SENSE, 2012, Vol. 2 (2), 21- 26
UDC: 233.852.5Y:001.891

Review Paper

Highlights of Scientific Yoga Research Trend in Kaivalyadhama Yoga Institute, Lonavla, India

Subodh Tiwari*, D.D. Kulkarni
Kaivalyadhama Yoga Institute
Lonavla, India

Abstract: *This review paper shows the steps of the development of scientific thought about yoga in the Kaivalyadhama Yoga Institute in India. There are chronologically shown results of some scientific researches. There were researched effects of yoga practice on physical and mental health of the individual, on physiological and biological state in different life occasions. The results evoke interest of the scientists for further, more detailed researches of the effects of yoga practice in different fields of life.*

Key words: *yoga, scientific researches, yoga therapy*

Swami Kuvalayananda, the founder of Kaivalydhama institution was the pioneer of scientific research in the field of yoga since, 1924. The Swamiji's vision was to explore claims of traditional yogic text such as Hatha Pradipika, Patanjali Yoga Sutra & Ghranda Samhita which deals with progressive body relaxation, higher mental and transcendental states. Swamiji was the pioneer to apply scientific methods in yoga research, and has conducted several research experiments to set a new the trend to study Yoga. He started his research journey from fundamental to applied aspects exploring scientific basis of yogic therapy through multidisciplinary approach. The pionner research outcome was first to be documented in the form of journal devoted to philosophic- literary and scientific research in yoga – the journal was named as *Yoga Mimamsa*. Here, is the glimpse of milestone achievements of past and present scientific research in yoga field, published in *Yoga Mimamsa*.

Since, the experiential aspect of yoga is known to improve both physical and mental health, it seems necessary to verify the experiences on organic level of the body. Hence, need of modern scientific approach seems relevant. Therefefore, Samijis' efforts to explore yogic effects on physical mental plane of the body. The journey of scientific research started by *Swami Kuvalayanda* by experimenting on yoga practitioners. This would help to understand the fundamental changes at physiological and mental level before and after yoga practices, which include *asanas* and *pranayama*. The first study by Swamiji was to understand the yogic nature of breathing activity different from that of normal breathing exercise. This was research finding reported in first three volumes of yoga –mimamsa journal. Swamijis finding revealed that yogic breathing exercise called *ujjayii pranayama* is different from typical non-yogic breathing activity performed with or without breath hold. This aspect was tested by the Swamiji based on famous Haldane hypothesis, in which it states that there is an anatomical and physiological limitations for lungs to hold the breath so as to fill maximum air in the lungs and it does not exceed more than 800c.c. of air. Swamiji from his study inferred that the breath hold performed by yogic technique method deviates from Haldane hypothesis as it exceeded with more than 800c.c. of air in lungs.

* Corresponding author: Subodh@kdham.com

The another remakrable study was to understand anatomical aspect of special yogic practices such as *uddiyana bandha* on Intra-gastric pressure in which X-ray study showed a distinct displacement of diaphragm position and enhanced intra –thorasic pressure in contrast to developing negative pressure below the stomach region that comprises large intestine and colon. This negative pressure was termed as *madhavadas vacuum* and its relevance in treating constipation was also explored. The other class of study is on *nauli* – a unique yogic technique also showed negative pressure along with the spatial displacement of the visceral region of alimentary canal which may be voluntarily shifted from center of alimentary canal to the either of the sides of abdominal regions. Its' relevance in emptying the Colon contents is well observed. It helps to eliminate undigested contents and waste products. This has a large implication to treat irritable bowel syndrome and constipation.

The other milestone on understanding the yogic effects were physiological and biochemical aspects of yogic practices. The fundamental research on physiological studies done by Swami Kuvalananda was to observe changes in blood pressure, oxygen consumption and carbon-dioxide tolerance. This was the major break through to reveal that the yogic practices performed with controlled breath and whole body awareness in effortless way, inspired to investigate the extent of energy expenditure due to yoga asana practices. Therefore, Swamiji designed a unique experimental design to test the energy expenditure in terms of oxygen consumption and carbon-dioxide tolerance. The famous experiment was referred as *bhugarbha samadhi* or *Air Tight Burial Pit* experiment. The yoga practitioner as an Experimental subject was compared to control subject to asses the ability to withstand the tolerance of carbon dioxide and demand for oxygen in the limited air volume over maximum duration. The study showed amazing results and revealed subject who practiced yoga practices lead to least oxygen consumption in contrast to the control subject and also tolerance towards accumulated carbondioxide content by the yoga subject was inferred. Based on the finding of this study Swamiji confirmed that carbondioxide tolerance increases after yogic practices. These findings indicate application of yoga practices to the subject to sustain in high altitude atmosphere, where the oxygen depletion exists seems useful. It has also been found later that yoga practice reduce cellular damages caused by oxygen radical formation. The further study by swamiji revealed the applicability yogic relaxation responses in treating hypertensive subjects were well documented.

