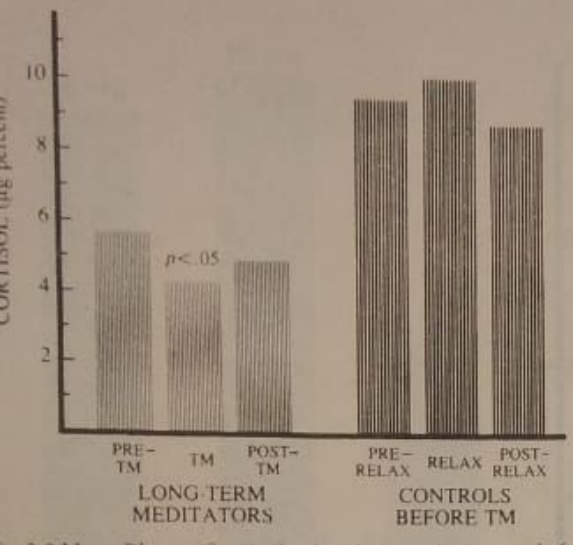
$p < .05$; *t*-test for paired samples.



g. 3.2 Mean Plasma Cortisol values before, during, and after ranscendental Meditation or Relaxation [After Scientific esearch on the Transcendental Meditation Program, Collected apers Volume I, Edited by David W. Orme-Johnson & John . Farrow.]

ontrol period, a meditation period and a post control eriod. Blood samples were drawn every 20 minutes, arting 10 minutes after the beginning of the experimental eriod. Subjects were not allowed to take breakfast or unch and were observed between 12 noon and 5 PM in im lighting. A minimum of two and one-half hour elapsed etween insertion of catheters and the beginning of the xperimental period. Plasma was assayed by specific adioimmuno-assays for prolactin and cortisol.

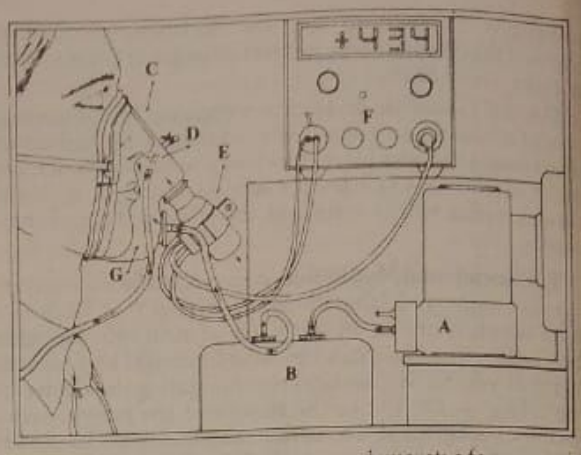
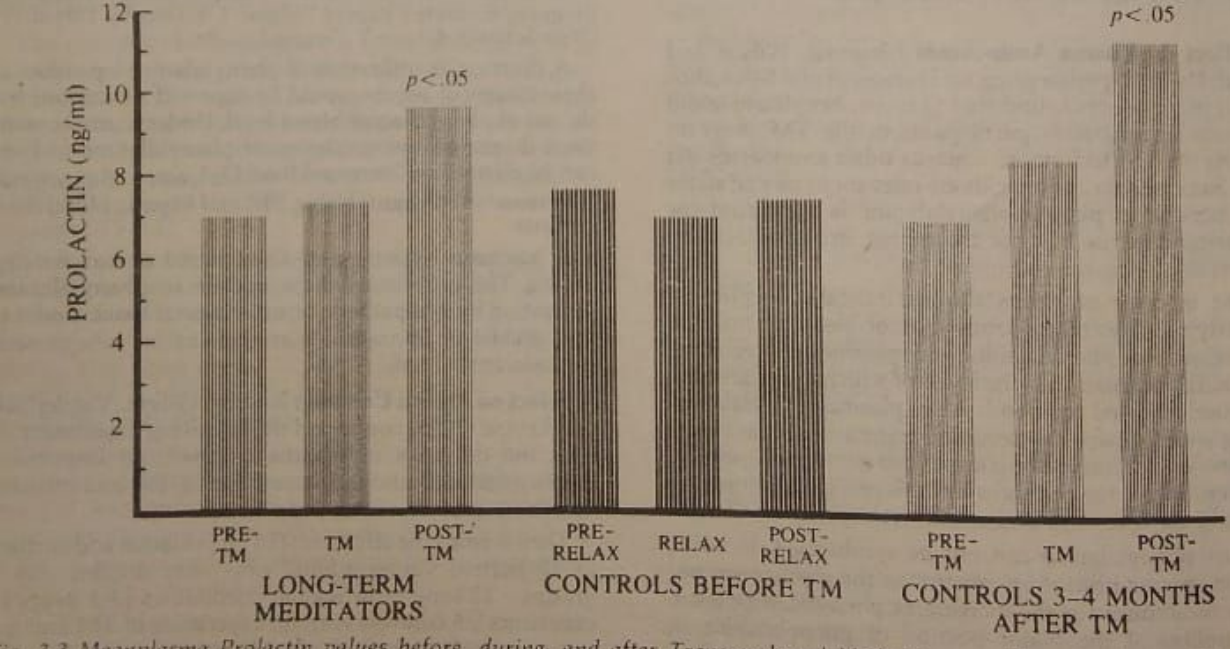


Fig. 3.4 Nonintrusive Respirometer — Apparatus for measuring respiratory parameters.

