Experiments in India on "Voluntary" Control of the Heart and Pulse

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PROMINENT among the many claims of unusual bodily control that emanate from practitioners of Yoga is the ability to stop the heart and radial pulse. Such claims often have been authenticated by physicians, and one "experiment" employed a loud-speaker system so that a large crowd could hear the heart sounds before and after their disappearance. To our knowledge, however, only one investigator had published electrocardiographic results before the work now reported.

In 1935 a French cardiologist, Dr. Thérèse Brosse, took portable apparatus to India and obtained measurements from at least one person who claimed the ability to stop the heart. A published excerpt from her data[4] involving one electrocardiographic lead, a pneumogram, and a pulse wave recording from the radial artery, shows the heart potentials and pulse wave decreasing in magnitude approximately to zero, where they stayed for several seconds before they returned to their normal magnitude. The data were held to support the claim that the heart was voluntarily controlled to a point of approximate cessation of contraction.

During our investigations in India we searched for persons who claimed to stop the heart or pulse, and were cordially assisted by many individuals including the Indian press. We found four. Another claimed only to slow the heart. Of the four, only three consented to serve as subjects, and one of these claimed he was too old to demonstrate heart stopping without a month or so of preparatory practice. Since he was the subject studied by Dr. Brosse in 1935 we were particularly anxious to gain his cooperation and, after considerable persuasion, he consented to demonstrate for us the method he had employed in "stopping the heart" for Dr. Brosse.

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Apparatus and Procedures

Our apparatus has been described elsewhere.[1-3] Briefly, it consisted of an 8-channel Offner type-T portable electroencephalograph with appropriate detectors and bridges for DC recording of respiration, skin temperature, electrical skin conductance, and finger blood volume changes. Procedures varied according to the cooperativeness of the subject and other circumstances. For that reason the results are reported for individual subjects.

Results

The first two subjects claimed they could stop the heart. No. 1. Shri Sal Gram, at Yogashram, New Delhi, made four attempts at one session. Only one electrocardiographic lead (III) and respiration were recorded, in what was planned as a preliminary experiment. The subject stood in a semi-crouched posture with the left side pressed against a table. Under retained deep inspiration considerable muscular tension was apparent in neck, chest, abdomen, and arms. Stethoscopically detected heart sounds either disappeared briefly or were obscured by sounds from muscle action. Palpable right radial pulse weakened or disappeared briefly at each attempt to stop the heart. Electrocardiographic records were replete with muscular artifacts but were readable for rate and QRS potential changes. Little change occurred in magnitude of potentials; changes in heart rate were small. There was no indication of heart arrest. The subject refused further cooperation.

