CHAPTER 2

REVIEW OF LITERATURE

The review of literature covers the primary evidence-base used in this research. For the study of the Patanjali Yoga Sutras itself, authoritative books of English translations have been referred. The main data bases of relevant and current research have been accessed through digital libraries and repositories. Search was conducted using key words and information collated from the following research repositories: Google Scholar, the National Center for Biotechnology Information (NCBI), and research sharing portals ResearchGate, and Academia. The literature review has been divided into the following parts:

2.1 Patanjali Yoga Sutras: English Translations and Interpretations
2.2 Modern Science and Ancient Traditional Science of India
2.3 Yoga and Medical Science Research
2.4 Yoga and Medical Neuroscience Research
2.5 Neuroscience of Meditation and its Medical Application
2.6 Neuroscience of Mindfulness and Mindfulness-Based Therapies
2.7 Mind Body Medicine
2.8 Neuroscience of Compassion and Positive Attitudes in Health
2.9 Wisdom as a Concept in Neuroscience and Medicine
2.10 Qualitative Research in Science
2.11 Qualitative Research in Medical Science
2.12 Hermeneutics as Qualitative Research Method
2.13 Hermeneutics in Medical Science Research
2.14 Medical Neuroscience as an instrument of Hermeneutics
2.15 Neuroscience of Wisdom in the Hermeneutics of Yoga
2.16 Neuroscience, Medicine and Spirituality

2.1 briefly introduces the main bodies of translations and interpretations of the Yoga Sutras of Patanjali that have been used as the basis of the research. 2.2, reviews the arguments for considering ancient traditional science, especially the rich traditional knowledge system of India to which the Yoga Sutras of
Patanjali belong, in relation to modern science. In 2.3 and 2.4, the current scientific research on yoga in Medical Science and Medical Neuroscience respectively are reviewed. 2.5 covers meditation research from a neuroscience perspective and its application in modern medicine. 2.6 captures the mindfulness concept and the research in neuroscience pertaining to this along with its medical applications. The new and emerging field of Mind-Body Medicine is reviewed in 2.7 in which Yoga and its associated aspects find a prime place. Higher qualitative human traits like compassion and attitude have currently become foci of research into the positive health benefits of possessing and cultivating these characteristics which have been reviewed in 2.8. In 2.9, wisdom, which is long considered as the highest level of human achievements is explored as a valid concept of medical neuroscience. In 2.10, a review of the relevance and use of qualitative research in science is presented. In 2.11 the use of qualitative research in medical science is appraised. The qualitative research method of hermeneutics as the methodological basis of research seems apt for the present study. A current understanding and use of the hermeneutics as a particular method of qualitative research in science is looked at in 2.12. Part 2.13 evaluates the current applications of hermeneutics as a valid methodology in medical science research. 2.14 discusses the application of neuroscience as an instrument of hermeneutics. 2.15 explores the feasibility of Yoga as understood through medicine and neuroscience and studying it as a wisdom science through the qualitative research methodology of hermeneutics. Finally, 2.16 looks at the field of spirituality as understood through the lens of science particularly neuroscience and its understanding and applications in medicine. This further provides credence to Patanjali Yoga Sutras which is considered as a spiritual scripture.

2.1 Patanjali Yoga Sutras: English Translations and Interpretations

This study has used authoritative English translations with commentaries of the Patanjali Yoga Sutras and also English translations of the ancient authoritative Sanskrit commentaries of the Yoga Sutras. Brief descriptions of the works, their authors and of the English translations and commentaries are summarised.
2.1.1 The Yoga Philosophy, Being the Text of Patanjali, With Bhoja Raja’s Commentary; Dr. Ballantyne and Govinda Shastri Deva (1885)

Bhoja Raja’s commentary on the Patanjali Yoga Sutras is considered one of the four great commentaries available in Sanskrit. The other three commentators or vrittikaras as they are called are: Sri Veda Vyasa, Vachaspati Mishra and Vignyana Bhikshu. This English translation is an old one (1885) jointly authored by a Western scholar Dr. Ballantyne and Indian Scholar Govinda Shastri Deva published by the Theosophical Society and edited by Tookaram Tatya, FTS. Bhoja Raja’s original work is called the Rajamarthandavritti or simply Bhoja-Vritti. Raja Bhoja was an 11th Century scholar king of Malava, a West-Central kingdom of India. The English translation and commentary of his work gives a balanced perspective from Western and Indian thinkers and their philosophical viewpoints. The theosophical basis of interpretation is brought out in the work. Theosophy was an attempt at an amalgamation of Western and Eastern philosophical thoughts and study of the occult. This became a unifying movement during the pre-independence era. Madame Blavatsky, William O. Judge and Annie Besant were some of the prominent people of this tradition.