Note : A. Pump B. Reservoir C. Mask D. Capillary to Mass Spectrometer E. Pneumotachograph Head F. Pneumotachograph G. Controlled Air Leak.
[After Scientific Research on the Transcendental Meditation Program, Collected Papers Volume I, Edited by David W. Orme-Johnson & John T. Farrow.]

A **Metabolic and Respiratory changes during Meditation :** Within 5-10 minutes after the onset of TM Oxygen consumption and carbon dioxide elimination decrease significantly; the mean decrease in O_2 consumption is about 17% and the mean decrease in carbon dioxide elimination is about 30 ml/minute. The mean decrease in total ventilation is near about 1 litre/minute. Ventilation is near about 1 litre/minute. Respiratory rate shows a mean decrease during meditation of about three per minute.

The result showed decrease of plasma cortisol, indicating lessened adrenocortical acitivity during TM.



ig. 3.3 Meanplasma Prolactin values before, during, and after Transcendental Meditation or Relaxation [After Scientifi esearch on the Transcendental Meditation Program, Collected Papers Volume I, Edited by David W. Orme-Johnson & John T arrow.]

A COMPARATIVE STUDY OF PHYSIOLOGICAL PARAMETERS & PHYSICAL FITNESS OF INDIAN NATIONAL HOCKEY TEAM, WINNERS OF 3RD WORLD CUP 1975 & MONTREAL OLYMPIC TEAM 1976

TABLE — II

PARAMETERS	WORLD CUP WINNING TEAM 1975 n = 16		MONTREAL OLYMPIC TEAM 1976 n = 16	
	MEAN	RANGE	MEAN	RANGE
Weight (Kg)	64.9	55.1 — 80.0	64.3	55.9 — 81.3
skinfold Thickness (mm)	20.4	15.8 — 26.8	23.6	15.5 — 42.5
Heart Rate (per minute)	48.2	40 — 50	52.1	43 — 58
Blood Pressure— systolic (mmHg)	116.9	108 — 130	108.2	100 — 118
diastolic (mmHg)	76.3	64 — 90	72.8	68 — 80
Pulse Pressure(mmHg)	40.5	30 — 52	35.4	22 — 46
Mean Pressure (mmHg)	89.8	81 — 100	84.6	90 — 95
Oral Temperature (°C)	36.3	36.1 — 36.6	36.2	36.0 — 36.6
Grip — Left (Kg)	39.3	25 — 50	44.6	40 — 50
Right (Kg)	40.9	30 — 50	46.0	35 — 50
Hemoglobin Content (gm %)	14.3	13.2 — 15.0	14.9	13.0 — 16.0
D.L.C. — Neutrophil (%)	51.1	42 — 59	53.0	45 — 65
Lymphocyte (%)	40.8	35 — 53	40.7	25 — 48
Monocyte (%)	3.6	2 — 6	2.8	2 — 4
Eosinophil (%)	4.6	3 — 9	3.5	0 — 8
Lung Function — Tidal Vol. (ml)	540.5	400 — 910	843.3	522 — 1426
Minute Ventilation (Lt/mt)	6:3	4.0 — 8.2	13.8	10.4 — 18.2
Insp. Capacity (ml)	2650.0	2050 — 3650	2998.0	2090 — 3919
Exp. Res. Volume (ml)	1512.3	1000 — 2000	1678.6	888 — 2404
Vital Capacity (ml)	4162.3	3175 — 5000	4676.0	3465 — 5250
F.E.V. 1 sec. (ml)	3395.3	2650 — 4550	3788.2	2874 — 4912
M.V.V. (Lit./Min)	110.3	87.5 — 150.0	118.3	85.0 — 150.0
Chest Expansion (cm)	9.0	7 — 11	9.9	6 — 14
Hyman's Cardio-pulmonary Index (Adynamic)	1.247	0.959 — 1.498	1.499	1.021 — 2.160

team were studied before and after their training and it is obvious from the *TABLE* I that there was a significant lowering of stress and precompetition tension. The team psyche was of high calibre. Subsequently this team while trailing behind in crucial matches (semi-finals and finals) against formidable and physically apparently superior teams of Germany and Pakistan, remained calm and steady. Our team not only equalized but eventually won the matches. This could be possible only because of better team psyche and superior mental fitness combined with a fairly good physical fitness, thus leading to a holistic fitness of our team. On the other hand as seen in the *TABLE* II of a comparative study of this World Cup winning team 1975 with the 1976 Montreal Olympic Hockey team, the physical fitness parameters were superior in the case of our Montreal Olympic Hockey team.