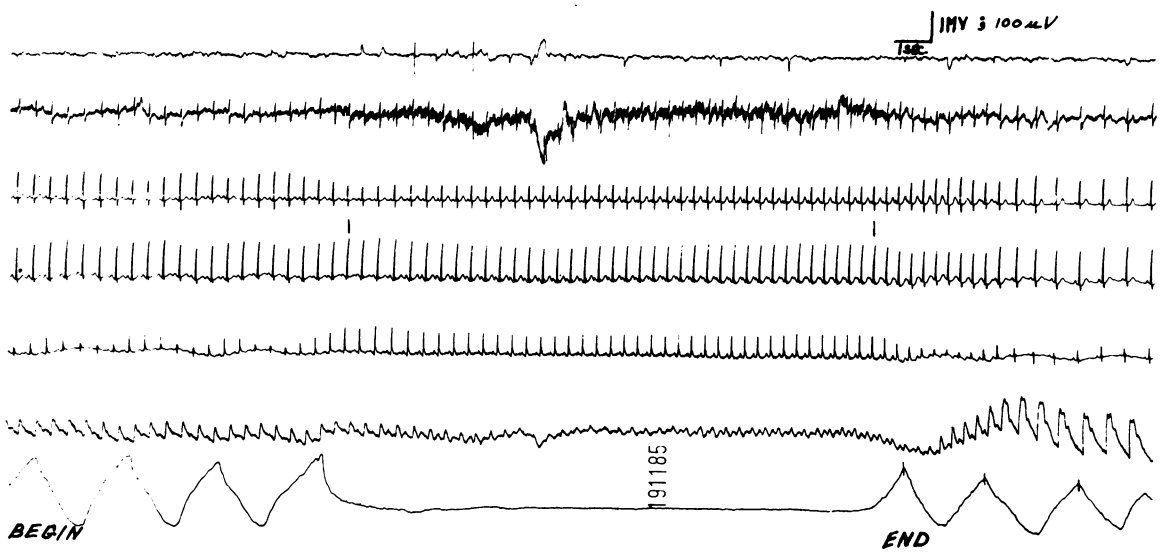

Figure 1

One "heart stopping" attempt by Shri Ramananda Yogi. The channels and variables are (1) muscle potentials, right biceps; (2) muscle potentials, right abdominus rectus; (3) electrocardiographic lead I; (4) electrocardiographic lead II; (5) electrocardiographic lead III; (6) plethysmograph, left index finger; (7) respiration. Calibration was 100 μv/cm. for the electromyogram and 1 mv/cm. for the electrocardiogram. Chart speed was 1.25 cm./sec.

No. 2. Shri Ramananda Yogi, of Andhra, age 33, at All India Institute of Medical Sciences, New Delhi, made seven attempts on 2 days, and additional experiments on a third day during fluoroscopy and x-ray photography,* all in a supine position. This work was initiated in the laboratory of the third author who became interested in the results and was asked to collaborate. His account of the second and third days of experimentation follows:

I examined Shri Ramananda Yogi on March 7, 1957, during two experiments in which he claimed he could stop the heart and pulse. He was investigated during these experiments electroencephalographically and electrocardiographically by Drs. Wenger and Bagchi, who also recorded his finger blood volume, respiration, blood pressure, and muscular activity. In the first experiment, Shri Ramananda Yogi stopped his respiration after taking four deep breaths. The breath was held in inspiration with closed glottis and the chest and abdominal muscles were strongly contracted. By this maneuver the pressure in the thorax was raised. During this period I could feel a very feeble pulse which had a normal rate in the beginning but became quick in the later part of the experiment. The heart sounds could not be heard but one could hear faint murmurish sounds due to the contraction of the thoracic muscles. The neck veins became distended. The breath was held for 15 seconds. This was immediately followed by quickening of the respiration, quick and deep pulse, and loud heart sounds. After a few seconds the heart rate returned to normal. The resting blood pressure had been 130/96 mm. Hg. Immediately following the breath holding it was raised to 210/100.

During the breath-holding period when the pulse was almost imperceptible and no heart sounds could be heard, the electrocardiograph continued to show contractions of the heart. The electrocardiographic pattern showed a slight right axis deviation which disappeared when respiration started again.

In the next experiment, he repeated the same procedure but held the breath in expiration. All other maneuvers were the same. The pulse, although very feeble, could still be felt. No heart sounds could be heard. Venous congestion in the neck took place. The electrocardiograph showed that the heart contractions continued but this time

*The radiologic investigations were conducted at Irwin Hospital with the assistance of Dr. N. G. Gadekar. The authors are grateful to him for his collaboration.