Research trend from 1960 onwards was more diversified to cover various other scientific disciplines such as fundamental physiology, psychology, physical education. The scientific evaluation of traditional claims of yogic concepts on mind –body relation as described in Patanjali yoga Sutras is the pivotal study on nostril dominance and brain functions. The study was conducted *Vinekar* and *Bhole* and revealed the implications of breath activity in body regulated through stimulation of yoga danda (Crutches) and its relevance to balance the opening of both nostrils– referred as "*Sushumna*" was highlighted and its implication to treat various psychosomatic diseases was vital contribution to yoga therapy. The other physiology using electro-myographic (EMG) study conducted by *Karambelkar* was first to demonstrate the difference between yogic asana performed as exercise and as relaxation technique. The yoga asana performed as isometric and isotonic exercise leads to intense muscle contraction and enhanced heart rate compared to yoga asana practiced as relaxation technique. The study of transcendental effects of samadhi state of yoga on brain functions revealed unique EEG patterns and suggested supra –conscious state of Samadhi.

The biochemical investigation of yogic practices on various parametres has led to theapeutic solutions. They are treating diabetes through selected yoga practices, reduction of excess fat as inferred from anthropological measurements such as skin fold thickness etc. The yoga practices for various applications that relate to improvement of human performance was another facet of

yogic research contribution of Scientific Research Department of Kaivalyadhama. This is based on studies conducted *Gharote, Ganguly* and *Bera*, *T.K*. The major findings indicate enhanced cardio-vascular tolerance, improved grip stregth, body flexibility etc., for various beneficiaries includes school children, athletes, police, etc. The mental aspect of yogic practices were also investigated based on principles of western psychology and its applicability related to human performance conducted *Vijendra Pratap* and *Kocher* on improved memory, psychomtor performance, two hand co-ordination, eye-co-ordination, reduced attention fluctuation, improved attention span and vigilance performance were some of the findings of psychological aspect of yoga practice. The scientific research on other aspect of yogic field is *shat kriyas* or cleasing techniques and its application towards physiological and psychological benefits. For, example: Practice of *vastradhauti, dandadhauti* has a biochemical implication to treat gastric acidity and also practicing *vayubhakshan* also has similar benefits. Its therapeutical applicability in treating respiratory disorders such as bronchial asthma is well evident. The practice of *trataka* is known to improove eye sight as per traditional claims, therefore an attempt in this direction was made to see the benifit of Trataka in this direction. The results indicated decreased attention flutuation, catheratic effects of suppressed thoughts and conflicts. The recent studies in context to applicability of yoga for various proffesionals are found to have profound effects. The examples on psychological front includes reduction of anxiety and neuroticism in police personnels was evident. The study on effects of meditation showed decreased energy expenditure and improoved vigilance performance suggest relevance of mental functions from Patanjalis' of *dhyana* view point. The studies on oxygen consumption in *kapalabhati* revealed that a reduced oxygen consumption for a long duration after ceasing Kapalabhati at rest still continued suggests that *kapalabhati* work as oxygen reservoir.

An inter-disciplinary study was conducted to asses yogic practice effects on academic achievements in residential school children. The findings revealed an improved physical abilities such as flexibility, foot plantation and balance performance. The psychological changes showed better academic achievement, enhanced attention function and optiumum physiological changes including normal blood pressure and pulmonary functions.

Similarly, the therapeutical utility of yoga was observed from a research study on yogic effects in treating obese patients. The study confirmed gradual reduction of excess body weight in the residential yoga group who were under diet control as compared to non-residential yoga group and aerobic group. Further, a study on student population in regard to deteriorating mental health due to stiff competition often leads to suicidal tendency among adolescent students of Maharasthra state. The research findings indicated that yoga practices led to reversal of suicidal tendency, frustration, anxiety and improved mental health and physiological changes such as reduced blood pressure, pulse rate, etc. The bio-chemical aspect includes hormonal changes such as cortisol, adrenalin and nor epinephrine levels. This suggest stress coping mechanism of yoga practices helps to reverse suicidal tendency.