2.1.2 Patanjali Yoga Sutras: by Swami Vivekananda (1896)

Swami Vivekananda (1863 – 1902) was a great Indian monk who was instrumental in taking the spiritual wisdom of India in the form of Vedanta and Yoga to the West. He was the chief disciple of the great 19th century saint Sri Ramakrishna Paramahamsa. His prominence grew in the Western world following his monumental speech at the Parliament of the World’s Religions in Chicago, U.S.A. in 1893. He worked for interfaith awareness and harmony and inspired and motivated the youth towards selfless work and nation building in pre-independence India. His birthday is celebrated as National Youth Day. His love and devotion for his country and its culture was unparalleled. He summarised the whole of the Vedanta philosophy by declaring that each soul was potentially divine. The goal was to manifest
that Divinity within. This had to be done by controlling nature both external and internal. He further declared that this had to be done either by work, or worship, or mental discipline, or philosophy. By doing so either by one, or more, or all of these one could be free. This he said was the whole of religion. He boldly then went on to say that doctrines, or dogmas, or rituals, or books, or temples, or forms, were but secondary details which meant that they were not the essence of the practice. He travelled and taught extensively in India, U.S.A and Europe.

Swami Vivekananda's teaching, transliteration, translation and commentary on the Patanjali yoga sutras in English is authoritative. The English work is usually available as part of his writing on Raja Yoga. Swami Vivekananda is in fact attributed to using the term Raja Yoga to Patanjali's Yoga Shastra. The Swamiji's explanations are lucid, logical and inspiring. He combines, science of his time, philosophy, Vedanta and spirituality to provide an understanding of the Sutras.

2.1.3 The Yoga Darshana: The Sutras of Patanjali with the Bhasya of Vyasa, Translated into English with the Notes from Vachaspati Misra's Tattvavaisaradi, Vijnana Bhiksu's Yogavartika and Bhoja's Rajamarthanda: by Ganganath Jha (1907)

Sir Ganganath Jha (1872 to 1941) was a Pundit and an eminent scholar of Indian Philosophy and professor of Sanskrit language. He was a renowned figure internationally in Orientology and Indology. The present campus of the Rashtriya Sanskrit Sansthan in Allahabad is named after him. He has translated several scriptural works from Sanskrit to English. He was the Vice-Chancellor of Prayag University (University of Allahabad). His scholarly work was well appreciated and won honours and awards. In the Yoga Darshana, Jha has provided a succinct English translation of the Patanjali Yoga Sutras along with the commentary of Vyasa. In doing his interpretation, he has also used the works or the three well known ancient indigenous Sanskrit commentators: Vachaspati Misra, Vijnana Bhiksu and Raja Bhoja. Most of the interpretation has followed that of Vachaspati Misra.
with modifications from the works of Vijnana Bhiksu and Raja Bhoja. The personal character and humility of the author is notable in his own critical analysis of his exposition. We can see the early use of hermeneutic philosophy in the interpretation technique of this work.

2.1.4 Yogasutra of Patanjali With the Commentary of Vyasa: by Bangali Baba (1976, Reprinted 2002)

Veda Vyasa's commentary on the Yoga Sutras is considered the most ancient and authoritative commentary in Sanskrit. It is not sure if the Veda Vyasa who wrote these commentaries is the same ancient and great sage who gave us the Mahabharata, Bhagavatam and the Brahma Sutras. A certain Vyasa also seems to have existed in the 4th and 7th Century CE. Some scholars claim that Vyasa was a pen name of Sage Patanjali himself. All later commentators have used the Vyasa-Vritti as the basis of their own sub-commentaries. A simple and true English translation has been rendered by Sri Bangali Baba. The work is difficult to get and has been used as a source by some modern English scholars. The original Sanskrit text of the Sutras as well as Vyasa’s commentary in Sanskrit are provided which gives the readers familiar with Sanskrit language script, an opportunity to contemplate on the original. The highlight of this work is a summary chart at the end simplifying and clarifying the concepts. Unfortunately no biographical information is available about the translator.