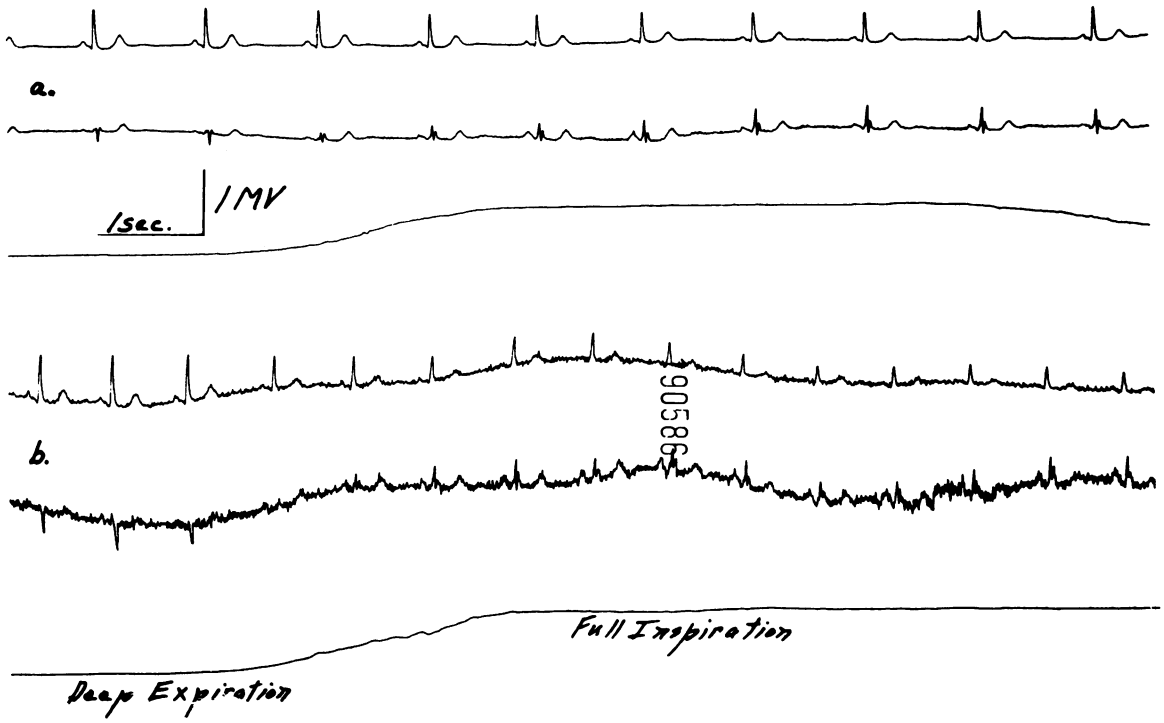

Figure 2

From demonstration by Shri Krishnamacharya of method used in "heart stopping." Electrocardiographic leads I and III, and respiration, are shown in that order (a) at rest, and (b) during demonstration. Calibration was 1 mv./1.5 cm. Chart speed was 2.5 cm./sec.

there was a slight left axis deviation. All other responses were similar to those in the first experiment.

Next day Shri Ramananda Yogi had skiagrams of the chest taken before experimentation and during two experiments, again attempting to stop the heart and pulse, one holding the breath in inspiration, and the other holding the breath in expiration. In both experiments one finds that the maximum transverse measurement of the heart decreases. Normally the maximum transverse measurement was 12 cm. During the first experiment (inspiration) it was decreased to 11 cm. During the second experiment (expiration) it was decreased to 11.5 cm.

Figure 1 shows the first attempt of March 7. During maintained inspiration the QRS potential is seen to decrease in lead I and to increase in lead III. (In the second attempt, during maintained expiration, the potentials increased in lead I and decreased in lead III.) The first two channels show muscle action potentials from the right biceps and the right abdominus rectus at the level of the umbilicus. Marked increases are seen to have occurred in the abdominal recording only. The plethysmographic recording shows that the finger pulse was always detectable, and that the pulse volume was greatly increased immediately after termination of the attempt. No unusual changes were detected in the electroencephalographic records.*

No. 3. Shri T. Krishnamacharya, of Madras, age 67, at Vivekananda College, Madras. This gentleman was the one who had "stopped his heart" for Dr. Brosse in 1935 but would not repeat the attempt for us. He finally consented to demonstrate the method he had employed, but with minimum apparatus attached: a blood pressure cuff, electrocardiographic leads I, II, and III, and a respiration

*This subject had engaged in a number of pit-burial demonstrations but refused us cooperation in that respect. Recently, however, he has cooperated with the third author and Dr. Gulzar Singh in such work. The results are to be reported soon.

