaro Takagi	(Nagoya University) Physiology
Prof. Toshizo Suzuki	(Nagoya University) Physiology
Prof. Yasusaburo Sugi	(Tokyo University of Education) Physiology
Prof. Akira Kasamatsu	(Tokyo University) Psychiatry

II. The results of *An Electroencephalographic Study of Zazen*, which has been carried on for the last ten years by the Department of Neuro-Psychiatry of the Tokyo University, Koishikawa Branch Hospital, directed by Prof. Akira Kasamatsu, Faculty of Medicine, Tokyo University.

From among these data we selected suitable materials for this film. Accordingly responsibility of this film rests with us. Our heartfelt thanks are due to the Zen masters, Reverends Eko Hashimoto, Koryu Osaka, Horyu Ishiguro and their disciples as well as participants of the group studies, Mr. Osai Minegishi, Mr. Kokan Sasaki, Miss Hiroko Otsuka, Dr. Takeo Doi, Prof. M. Burg and Mr. D.C. Garick. They showed great interest and understanding toward the aim of this film, and helped us unsparingly throughout the production.

Zazen or Zen meditation is a spiritual exercise practised in the Zen sect, a school of Buddhism. It is said that by practising Zazen one can find his true self and learn the way of living the real spiritual life. About 2500 years ago, Sakyamuni or Gautama, became enlightened concerning worldly sufferings such as senility, illness, death, etc., through the practice of Zazen under the bodhi-tree. Thereby he attained Nirvana, a perfectly peaceful spiritual state. He therefore came to be called the Buddha. Buddha means the enlightened one or a person who has attained the highest state of the human mind.

Many religions have Gods and Absolute as their objects of worship, and their adherents seek relief from their troubles by praying to them. On the contrary, the character of Buddhism is that man can liberate himself from the uncertainty and unreliability of life through re-search and self-cultivation. While Christianity is highly theocentric, Buddhism centers on man, and can be considered a religion which embraces science.

With the development of Buddhism from India through China to Japan, the forms of religious exercise changed according to the differences between the races and cultures of various countries. Even now, however, Zen meditation remains the most fundamental exercise of Buddhism.

By practising Zen meditation man can become emancipated from the dualistic bondage of subjectivity and objectivity, of mind and body, and of birth and death. At the same time, he can be free from lust and self-consciousness and desires for personal gain. Here man is awakened to his pure, serene, true-self, that is, his Buddha nature. This is "Satori" or "Enlightenment".

Those who have attained this condition of Satori never fail to reveal the truth to many other people. This is the principle of the compassion inherent in Buddhism.

There are, at present, two large Zen sects in Japan: Soto and Rinzai. Let us consider the basic sitting meditation form of Soto Zen as practised under the guidance of the Master Eko Hashimoto. Here is Master Hashimoto himself practicing Zen meditation.

There are two forms of Zen meditation, a full cross-legged sitting and a half cross-legged sitting.

Notice that the master's eyes are open and look downward about one meter ahead, and his hands generally join. Before beginning Zen meditation one eats and drinks in moderation and gets a good night's sleep. In a quiet room one sits on a round cushion. You can see that Zazen is by no means physically difficult training.

This is *kin-hin* of the walking form of meditation in Zen. Notice that the master walks very slowly. He takes steps half the length of his foot during one breath.

About the mental state of Zazen meditation, Dogen, the founder of Soto Zen, stated as follows: "Think the Unthinkable. How do we think the Unthinkable? It's beyond thinking!"

A disciple feels drowsy.

He is hit on the back with a stick. In Soto Zen the importance of Zen practice itself is strongly emphasized. Sitting in the lotus posture without even seeking enlightenment is equated with enlightenment.

Next we see Rinzai Zen practised by Master Koryu Osaka who is not a priest.

Many of the disciples seen here are university students. Thus in Japan many people of all ages and both sexes practise Zen meditation in order to purify themselves spiritually. Laymen as priests have one week period for continuous Zen meditation. This is called "Sesshin." During this period, the disciples do not engage in daily activities but spend the time following the strict schedule.

This is a scene of the Sesshin conducted by Master Horyu Ishiguro.

Along with sitting meditation, Rinzai Zen uses "Koan" and "Sanzen". "Koan" is a kind of problem which is given by the master to the disciple.

For example: "See or become "Mu!", ("mu" means nothing.)" "Hear the sound of one hand clapping!" "What was your original countenance before the birth of your father and mother?" "When you are dead, cremated and the ashes scattered, where are you?" Each of these problems seems irrational and nonsensical.

"Sanzen" means that each of the disciples enters the master's room alone and states his interpretation of the Koan. The Sanzen is held several times a day and the master rigorously demands that the disciple give his answers, exclaiming "Speak!", "Speak!"