Yet this team of 1976 although had received superior conditioning and were physically fitter, performed poorly. It was quite evident from their performance at Montreal that they lacked the vital qualities of the 'Total Fitness' which made the 1975 World Cup team come out victorious inspite of heavy opposition from formidable rival teams. Those of us who were witnessing our Olympic team's performance in 1976 at Montreal could not believe our eyes as our team showed a totally defeated attitude long before the game was over. Whereas performance of teams which came from other countries (the way they kept trying their best till the end) won the admiration of all the spectators. We had a good team well selected by highly experienced selectors and had very good training and as per the *TABLE* II even were physically in better condition than our World Cup winning team of 1975. Yet they lacked that 'Something extra', the vital qualities of the 'Total Fitness' was lacking and team psyche was poor. Yogic discipline when implemented seriously has unlimited potentials for promoting Total Fitness of our sportsmen. Serious trials and more scientific research are essential for introducing this great superior media originating from India and it will be a pity if we do not take advantage of such a great thing we already possess, to promote 'Total Fitness' of our sportsmen by establishing 'Mind over Body'.

The Sutlej river in Punjub used to flow freely, carrying away millions of mega-volts of current uselessly till it was harnessed by the Bhakra Dam and the controlled release of water produced the much needed power generation which made Punjab so prosperous. The unthinkable and unfathomable depths of human capability may reach to undreamt heights of perfection, provided we concentrate on the holistic, promoting dedicated inner discipline and self-control, to be used with devotion and determination to bring out the best in an individual when required. To promote and ensure this, the possible role of yogic discipline among our youngmen is undeniable and must be seriously consid ed This unpublished comparative data of our Natio l Hockey teams of 1975 & 1976 give sufficient evider e for the great importance and possibility of imple- mentir Total Fitness by having Mind over, Body, while we tra our budding sportsmen.

ating from the mind — and what is mind ? The poet
ry nicely framed this in the following lines :—

Life's battle's victory won't always go,
To the stronger or faster man,
ut sooner or later, one who wins,
Is the one who THINKS he can".

a successful performance in sport a general physical
is undeniably essential. But it is the 'Total Fitness' of
tsman — the fitness of the body, mind and spirit —
provides that Something Extra making the difference
en success & failure, enabling outstanding achieve-
in big competitions.

rtsmen face various psychological problems. During
ive training, high emotional tension, the non-specific
al resistance to stress is lost first. The vegetative
ons deteriorate next, and finally the motor coordina-
s affected resulting in poor performance. Since in
e competition the hard physical work with emotional
ons is bound to be present, several ways of meeting
ressful condition are sought by diet, physiotherapeutic
s, improved routine of training conditions and finally
laxation. 'Precompetition tension' has an adverse
on team psyche and lowers the morale of sportsmen
rbing their overall efficiency, stability and ultimately
performance. This fact is well recognised and careful attention is paid to the sportsmen during precompetition days. It is now an accepted practice in countries leading in various sports to emphasize relaxation before an important competition. Rathbone had introduced & established specific techniques for relaxation to release tension. Too much tenstion results in hypertonus which is detrimental to the performance of an individual. Also it disturbs his other important physiological functions like digestion, circulation, excretion & sleep. Sports phychology nowadays has been given important recognition.

The following Data in *TABLE* I collected by us reveals significant changes in various physiological parameters of our 3rd World Cup winning Hockey team in 1975 during their precompetition days before and after trainingwhen they were undergoing intensive training before their tournament. We introduced Yogic discipline emphasizing deep relaxation by 'Shavasana'. Yogic discipline when observed properly — leads to a state of tranquil equipoise. The great tension and worry for success or failure is not the chief concern, but doing one's best of the perfection of the job is of prime importance to the performers. Actually this is the doctrine of *'Karmayoga'*.

Yogaschittabritti Nirodha means a state of absolute control of the senses by the Yogic discipline bringing balance and harmony leading to perfection of body, mind and spirit. Our 3rd World Cup victorious National Hockey

A COMPARATIVE STUDY OF PHYSIOLOGICAL PARAMETERS & PHYSICAL FITNESS OF THE INDIAN NATIONAL HOCKEY TEAM, WINNERS OF THE 3RD WORLD CUP 1975

Table — I

PARAMETERS	BEFORE TRAINING (n = 16)		AFTER TRAINING 6 wks (n = 16)	
	MEAN	RANGE	MEAN	RANGE
Weight (kg)	63.7	54.1 — 79.5	64.9	55.1 — 80.0
Skinfold Thickness (mm)	22.3	15.4 — 37.1	20.4	15.8 — 26.8
Heart Rate (per minute)	57.6	40 — 60	52.1	43 — 58
Blood Pressure systolic (mmHg)	122.3	108 — 136	116.9	108 — 130
Diastolic (mmHg)	84.3	70 — 92	76.3	64 — 90
Pulse Pressure (mmHg)	38.0	30 — 48	40.5	30 — 52
Mean Pressure (mmHg)	96.9	83 — 105	89.8	81 — 100
Oral Temperature (°C)	36.2	36.0 — 36.6	36.3	36.1 — 36.6
Grip — Left (Kg)	37.8	20 — 50	39.3	25 — 50
Right (Kg)	37.7	20 — 50	40.9	30 — 50
Hemoglobin content (gm %)	14.3	13.2 — 15.0	14.8	14.0 — 15.4
D. L. C. — Neutrophil (%)	51.1	38 — 55	51.1	42 — 59
Lymphocyte (%)	42.6	35 — 52	40.8	35 — 53
Monocyte (%)	3.0	1 — 9	3.6	2 — 6
Eosinophil (%)	3.4	0 — 9	4.6	3 — 9
Lung function - Tidal Volume (ml)	401.4	350 — 510	540.5	400 — 910
Minute Ventilation (Lt/mt.)	6.2	4.0 — 8.0	6.3	4.0 — 8.2
Insp. Capacity (ml)	2559.4	2050 — 3650	2650.0	2050 — 3650
Exp. Res. Volume (ml)	1198.4	750 — 1750	1512.3	1000 — 2000
Vital Capacity (ml)	3757.8	3100 — 5000	4162.3	3175 — 5000
F.E.V. 1 sec. (ml)	3395.3	2650 — 4550	3432.3	2550 — 4600
M.V.V. (Lit./min.)	103.1	78.2 — 150.0	110.0	87.5 — 150.0
Chest Expansion (cm)	7.5	4 — 11	9.0	7 — 11