2.1.5 Patanjali Yoga Sutras: by Swami Prabhavananda and Christopher Isherwood (1953, Reprinted 2002)

This is a highly accessible and popular English translation and commentary of the Yoga Sutras available from the recent past. Swami Prabhavananda was an Indian philosopher and founder monk of the Vedanta Society of Southern California belonging to the Ramakrishna Order (1930). Christopher Isherwood was a popular Anglo-American novelist and writer who became a disciple of the Swami in 1940. He was a yoga practitioner and helped in popularizing the Indian philosophy, Vedanta and Yoga in the
Western world through his translations and writings. In this commentary there is good synthesis of the yoga tenets with Western thought, Vedanta and Christian theology so as to make it appreciable and more understandable to the English educated minds of West and East.


Late Sri B. K. S. Iyengar has had a very profound impact on the global spread of yoga. His technique is termed ‘Iyengar Yoga’. This has even entered the common English vocabulary and included in the Oxford English dictionary. He was a mentor for several celebrities and also taught yoga to the Queen Mother of the United Kingdom. His translation and commentary on the Patanjali Yoga Sutras in the English language gives a good blend of his hereditary tradition and knowledge of Vedantic practice and modern Hatha Yoga practice and teaching which he has incorporated into his interpretation. The language is simple and lucid and the Sanskrit terms are explained for clarity to one unfamiliar with the language.

2.2 Modern Science and Ancient Traditional Science of India

The tradition of systematic enquiry, discovering natural laws, setting forth principles and rules of enquiry is not new to the Indian mind. It goes back to several thousands of years to the Indus Valley and Vedic civilizations. In this analysis of literature there is an attempt to demonstrate how the wisdom of the past has influenced the evolution of the sciences and how understanding this can benefit the science of the present. It is time the concept of science itself is broadened to include rational and logical observations, thinking and ideas of different world cultures and traditions rather than restrict it to the narrow Eurocentric Western conceptualizations and definitions. This will only help enrich science and human knowledge system. It will also help remove prejudice and contempt which is prevalent in certain mind-sets about indigenous scientific thought and systems and hyping up the superiority of Western science and a false prestige in their own mastery of it and a false pride of belonging to a
superior system that makes them think that it gives them license to unfairly criticise and put down the indigenous systems much to the detriment and loss of valuable national heritage, national pride and self-confidence of the indigenous peoples.

2.2.1 **Indigenous Science: Gloria and Corsiglia (1998)**

This work explores the concept of science itself. The Modern Western Science is not universal. It has to be seen in the background of colonization by Western people where there was suppression of indigenous knowledge traditions of local cultures. The authors argue that this has led to the particular difficulties we are facing especially in relation to the environment and ecology. They use Traditional Ecological Knowledge (TEK) transmission as their basis. Local knowledge which is based on local world view and local needs have developed over centuries and preserved through oral traditions of folklore, cultural rituals, mythology, etc. All these are also pertinent sources of knowledge and science. It is difficult to access TEK as it is an oral tradition and people who possess them may be geographically and culturally inaccessible. Fortunately there is a growing literature of TEK available for educators that are of proven value over time, productive and cost effective that can be considered as indigenous science.

It may be difficult for Westerners and those trained in the Western traditions of science to appreciate indigenous science as it may be more contextual rather than being universal and may be moral rather than value free which are expectations of modern scientists. TEK is generally refined over a long period of time and transmitted through oral traditions in families and cultures and not necessarily written down. Besides TEK is transmitted in folklore, stories, metaphors, rituals and formal cultural or traditional experiential teaching methods. Unfortunately the colonizers tended to marginalize, dilute and diminish the indigenous culture and knowledge systems so the TEK.