Table 1

Variability in Heart Period in Last Phase of Heart Slowing Experiments of Subject no. 4 (HP in seconds)

Experiment no.	1	2	3*	1	2	1	2
Date		4/25			5/23		5/24
Initial range		0.6-0.9			0.7-0.8		0.7-0.9
Last 10	1.2	1.2	0.7	1.8	1.3	1.9	1.7
heart periods	1.1	1.6	0.8	1.8	2.1	1.8	2.0
	1.4	1.4	0.9	1.8	*2.5*	1.9	1.9
	2.6	2.0	0.9	*2.8*	2.0	1.9	1.9
	2.5	1.6	1.2	1.9	1.8	1.9	1.8
	1.9	*2.9*	1.6	2.2	2.4	1.8	1.8
	2.3	2.2	1.8	2.1	2.0	1.8	1.8
	2.1	2.3	*2.0*	2.0	2.2	1.6	1.8
	2.0	2.1	1.7	2.0	2.1	1.6	1.8
	1.7	1.6	0.9	1.8	1.4	1.5	1.3
Just after maneuver	0.8	0.9	0.6	1.2	0.9	1.2	0.7
Longest HP	2.6	2.9	2.0	2.8	2.5	2.8	2.9

**Uddiyana* alone

belt; none of which he would tolerate fastened tightly. He said his radial pulse might stop, but his heart wouldn't. The method proved to be similar to that employed by Shri Ramananda Yogi during maintained inspiration. The muscular effort expended was less, but the periods of maintained inspiration were considerably longer. Again, the blood pressure increased, the maximum change being from 128/80 to 140/105. There were no definite "attempt" periods for this subject. He merely permitted us to record data while he reclined and engaged in *pranayama* (breath control) as he pleased. On three attempts to measure blood pressure no sounds could be heard from the brachial artery. On another day with the subject seated, a physician was permitted to palpate both radial arteries and listen to heart sounds stethoscopically.† He reported no absence of heart sounds but at one time the radial pulse was not detectable in either wrist.

We believe the most significant data from these experiments are the changes in QRS potentials in leads I and III (fig. 2). As we previously had found with Shri Ramananda Yogi, during maintained inspiration with glottis closed and with increased tension in abdominal muscles, the heart potentials decreased in lead I but increased in lead III. Again, right axis deviation of the heart is indicated.

No. 4. Shri N. R. Upadhyaya, age 37, at Kaivalyadhama, Lonavla. This gentleman did not claim to stop the heart. He claimed only to slow it. He was a student of Yoga with more than 5 years of training, and had discovered accidentally that he could slow his heart. The maneuver occurred in the reclining position and during maintained inspiration. Just before the attempt a rolled towel was inserted under the lumbar area of the spine which gave a support 4 or 5 inches in height. After inspiration the subject engaged in the Yogic posture known as *uddiyana,* which involves a raising of the diaphragm and an inward distention of the abdomen, and accompanied it with another posture known as *jalandabar bandha,* in which the chin is depressed and extended toward the chest.

We tested him on 3 days, and on the first 2 days applied electrocardiographic chest leads V_2 and V_5 in addition to standard leads I, II, and III. There were only small changes in the magnitude of the QRS potential in any

†The authors are indebted to Dr. S. T. Narasimhan of Madras for his assistance in this experiment and for his genial aid in our work.