hysiological components in measuring physical fitness
ude measuring cardiac output, oxygen consumption,
on dioxide output, heart rate during and after exercise.
e devices are employed — running on a tread-mill,
alling a stationary bicycle (bicycle-ergometer), stepping
onto a 20" stool (Harvard Step test) which do not
uire unusual skill.

erformance is measured in terms of maximum duration
ffort or by the maximum output of work. Physiological
ct is measured by the magnitude of changes in heart
during exercise and the rapidity with which the heart
returns to normal when the exercise is over.

larvard Fatigue Laboratory has devised tests for physical
ess for heavy strenuous exercise which help detection
lteration of physical condition in individuals on reduced
orie intake, reduced Vit. B complex in the diet. This also helps evaluation of programmes of training whether training is adequate, helps in programmes of rehabilitations and convalescence and in many other physical conditions.

Competitive sports has lent a significant colour to our positive health. Besides the great satisfaction of winning against strong opponents, a true sportsman moulds his life's philosophy by always trying to improve according to the motto — Citius (faster), Altius (higher) and Fortius (stronger). He is a true sportsman who receives victory with real humility, accepts defeat gracefully and without resentment and never gives up trying to do his best to improve *Shariramadyam Khaludharma Sadhanam.*

One can achieve only when the mind perceives and heart believes. Extraordinary tests are not performed by physical powers alone but by a tremendous extra power

PHYSIOLOGICAL DIFFERENCES BETWEEN WORLD'S CHAMPION RUNNERS AND HEALTHY NON-ATHLETES. FROM DATA REPORTED BY THE HARVARD FATIGUE LABORATORY*

OBSERVATION	CHAMPIONS	NON-ATHLETES
1. Alkaline reserve Vol. % of CO_2...	48.1	48.0
2. Residual air / Total lung volume.....	0.288	0.285
3. Vital capacity (liters) / Body height (meters).....	3.03	2.73
4. Maximum ventilation during maximum work.....	113	99
5. Tidal air / Vital capacity.....	0.458	0.464
6. Respiratory rate during maximum work.....	48	44
7. Tidal air in maximum work.....	2.38 liters	2.25 liters
8. Oxygen intake per sq. meter of body surface while walking.....	1.0 liters	0.99 liters
9. Blood lactic acid while walking....	13.4 mg. %	19.1 mg. %
10. Maximum increase of metabolic rate.....	21.4 times basal level	14.5 times basal level
11. Heart rate while walking.....	111	134
12. Heart rate while running at 7 m. p. h.....	171	190

*Robinson, S., Edwards, H.T., and Dill, D. B. : New Records in Human Power, Science 85 : 409, 1937.

Total Fitness :

Those of us who are dealing with promotion of health nd fitness of people by preventing and treating diseases nd imparting health education to promote positive health, re aware that the World Health Organisation defines 'ealth' as not merely being free from diseases and infirmity, ut it is a state of mental, physical and social well being of n individual. *Physical Fitness* on the other hand can be eferred to as the capacity of an individual to perform a sk or job physically. It is related to the task performance nd not merely to the health of the individual. Late Dr. einhous a great authority in this field, when asked by the uthor to define total physical fitness, he emphasized that t is a many splendoured thing. It is fitness of body, mind nd spirit, it is fitness beyond muscles only. So the term hysical education' has to be chnaged as 'Health education' – the AIM of medical profession.

The fundmental questions which are not satisfactorily nswered :

(1) Whether there is a thing like physical fitness in eneral or only fitness for particular activities;

(2) Whether we can formulate well-defined parameters o measure physical fitness based on a single test or a ombination of tests;

How one can define fitness ? *A person is considered to be fit for a particular task or activity if he accomplishes it with a reasonable degree of efficiency without being fatigued and with rapid recovery from the effects of that exertion.* So physical fitness is a relative term which connotes a measure of degree of fitness. It is well nigh impossible to make an absolute distinction between *fitness* and *unfitness*.

Components of Physical fitness : There are broadly three components viz. *Anatomical, Physiological* and *Phychological* fitness. When all the organ parts of the body which are essential for the task are functionally present, an individual can be considered as anatomically fit. A man without a leg may not be a runner but can do lot of other things, with his hands. Physiological fitness means the capacity of the individual for the skilful performance of the task along with rapid recovery. This includes muscular strength, motor skill, endurance etc. A man with a weak musculature lacks capacity for doing a work requiring muscular strength but may acquire high degree of motor skill. Phychological fitness implies the necessary emotional stability, drive, motivation, intelligence and desire to learn to perform a task.