A inter-disciplinary study was conducted on women prisoners in regard to psychological and biochemical changes. The study showed shift to internal locus of control (LOC), reduction in anxiety, improved mental health, etc. Biochemical study revealed better improovenment in haemoglobin levels. The other similar study also was conducted on railway engine loco-drivers in regard to physiological and biochemical aspects of proffesional hazards. This study revealed improved motor nerve conduction velocity as physiological findings of yoga practice effects and on biochemical aspect it showed reduction in C-reactive protein which is responsible for cardiac inflammation, yoga practice prevents atherosclerosis. The study in relation to adoloscent population was done, especially among females suffering from pre-menstrual symptoms and managing the same through yoga training. This is a multidesciplinary study conducted on PMS

identified females on psychological and biochemical aspects. The findings revealed better adjustment, decreased anxiety, frustration, attitude towards yoga, decreased distractions towards studies, etc. The reduction in PMS symptoms such as decreased abdominal pain, reduction clots,etc. The biochemical effects of yoga practice showed favourable changes in menstrual harmones such as estrogen, follicular stimulating hormone and progesterone. The findings suggest that the yoga practices are helpful to manage the PMS symptomps.

Conclusion

The above scientific research highlights since 1924 to the present day reflects that yogic principles have a sound scientific basis and attempts to scientifically co-relate with some of the claims made in traditional yogic texts. This suggests yogic practices apart from expreiential aspect it has firm scientific basis to restore mental and physical health.

References:

1. Bhogal, R.S., Oak, J.P., Gore, M.M., Kulkarni, D.D. & Bera, T.K. (2005). A Month Long Training Programme of Yoga and Aerobics on Anxiety in Obese Indians. *Yoga –Mimamsa*,37, 1 & 2: 31-44.
2. Bhogal, R.S., Oak, J.P., Kulkarni, D.D., Gore, M.M. & Era, T.K. (2004). Psycho Physiological Responses to Omkar and Gayatri Mantra Recitations in Police Trainees Undergoing proffesional Training. *Yoga- Mimamsa*,36, 1&2:11-27.
3. Bhole, M.V. & Karambelkar, P.V. (1968). Significance of Nostrils in Breathing. *Yoga-Mimamsa*,10 (4):1-12.
4. Desai, B.P. & Bhole, M.V. (1981). Gastric responses to Vastradhauti and Standard Alcohol test meal in Asthmatics - A comparative study. *Yoga-Mimamsa*, 20, (1):13-22.
5. Gangully, S.K. & Gharote, M.L. (1974). CardioVascular Effeciency Before and After Yogic Training, *Yoga-Mimamsa*,17 (1); 8-13.
6. Gharore, M.L, Gangully, S.K. & Moorthy, A.M. (1976). Effect of Yogic Training on Minimum Muscular Fittness. *Yoga-Mimamsa*, 18 (2):1-20.
7. Gharote, M.L. (1971). Effect of air swallowing on the gastric acidity - pilot study. *Yoga- Mimamsa*,14 (1& 2): 2-7.
8. Gharote, M.L. (1976). Physical Fitness in Relation to the practice of selected yogic exercises, *Yoga -Mimamsa* 18 (1):14-33.
9. Gore, M.M, Kulkarni, D.D., Bhogal, R.S. & Bera, T.K. (2003).Yoga Training and Detraining Effect on EEG Alpha and Autonomic functions in School Boys. *Yoga-Mimamsa*, 36, 3&4: 133-139.
10. Gore, M.M. (2004). Influence of Asanas on Nostril Dominance. *Yoga-mimamsa*, 36 (1): 28.35.
11. Gore, M.M., Bhogal, R.S. & Rajapurkar (1990). Effect of Trataka on Various Psycho-Physiological Functions. *Yoga-Mimamsa*, 29 (3), 18-32.
12. Karambelkar, P.V., Deshpande, R.R. & Bhole, M.V. (1983). Oxygen consumption during pranayama. *Yoga-Mimamsa*,14 (3&4):7-13.
13. Karambelkar, P.V. & Bhole, M.V (1971). Effect of yogic treatment on blood picture in asthma patients, *Yoga-Mimamsa*,14(1&2);1-16.
14. Karambelkar, P.V., Bhole, M.V. & Gharote, M.L. (1969). Muscle activity in some Asanas. *Yoga-Mimamsa*, 12 (1):12-13.
15. Karambelkar, P.V. & Bhole, M.V. (1967). Underground burial or bhugarbha samadhi, *Yoga-Mimamsa*, 10 (2): 2-16.
16. Karambelkar, P.V., Gharote, M.L & Bhole, M.V (1968). Uropepsin Excretion as Influenced by Some Yogic Practices. *Yoga-Mimamsa*, 18 (1): 1-8.
17. Karambelkar, P.V. Gharore, M.L, Gangully, S.K. & Moorthy, A.M (1977). Effect of Short Term Yogic Training on Serum Cholestrol Level. *Yoga -Mimamsa*,19 (1): 1-12.
18. Kocher, H.C. (1974). Effect of Short Term Yogic Training Programme on Dexterity -A Pilot Study. *Yoga-Mimamsa*, 16 (3&4); 131-148.
19. Kocher, HC (1971). Construction for a scale of measurement of Attitude towards yoga. *Yoga-Mimamsa*, 14 (3&41):35-52.
20. Kocher, H.C. (1972). The mirror tracing test as a measure of steadiness among yoga practitioners. *Yoga-Mimamsa*, 15 (3);13-22.
21. Kocher, H.C. (1976). Influence of Yogic Practices on Mental Fatigue. *Yoga-Mimamsa*, 17(2):1-13.
22. Kocher, H.C. (1976). RESEARCH NOTE: Effect of Yogic Practices on Immediate Memory. *Yoga-Mimamsa*, 18 (3&4):57-62.
23. Kulkarni, D.D. (1998). Orienting Reflex In Shavasana Practice and Shavasana Imagery.*Yoga-Mimamsa*, 34, (1):27-36.