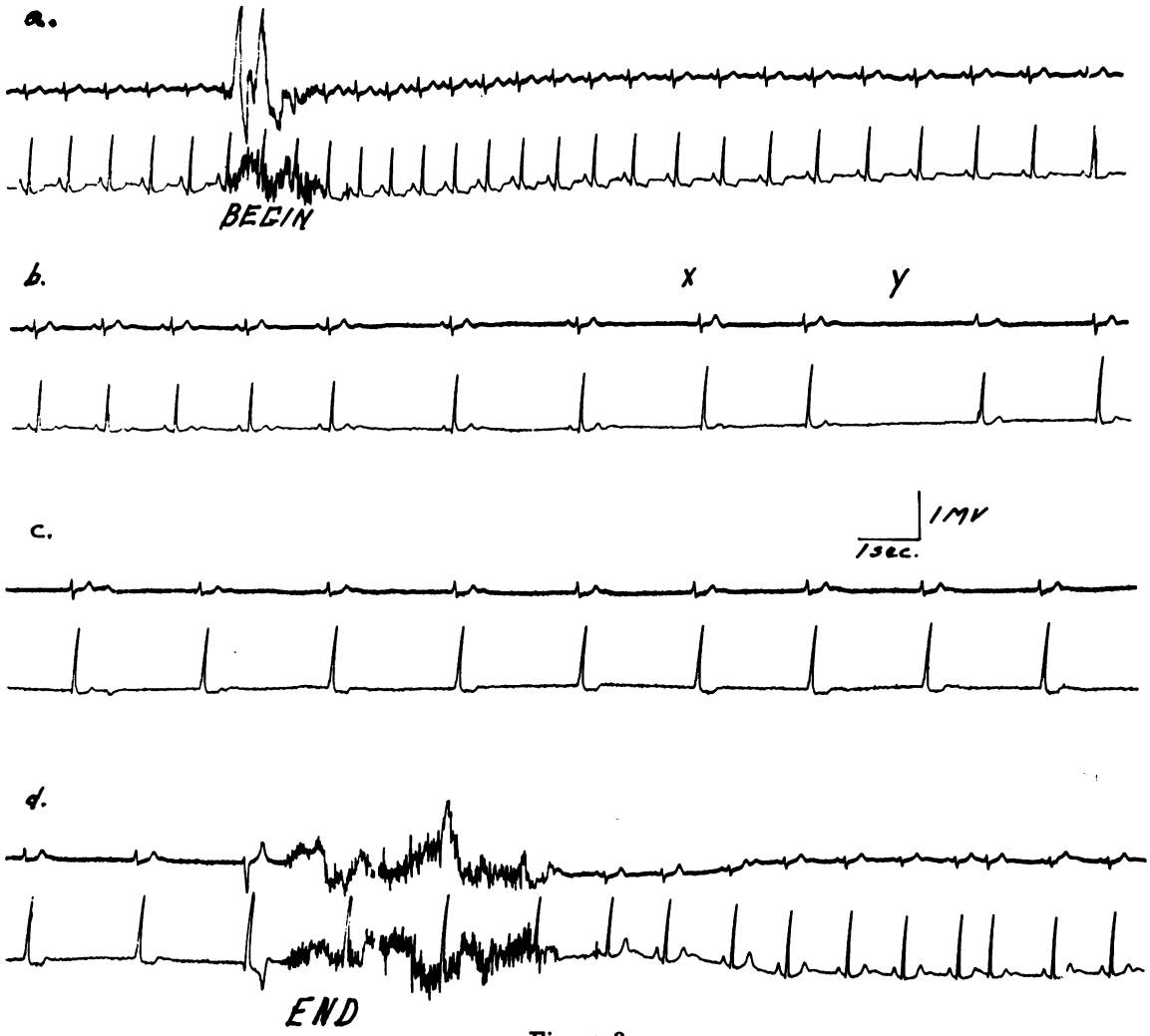

Figure 3

One attempt by Shri Upadhyaya to slow the heart. Sequential portions of the recording of electrocardiographic leads I and III are shown. Calibration was 1 mv/cm. Chart speed was 1.25 cm./sec. The P wave disappeared (x) and was absent for 16 heart cycles. The longest cycle length (Y) was almost 3 seconds.

lead. There was, however, a marked slowing of the heart in each test. In addition to bradycardia we found an increase in the P-R interval and finally a marked decrease or disappearance of the P wave. Thus a nodal rhythm appeared for a few beats before the subject terminated the maneuver. Figure 3 demonstrates the longest P-wave depression we obtained. The longest cycle length was approximately 3 seconds.