Tests for measuring fitness : Clinical examination helps in screening the unfit but fails to differentiate those amongst the fit. The anatomical and physiological fitness can be measured though the former more accurately than the later. Some functional tests are useful. Test conditions closely approximating working conditions are made to evaluate the fitness, but this is not full proof. Repetition of exercise at weekly intervals improves the recovery of pulse rate, respiration, blood pressure but does not improve the performance. Soldiers put on three-mile training-run, better the timing after six months' training which bears no relationship with vital capacity, breath-holding time, resting pulse and post exercise pulse as well as with other metabolic and circulatory functions (even if the performance was carried on with a bicycle-ergometer for a check). So functional tests are at best a rough gauge — to measure physical fitness tests.

Johnson put forward that there are some quantitatively measurable differences between fit and unfit. He also suggested that there are some fundamental physiological adaptations common to fitness for all types of exertion which is distinguishable from special skill necessary for the successful performance of different types of physical endeavours.

Differences between fit and unfit individual

Fit	Unfit
1. Oxygen consumption is lower for a given task.	1. Oxygen consmption is higher for the same task.
2. Pulse rate is slower during work.	2. Pulse rate is higher during same work.
3. Larger stroke volume	3. Higher stroke volume
4. Lower blood lactate	4. Higher blood lactate
5. Faster return of blood pressure and heart rate to normal after the exercise is over.	5. Slower return at blood pressure and heart rate after the exercise is over.
6. Exhaustion occurs after a longer duration for a sustained work.	6. Exhaustion occurs quicker for the same sustained work.
7. Steady states are reached at higher grades of work.	7. Steady states are difficult to reach if at all reached it is with lower grades.
8. Less displacement of physiological equilibria for a sustained work.	8. Greater displacement of physiological equilibria for sustained work.

Metabolic rate changes are less regular between fit and unfit.

ental box. Exploration with the electroencephalograph howed that meditation produces changes in the electrical ctivity of the brain.

Das and Gastant in an electroencephalographic examina- ion of seven Indian Yogis observed that as the meditation progressed the alpha waves gave way to fast-wave activity at the rate of 40-45 cycles per second and these waves in urn subsided with a return of the slow alpha and theta waves.

Transcendental Meditation, a special meditation techni- que as taught by Maharshi Mahesh Yogi that leads to a state which is unique in its degree of neurophysiological integration. The European University founded by Maharshi Mahesh Yogi in Switzerland is propagating the tennets of the 'Yoga' — *i.e.* TM to the benefit of the people with a scientific background. The various faculties of the University published voluminous research papers on various Physio- logical changes which take place during TM. As this is the only form of 'Yoga' which has been scientifically studied, it will be in the fitness of things to place some of their findings. It should be rememberd that 'Yoga' is a highly personalised subject as such whatever changes, Physical, Physiological or Psychological — take place, these are ingrained in the individual who practises it. Naturally, TM should not be confused with classical Yoga.

Physiological changes such as reductions in oxygen consumption, carbon dioxide elimination and arterial lactate concentration; decrease in heart rate, respiration rate and base excess; rapid rise in basal skin resistance, rise of serum amino acid phenylalanine; fall of plasma cortisol and various other physiological changes occur during medita- tion. There is also abundance of electroencephalographic alpha-wave activity and synchrony in central and frontal derivations with occasional rhythmic frontal theta-wave activity during the practice of meditation.

Effect on Plasma Aminoacids : Jeuning, Wilson and Smith (1975) experimenting on Transcendental Meditation (TM) practitioners found that plasma phenylalanine did increase in long-term participants in the TM program during the TM technique, whereas other aminoacids did not. Since plasma aminoacids are relevant to mental states the increase in plasma phenylalanine is significant for understanding the basis of the change in neural activity occurring during the technique.

The increase of phenylalanine indicates a different underlying physiology from that of sleep. It may be mentioned that phenylalanine and tyrosine are precursors of brain catecholamines, the levels of which are believed to be closely related to mood. Also, plasma phenylalanine along with tyrosine, leucine, isoleucine and valine affects the amount of tryptoophan converted to serotonin. Possibility of alteration of the protein synthesis or degradation may be neglected since other aminoacid levels remain unaffected.

Since phenylalanine can not be synthesised de novo, altered specific utilization remains as the mechanism not likely to account for the increase of phenylalanine level. Metabolism of the major portion of phenylalanine in normal persons depends on hydroxylation to tyrosine. This occurs principally in the liver and in sympathetic and other nervous tissues synthesising catecholamines.