24. Kulkarni, D.D. & Bera, T.K. (2009). Yogic Exercise and Health -A Psycho-Neuro Immunological Approach. *Indian Journal of Physiology and Pharmacology*,53,1:3-15.
25. Kuvalayananda, S. (1924). Studies in internal and external pressure changes in madhya (central) nauli. *Yoga-Mimamsa*, 2 (1):9 1-100.
26. Kuvalayananda, S. (1924). X ray experiments on uddiyana. *Yoga-Mimamsa* 1 (1): 1-27.
27. Kuvalayananda, S. (1928). X-ray experiments on the diaphragm and the ribs. *Yoga-Mimamsa* , 3 (2): 87-89.
28. Kuvalayananda, S. (1931). CO_2 elimination in pranayama. *Yoga-Mimamsa*, 4 (3): 95-122.
29. Kuvalayananda, S. (1934). Alveolar air composition experiments.*Yoga-Mimamsa*,5(1):9-42.
30. Kuvalayananda, S. (1957). Carbon dioxide concentration in resting alveolar air. *Yoga-Mimamsa,* 5 (1):41-43.
31. Kuvalayananda, S. (1957). Studies in internal and external pressure changes in madhya (central) nauli wama (left side) nauli. *Yoga-Mimamsa*, 7 (2):273-282.
32. Kuvalayanada, S. & Karambelkar, P.V. (1976). Pressure Changes and X-Ray Studies in Gajakarni. *Yoga-Mimamsa*, 18(1):1-10.
33. Mahaure, H.H. (2008). Effect of yogic exercise on super oxide dismutase levels in diabetics. *International journal of yoga*, 1(1): 21-26.
34. Sahu, R.J. & Bhole, M.V. (1984). Effect of Two Types of Pranava (Om) Recitations on Psycho-Motor Performance. *Yoga-Mimam*sa, 22 (3&4): 22-30.
35. Sahu, R.J. & Gharote, M.L. (1984). Effect of Short Term Yogic Training Programme on Dexterity -A Pilot Study. *Yoga-Mimamsa*, 23(2):21-27.
36. Sahu, R.J. & Bhole, M.V. (1981). Effect of OM recitation and Physical Activity on Psychomotor performance- A comparative study. *Yoga-Mimamsa*, 20 (1&2):22-30.
37. Shete S.U., Kulkarni,D.D. & Thakur, G.S. (2012). Effect of Yoga Practice on Hs-CRP in Indian Railway Engine drivers of Metropolis. *Recent Research in Science & Technology*, 4, 2:30-33.
38. Thakur, G.S., Shete, S. & Kulkarni,D.D. (2012). Effect of Yoga Training on Hand Steadiness in School Children. *Yoga –Mimamsa*, 53,4:297-303.
39. Pratap, V. (1968). Steadiness in Normals Before and After Yogic Practices, *Yoga-Mimamsa*, 11(2);1-13.

Received: July 25, 2012
Accepted: August 23, 2012