In these sessions, the disciple's logical and dualistic way of thinking is relinquished, the double structure of subjectivity and objectivity is shattered, and at last he attains the real

awakening of his true self. Dr. D. T. Suzuki has written many works in English about Rinzaï sect.

By now, you may have some idea as to what Zen is like. Now we are going to deal with Zen meditation as an object of science, especially physiology and psychology. We must admit, however, that Zen is a spiritual exercise and can be grasped only by personal experience. Still it should be worthwhile to study Zen meditation scientifically.

RORSCHACH TEST

First the results of Rorschach Test will be shown. There are no remarkable differences in scores of the test between Zen practitioners and ordinary people. But several differences are noted here. Relatively higher scores of whole responses among Zen practitioners. Besides, scores of Human Movement Reaction are relatively high, while total color responses and differentiated texture reactions are relatively low.

VISUS

Next, we will show the results of eye-test. Some priests' far-sighted power slightly increased after Zazen.

But the near-sighted vision varied from case to case.

RESPIRATION AND ENERGY METABOLISM

This is the diagram of the respiratory movements of a Zen veteran. The upper line shows thoracic respiration and the lower line abdominal respiration.

At this point Zen-sitting begins. The respiratory rate decreases rapidly and reaches about 4 per minute.

And 1 or 2 minutes after the end of Zen-sitting the respiratory rate, returns to normal.

This is the diagram of the measurements of respiratory rate, tidal volume and oxygen consumption.

The respiratory rate begins to decrease at the beginning of Zazen, and this slow rate of respiration has continued during Zazen.

On the contrary, the tidal volume increases during Zazen.

Oxygen consumption is far below the normal level though one may expect that it will increase. The rate of decrease is from 20 to 30 percent of normal Oxygen-consumption.

We have also measured the energy metabolism during Zazen.

This line shows the basic metabolism.

A, B, and so on are Zen Veterans. A's energy metabolism is 0.850-lower than basic metabolism. Likewise all others show lower energy metabolism than the basic rate.

The control experiment of forced reduction in respiratory rate.

This line shows the energy metabolism at the normal respiratory rate. It is 1.58.

When the respiratory rate is reduced to five in accordance with the metronom rhythms the energy metabolism becomes 1.26.

This is the energy metabolism at 3 breath per minute.

At 2 breath per minute. Therefore the decrease of energy metabolism during Zazen can not be explained only by the reduction in respiratory rate.

Furthermore a certain additional amount of energy is required for maintaining Zazen posture. Why then should this decrease in metabolism happen? Perhaps it may be due to the decrease of energy metabolism in the brain.

ELECTROENCEPHALOGRAM

EEG is recorded continuously through all stages—before, during and after Zazen with open eyes. EEG records in Zen-walking are about the same as during Zen-sitting.

The upper 2 lines are Parietal and Occipital EEG of a Zen veteran. The below line is the EEG of a beginner. There is a remarkable difference between the upper lines and the below. The Zen veteran's EEG shows the regular alpha pattern continuously, in spite of the open eyes.

Let us examine the typical EEG changes of a certain Zen veteran in detail. This is the activating pattern.

But one minute and 30 seconds after the beginning of Zazen, alpha waves begin to appear.

After 8 minutes and 20 seconds, the amplitude of alpha waves become larger.

At 27 minutes and 10 seconds, rhythmical waves of 7 or 8 per second appear.

And 20 seconds later rhythmical theta trains begin to appear.

After the end of Zazen alpha waves are still seen continuously.

2 minutes later alpha waves still persist. It seems to be the after-effect of Zazen.

This is the table of the EEG changes in Zazen.

First, the activating pattern of open eyes before Zazen.

Appearance of alpha waves.

Next is increase of alpha amplitude.

Decrease of alpha frequency.

Appearance of theta train. This does not always occur.

The series of EEG changes in the course of Zazen are classified as I, II, III and IV.

Next we study the correlation between the number of years spent in Zazen training and EEG changes. The more years spent in Zazen, the more EEG changes are seen.

The Zen master estimates the mental state of disciples as low, middle and high. It shows the close relationship between the evaluation by the master and the degree of EEG changes.

This is the EEG in hypnotic trance. A few alpha waves are seen—his eyes are closed, but the activating pattern is moderately seen. The trance-like mental state called "Sanran" or "confusion" is suppressed in Zen training.

The disciples sometimes fall to sleep. This is EEG in the drowsy state. When click stimulus is given at this point, this drowsy pattern turns to the alpha pattern, that is, alpha arousal reaction.

Let us compare the EEG changes during Zazen with the sleep EEG. This train shows

EEG changes.