Our attempts to discover the mechanisms contributing to these results were not fruitful. Pressure on the carotid sinuses produced an increase rather than a decrease in heart rate. The chin lock alone (*jalandabar bandha*) produced little or no change. *Uddiyana* alone produced some bradycardia and one cycle of almost 2 seconds' duration, as may be seen in the third column of table 1. The other columns of the table show (a) the durations of the last 10 cycle lengths in the six main experiments, (b) the premaneuver range, (c) the first postmaneuver heart period, and (c) the longest recorded heart period. The period-to-

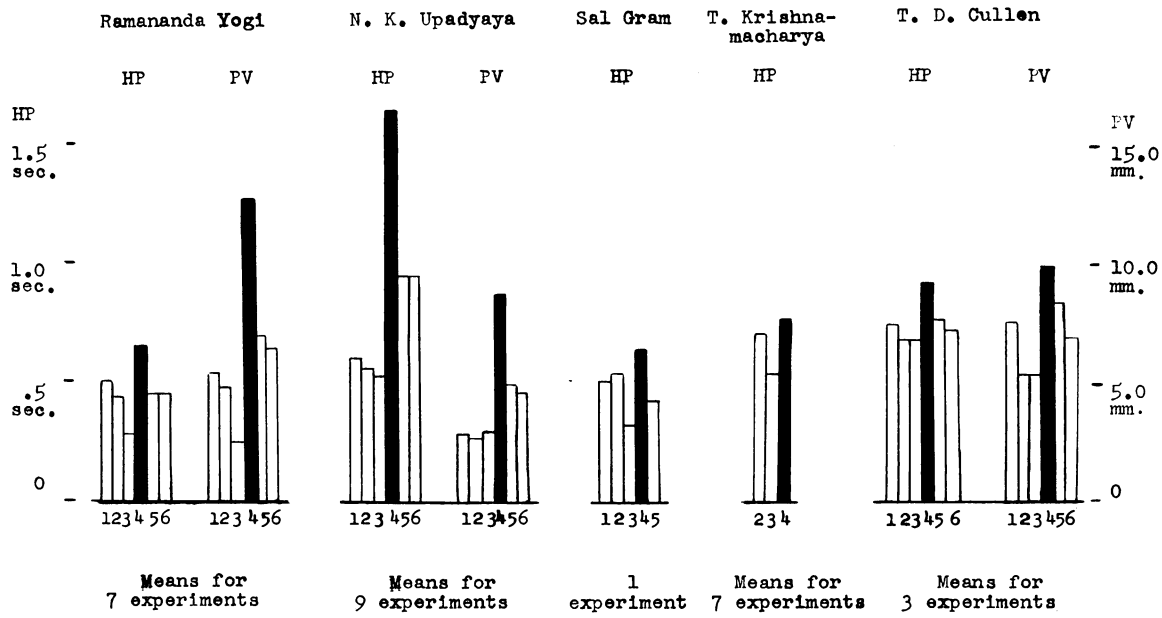

Figure 4

Summary of experiments on control of the heart. Each entry for heart period (HP) and finger pulse volume (PV) represents pooled means for samples of 10 heart cycles from each phase of each experiment. Different phases of the experiments are indicated as follows: 1. Initial rest. 2. After instructions. 3. Fastest HR and lowest PV during maneuver. 4. slowest HR and highest PV during and just after maneuver. 5. 50 HP after sample no. 4. 6. 100 HP after sample no. 4.

period variability is apparent. Of additional interest is the observation that only on the last day of experimentation was the maneuver maintained for 10 or more heart cycles beyond the greatest bradycardia. Apparently experience or amount of attached apparatus, or both, influence the effects of this maneuver. This subject is still available for research. Subsequent work by Indian investigators supports the above observation in that a heart period of 5.6 seconds has now been recorded.[5] Perhaps they will discover the mechanisms underlying the effect.