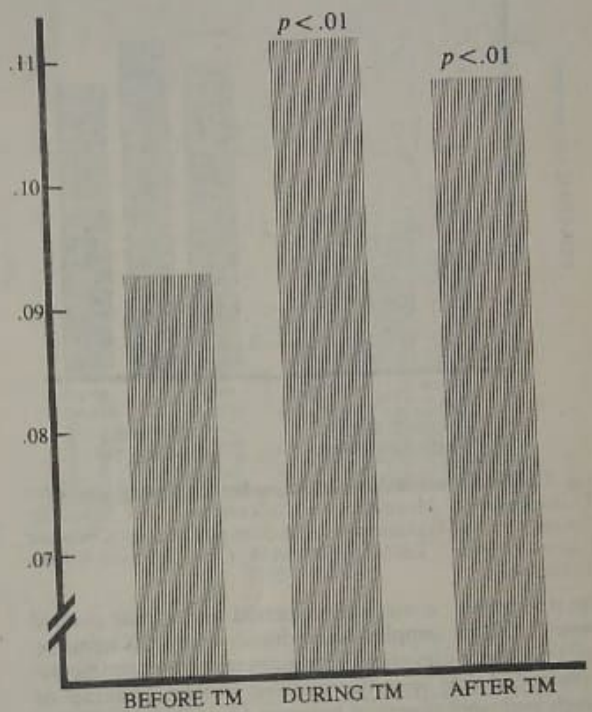


Fig. 3.1 Plasma Phenylalanine level in long-term participants in the TM program before, during, and after the Transcendental Meditation technique. No change in phenylalanine level was noted in controls relaxing maximally or in restudied controls. [After Scientific Research on the Transcendental Meditation Program, Collected Papers Volume I, Edited by David W Orme-Johnson & John T. Farrow.]

A decrease in utilization of phenylalanine by either o these classes of tissues would be expected to account fo the rise of phenylalanine blood-level. Under normal cond tions decreased hydroxylation of phenylalanine in liv can be effected by increased liver O_2 tension. But arteri PO_2 remains constant during TM and hepatic blood flo declines.

It has been hypothesised that altered neural activi during TM is reflected in a decline in phenylalani utilization by sympathetic or other neural tissue, and i this decline in utilization that explains increase plas phenylalanine level.

Effect on Plasma Cortisol : Jeuning, Wilson, Vanderl and Levine (1975) conducted the following experimen find the decrease of plasma cortisol, an import biochemical indication of stress, during TM and incr of plasma prolactin after TM.

They studied the effects of TM on prolactin and cor in 17 normal young adults, who were divided in groups : 12 long-term regular meditators (3-5 yea experience), 5 controls with no experience in TM an same controls restudied after having learned TM having practised it for 3 to 4 months. The experimen divided into three parts, each 40 minutes in length;

3 : Physiological changes during meditation :

As it is mentioned already that the first part of the practice of Yoga is concentration or DHARANA. Concentration leads to Meditation or DHYANA which leads to final policy to join the experience of ABSOLUTE. So Meditation is an important step in most of YOGA according to Hinduism, Buddhism, Jainism and possibly play on important role in the rituals of other religions too.

The practice of Meditation : A quiet secluded place is chosen where there is no disturbance and a feeling of security exists. The individual may sit cross-legged on an *asana* with straight body, or on a chair with a back-rest so that one can feel at ease to forget about the body. Recumbent position is not suitable except in case of illness or incapacity. It should begin into a prayer or inner call — an aspiration towards DIVINE.

1. One of the first method consists in watching the thought processes as they swarm about in the mind, without having an attachment to any of the thought processes. Because of the detachment, the thought processes will weaken after some period — and a state of 'quietude' or 'quiet mind' is reached. Thoughts do occur but do not disturb the inner perceptions.

2. Another method is to create void in one's mind. It is quicker and difficult as one is to banish all thoughts from the mind. As soon as the thoughts come, it is discarded and pushed out before it is allowed to settle down. In this way, the memories and associations are also relegated to insignificance. So the mind passes into quietude or peace.

3. The other method is to concentrate *i.e.* filling of the mind on a single object so strongly that the mind unites with the object. The object is surely the DIVINE or SUPREME. It matters little whether it is Impersonal or Personal God or subjectively ONE SELF. One idea is *"God in all and all in God"* attitude. Whenever mind wanders away, it is to be brought back to its object with quiet and persistence. Dissociation is to be practised here also. It is better that one should practise the three methods concurrently according to the need. One point to be remembered that the practice should be regular and preferably at the same hour of everyday. With sincere practice, one day the individual will experience sudden *'Unutterable happiness"* — to which no human joy or pleasure can be compared. It is an impersonal state, without an object and still there is presence, invisible but penetrating into the depths of the soul or descending from the highest range of spirits. When this state is reached all doubts disappear, all problems vanish — and there reigns *security, confidence* and *certitude*. Mystics of all countries experiencing this state has given it various names. **The Great Peace, Illumination,** The **Repose in Brahaman, Nirvana** etc.

In *Buddhism* there are details of numerous methods of meditation. They acknowledge nine successive stages of meditation *(Naba-Anupurvavihara)* which culminate in *trance* i.e. *Vissuddhimagga* or *Buddhaghosea*.