The sleep pattern diverges from this train in a downward curve, and turns to deep sleep pattern.

We studied the EEG changes to click stimulation in Zazen subjects. The above is the EEG of a veteran with open eyes and the below, the EEG of a control subject with closed eyes. Both show the alpha pattern.

We gave click stimuli repeatedly with an interval of 15 seconds. To the first stimulus alpha blocking occurs for 2 seconds in the veteran but in the control subject, it lasts for 7 seconds or more.

In the veteran the 5th click does not change the alpha blocking time, but in the control subject alpha blocking is not clearly seen.

At the 15th stimulation. Alpha blocking time is the same in the veteran while in the control subject alpha blocking is hardly seen.

It does not change at the 20th stimulation.

The decrease in alpha blocking time, which we call habituation, will be shown more clearly in this diagram. This horizontal line represents the number of clicks. The vertical line shows the alpha blocking time. The habituation occurs very quickly.

All 4 control subjects showed similar habituation.

This is the graphs of a Zen veteran. There are some random changes in alpha blocking time, but no habituation occurs.

3 veterans showed the same results. In general, the habituation of auditory stimulation is scarcely seen in the Veterans's group.

In conclusion, we will discuss further our findings of EEG with special reference to the mental state during Zazen. There are several instructions about Zazen.

Among these, "Choshin" or the regulation of inner mind is especially important. From the electrophysiological point of view, this mental state will be shown as following several points; First, during Zazen the level of the cerebral excitatory state is gradually lowered in a way that is different from sleep pattern. Second, the concentration of mind in Zazen superficially similar to the hypnotic trance. But there are differences in electroencephalographic findings between the two. In mental state during Zazen, outer or inner stimuli are not neglected but precisely perceived. This is clearly shown that there is almost no habituation in EEG responses to stimulation. These findings seem to indicate that the mental state of Zen veterans is such that it cannot be affected by either external or internal stimulus beyond the mere response to it. One master described such state of mind as that of noticing every person he sees on street but of no looking back with emotional lingering.

In recent years, the interest in Zen has greatly increased in many countries. However, it is extremely difficult to understand Zen in those countries which have no Buddhist influence in their cultural background. Our approach is strictly scientific. We hope, therefore, that we have opened the way to a scientific understanding of Zen, thus making it intelligible even to those people who have no such cultural tradition.

Lastly, we would like to mention the relationship of Zazen and mental health. It is often said that Zazen is good for mental health. But we believe that Zazen alone can not take the place of medical psychotherapy, though it certainly can be used as a useful adjunct

or supplement. Or perhaps the enlightenment of Zen may provide the final goal of psychotherapy, for one has to attain, after all, one's true "self".

Akira Kasamatsu (笠松 章 1910-) M.D., Doctor of Medical Science. Professor of Psychiatry, Koishikawa Branch Hospital, Univ. of Tokyo, Bunkyo-ku, Tokyo.

Tomio Hirai (平井 冨雄 1927-) M.D., Doctor of Med. Science. Lecturer, Department of Psychiatry, Koishikawa Branch Hospital, Univ. of Tokyo.

SCIENCE OF ZAZEN. A Film produced by Dr. Kasamatsu and Dr. Hirai.
Distributor: Nippon Film Center, # 1, 2-chome, Sakuradai, Nerimaku, Tokyo.
(Price \$ 110. Airmail postage \$ 15. to U.S.A.)

BOOKS RECEIVED

- Bertocci, Peter A. & Richard M. Millard. *Personality and the good: psychological and ethical perspectives*. New York: David Macky. 1963. xxi, 711p.
- Kelman, Harold. *The process in psychoanalysis*. New York: Amer. Instit. for Psychoanalysis. 1963. 159p.
- Ramachandra Rao, S.K. *Development of psychological thought in India*. Mysore: Kavyalaya Publishers. 1962, viii, 225p.
- Smith, Robert J. & Richard K. Beardsley. *Japanese culture. Its development and characteristics*. Chicago: Aldine. 1966. x, 193p.

- Hirota, Kimiyoshi. *Psychology of groups*. Tokyo: Seishin-shobo, 1963.
- Takeuchi, Yoshio. *Strengthening character by auto-hypnosis*. Tokyo: Diamond-sha. 1963. 14, xiv, 318.
- Sasaki, Tetsuro (Transl). *Kodokagaku-nyumon*. (The Voice of America. Forum Series: Behavioral Science Series) Tokyo: Seishin-shobo. 1962. iv, 227, 160p.
- Ibukiyama, Taro, et al. *Keieisoshiki-no-Kakushin*. (Mason Haire, ed. Modern organization theory) Tokyo: Nihon-Noritsu-kyokai. 1963. 416p.