Discussion

It is obvious that the subjects we tested do not voluntarily control the heart muscle directly. In each instance some striated muscle action intervenes. Through muscular and respiratory control certain changes do occur in circulatory variables. Figure 4 shows changes in heart period and (for some subjects) finger pulse volume for the Indian subjects and for one American (Dr. Cullen)* who attempted to repeat the Valsalva experiment. Decreased heart rate was greatest in the subject who claimed only to slow the heart. The greatest changes in finger pulse volume occurred in Shri Ramananda, who exerted utmost effort to demonstrate "heart stopping." Dr. Cullen employed less effort, although his pattern for heart period is not greatly different from that of Shri Ramananda.

For the first three subjects we assume that by increased tension in the muscles of the abdomen and thorax, and with closure of the glottis, there is developed an increased intrathoracic pressure that interferes *with the venous return to the heart.* With little blood to pump the heart, sounds are diminished, as

*The authors are indebted to Dr. Thomas Cullen, University of California, Los Angeles, for his participation in this experiment and for his assistance in analyzing the data.

well as being masked by muscular sounds, and the palpable radial pulse seems to disappear. High amplification finger plethysmography continues to show pulse waves, however; and the electrocardiograph shows that the heart goes on contracting. The electrocardiograph also shows right axis deviation under deep inspiration. The QRS potentials in lead I are markedly decreased. It seems, therefore, that Dr. Brosse's record of "heart control" is to be so explained. She recorded lead I only from Shri Krishnamacharya. Had she recorded lead III, or had she recalled the results of the Valsalva maneuver, she probably would not have claimed that her subject voluntarily controlled his heart.

It is of interest to know that our conclusions have had a forerunner in India. After completion of our work we discovered a monograph published in 1927 by Dr. V. G. Rele of Bombay.[6] Although he published no data, he writes of electrocardiographic records and x-rays on one subject, and reached conclusions similar to ours, although he extended them more than we care to do.

Our fourth subject demonstrated a different phenomenon that further research may explain. It could be said that he "stopped the heart" for a few seconds. We prefer to assume that by some striated muscular mechanism he stimulated the vagus output to the sinoatrial node, interrupted it, and thus interrupted regular cardiac cycles and a nodal rhythm was briefly established.

In this connection a recent publication in California is of interest.[7] A patient complained of heart slowing when he relaxed. Published electrocardiograms show a period of standstill of approximately 5 seconds followed by a QRS potential with no P component. The report, supplemented by private correspondence, indicates that there were no changes in QRS magnitude but that the P wave at the end of the periods of bradycardia was reduced or absent. Contrary to our Indian subject, he apparently employed no intervening muscular or respiratory mechanism. He merely relaxed. His data call to mind other examples of voluntary control over supposedly involuntary musculature, such as one reported by Lindsley and Sassman[8] with pilomotor control, and one[2] with sudomotor control. Such examples probably are to be explained in terms of accidental conditioning.

Summary and Conclusions

Among other studies in India the authors investigated four practitioners of Yoga in respect to control of the heart and pulse. Two claimed to stop the heart. One formerly made this claim but only demonstrated his method. The fourth claimed only to slow the heart.

The method for the first three was similar, involving retention of breath and considerable muscular tension in the abdomen and thorax, with closed glottis. It was concluded that venous return to the heart was retarded but that the heart was not stopped, although heart and radial pulse sounds weakened or disappeared.

The fourth subject, with different intervening mechanisms also presumably under striated muscle control, did markedly slow his heart. The data indicate strong increase in vagal tone of unknown origin.

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