The first four of these nine stages that are attained in the realm of *form*, with the help of *'form'* or matter as the object of meditation; the next four are those which are attained in the realm of *formless;* with the help of *formless* or *'nonmatter'* as the object of meditation. The ninth is the last stage where not only sensations or consciousness, but also all the mental properties or mentals (caitta caitasika Dharma) are suppressed with the mind itself. In this stage there is only slight difference between the man in trance and a dead man. The first four *trances* are performed with *'form'* will as image of Buddha, they are called *'trances from forms'* or *'Rupa-Dhyana'*. The next four trances occurring by passing wholly beyond all perceptions of matter above mental awareness.the individual enters into as abides by the *Sphere of Infinite space*.

In the ninth stage, there is cessation or suppression of consciousness and sensation *(Smjna-Vedita nirodha)*. This state is also called *'asamprajnanata'* in *"Yoga Sastra"* and *"nirvikalpa"* in Vedanta. This stage is sometimes called *'SAMADHI'*.

Many yogis claim that they are capable of voluntarily stopping the heart beat or surviving for extended periods in an "air-tight" pit or in extreme cold without food or in a distorted physical posture.

There'se Brosse, a French cardiologist was the first to perform experiments in an objective way in 1935. She found from her tests that one of her subjects actually was able to stop his heart.

In 1957 two American Physiologists,M.A. Wenger and B.K. Bagchi of the University of Michigan Medical School conducted a series of experiments and concluded that some of the yogis could slow both heart beat and respiration rate.

Y. Sugi and K. Akutsu a few years back, worked on zen meditators and other types of Yoga practitioners and found that during meditation the subjects decreased their consumption of O_2 by about 20% and reduced their output of CO_2.

Anand, Chinna and Singh got a similar finding in examination of yoga practitioner, confined in a sealed

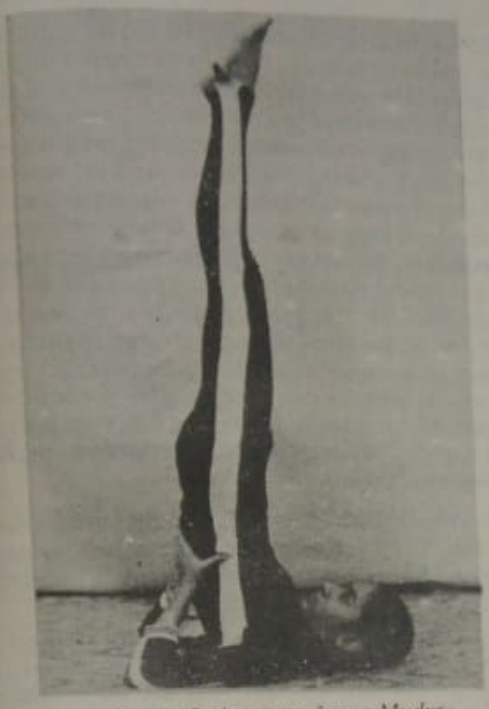


Fig. 2.3 Sarbayanga Asana-Mudra
(By the courtesy of Malay Roy (Yoga cure centre, Calcutta)

gical parameters of subjects observing Yogic discipline. They have significantly slower heart rate, slower respiration rate, lower serum cholesterol level, lower fasting blood sugar level and increased lymphocyte count when compared with others. The slightly elevated basal calories of the Yoga practitioners within normal range indicate a better physical condition with active readiness of the body and the raised lymphocyte count suggest the preparedness of the body defence mechanism.

This was further corroborated by Dr. UDUPA and his colleagues in Institute of Medical Sciences, Varanashi. They studied the effects of individual *'asanas'* by dividing the volunteers into three groups, each group practising one of the three important *asanas* namely *Sarvangasana* (standing on shoulder), *Shirshasana* (standing on head) and *Halasana* (Plough pose). Each was practised along with its complementary postures i.e. *Matsyasana, Mayurasana* and *Pashchimattasana* for optimal results. The effect of Sarvangasana induced cardiorespiratory responses and less endocrine and metabolic responses. Shirshasana induced less physiological changes and Halasana produced more physical changes and less physiological changes.

In another study, the experimentors found respiratory responses along with adrenocortical hyperactivity in *Pranayama* — a breathing yogic exercise. They suggested that each of the asanas inspite of having broader trends has some degree of specificity of its influence.

Thus it is quite evident, the tremendous possibilities Yogic discipline have by its great impact on the body mind and spirit.

The gaining of a healthy body and mind, calm and passive under all circumstances is common aspiration of all Yoga culturist. Control of one's mental processes as well as reduction of the emotions is a basic common goal. This is achieved partly through conscious inner discipline, and partly by releasing the undercurrents of the mind — the subconscious. Like "Bayu Rohita Pradeshe Nishkampa Pradipa-bath" which means leading to a tranquail state comparable with an unflickering steady flame protected from disturbing blasts of wind. To bring about peace in the world one must himself be at peace and harmony within. The greatest mark of Yoga is Peace, and Harmony. Modern science inspite of its brilliant achievements donot and cannot give a complete clarification and understanding of pain, sorrow and suffering, which is the fundamental problem of mankind haunting us from the very beginning of existence. Yoga is a way of life. Living a natural simple life, practising regular daily Yogic exercises, taking simple sattwic food with complete detachment and absolute control of the mental processes along with the physical, will enable and lead one to attain perfection and salvation (Mukti).

With serious and deep studies, more and more scientific research, Yoga may come out from the cloud of occult mysteries. This ancient but so great and perfect scientific art originating from India will be having unfathomable benefits for human lives once again, if properly applied and utilized.

Fig. 2.4 Dhanurasana
(By the courtesy of Malay Roy of Yoga cure centre, Calcutta)

Fig. 2.5 Bhujangasana
(By the courtesy of Malay Roy of Yoga cure centre, Ca

2: *Physiological Aspects of Yogic Discipline :*

With the advancement of civilization human race has made tremendous achievements in many fields.One great accomplishment being the successful control of many infectious and communicable diseases and the life expectancy has gone up very much (almost doubled) as a result of this success. On the other hand many new diseases we are facing now which are directly related to our way of life, full of stress and tension by living in the concrete jungles of modern era. Heart disease has become one of the biggest killer in our times. We are living in an age where neurotic personality has become most common. Medical World is trying their best to combat now a formidable enemy termed as Psychosomatic diseases. Also worth remembering the term 'Iatrogenic Disease' which is a result of modern treatment induced by drugs.

Maharshi Patanjali the father of modern concept of Yoga and a great physician himself, in the 3rd century BC defined Yoga as the complete mastery of mind and emotions. Unlike so many other philosophies of the world it is a scientific philosophy that is wholly practical. Yoga is an exact science which has its foundation on certain immutable laws of nature and establishes 'Mind over Body'. The gaining of healthy body with a calm and steady mind under all circumstances is common aspiration of every individual. The word Yoga is derived from the Sanskrit word 'Yuj' which means 'control' or 'unite'. Both these words quite adequately give the meaning of 'Yoga'. Kathopanished(XI, 3, 10-11) defines it as a 'state of steadiness with control of senses as well as the mind and the intellect; which when achieved makes an individual completely faultless and unoffending'.Real Yoga-Sadhana leads to harmony and perfection of body, mind and spirit. Gita refers to Yoga in several places — Gita XI, 48 defines Yoga as signifying a state of tranquil equipoise, wherein opposites like success or failure make little difference. According to the definition, Yoga gives complete freedom of desires to achieve anything worldly. Gita XI, 50-51 states a Yogi who renounces the concern of the consequences of his deeds — i.e. who remains concerned only with the perfection of the action and not the consequences, is not reward motivated, will over-come bondage for ever. Gita also in VI, 21-23 mentions Yoga as state of separation from sorrow. This is possible when we are aware of the fact that we always aspire for an improvement in our status and position and advancement in our society. But true Yogi is not such reward motivated and therefore remains undisturbed and absolutely serene in the wake of severest adversity.

Yoga is a science which enables us to learn to unite our *Jivatma* (individual soul) with the *Paramatma* (universal Soul). While the final union is the fulfilment of 'Yoga', even the techniques while promote one's progress towards realisation of the Supreme are called 'Yoga'. Thus there are in Hinduism four classical paths to reach the ultimate goal.

1. BHAKTI YOGA – THE PATH OF DEVOTION
2. GNANAYOGA – THE PATH OF KNOWLEDGE
3. KARMA YOGA – THE PATH OF ACTION
4. HATHA YOGA – THE PATH OF MYSTICISM.

(Apart from this, there is Tantrika Yoga, Mantra Yoga, Yoga of Mahayana Buddhism. One simplified form of yoga is transcendental Meditation. Sri Arabinda's integrated yoga or Purna Yoga is another variety).

The theme of all these YOGAS is one and the same and the scientific theory in these techniques is based on mental integration and self purification. The different techniques ingrained in these YOGAS are to accomodate different temperament and types of people.

The mental frame and intellectual attainments are different in different individuals. Based on this, the whole human race is divided into four catogories.

1. Man of heart — The Emotional
2. Man of Head — The Intellectual
3. Man with equal development in Heart & Head — The Active
4. Man who are under developed in Heart and Head.

Bhakti Yoga is advised to the Emotional, Gnana Yog to the Intellectual, Karma Yoga to the Active and Hath Yoga to the underdeveloped.

It is Hatha Yoga which is well practised and preached the Westerners and lay people will mean it while talkir

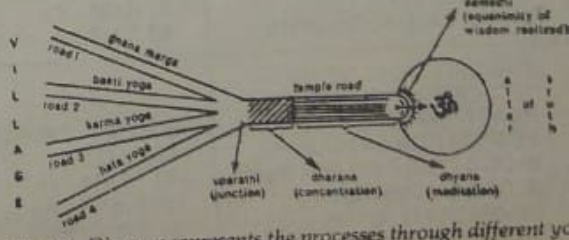


Fig. 2.1. Diagram represents the processes through different yo in which man must enter to gain the ultimate experience of Absolute.

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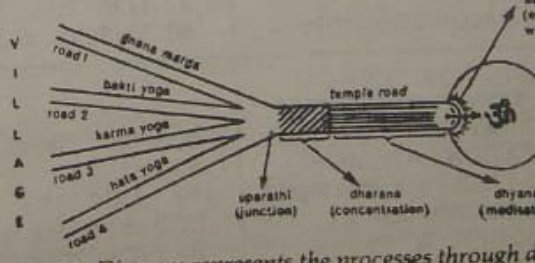

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