The definition of science itself can be restrictive and become a hurdle as it tends to act as a gate keeper of science disallowing creative science and
indigenous knowledge systems. Science has to be multicultural as there have been contributions of several cultures to the body of scientific and technological advancements and it is important that this is appreciated and acknowledged by scientists, science educators and transmit the broadened knowledge base of science to the coming generations. There is a need for considering this multicultural aspect of science when considering developing curriculum for science education especially in the schools. This understanding is important when we embark on a study of the Yoga Sutras which has been transmitted through the ages by the oral tradition and ritualized spiritual and religious practices of the indigenous Vedic culture of India.

2.2.2 Math, Science and Technology in India: Narasimha (2015)

In this paper the author asserts the long tradition of scientific enquiry, temper and discipline of the people of India. Starting with the vedas till up to the recent times, India has given birth to numerous scientists. Mathematics was given a prime position among the sciences. The science of numbers or mathematics is the forerunner of any system of scientific thought of ancient India. The terminology used in Sanskrit is ganita shastra which means the science of reckoning. Whereas the system of science that derived from Greek thought has its origins from geometry, even occidental science attributes its advanced development to numbers originating from Indian concepts. The numerical system originated in India which spread to Persia and Arabia and then was passed on to Europe and hence the present day number system is called the Hindu Arabic numerical system. The concept of ‘zero’ originated in India which is fundamental to mathematics and science.

The Aryabhatiya authored by Aryabhatta dates back to nearly 500 CE and a monumental work on mathematics and astronomy. The Aryabhatta School is considered as a rational system of thought. This was challenged by another great scholar named Brahmagupta who was more conservative and gave traditional culture based interpretations. Thus there was flourishing of
different points of view in a healthy discourse. There are references to several advance concepts of algebra, trigonometry, geometry and calculus in ancient Indian mathematical works.

The author reviews other ancient sciences including Medicine which had a very advanced standing. Ayurveda or the science of life dates back to over 5000 years and has its origins in the Vedas. The Atharvaveda Veda covers descriptions of diseases and their treatments. Advanced medical systems are preserved in the works of Charaka in the form of Charakasamhita, the treatise on Internal Medicine and the works of Shushruta in the form of Shushrutasamhita.

Linguistics and grammar had been a preoccupation of ancient Indian thought for over 3000 years. Panini’s Astadhyayi is a work on grammar dating back to at least 300 BCE. Likewise technology also has ancient roots in India. Metallurgy was quite advanced and the knowledge of extraction and purification of metals was well known in ancient India. Indian expertise in ship building technology was famed the world over. The making of fine cloth was also a skill and art perfected in ancient India.

With the industrial revolution in the 19th and early 20th centuries in the West, Indian reformists and thinkers like Raja Rammohan Roy, realized the need to understand the Western scientific advances. This led to the establishment of enterprises to indigenously look at the modern science and technology. Thus came into existence, the Indian Association for the Cultivation of Science established in Kolkata, the Indian Institute of Science in Bangalore and the Indian Science Congress, an annual meeting event of all scientists.

The author laments that with colonization the indigenous science became suppressed. But traditional knowledge continued to exist although in a rudimentary form. Some Western minds did take an interest in the rich knowledge and science traditions of India and worked for their preservation. India has a very large scientific community but the percentage of those graduating in science doing research is very small. People who excelled in
modern science in India found that their talents were better recognized abroad and there were no opportunities for them within the country. This led to migration of scientists which continues even to this day. The need therefore is to instil pride in our culture and scientific tradition, and encourage respect for science and scientists in our country. There is also a need to encourage and support indigenous science and research and advancement in these traditional scientific systems.

2.2.3 Evaluating Indian Science: Vahia (2015)

It is important for science and more so for scientists to maintain discipline, neutrality of value and be rational and logical in their conduct of research and scientific claims. The author refers to recent trends where fringe groups with extreme views who have tried to gain populist and narrow gains by making extraordinary claims of ancient India. While highlighting the real, rich and valid contributions of ancient India, especially through the Vedas, darshanas, yoga and Ayurveda, to science and how the forefathers of modern India, post-independence, had set high standards of science and scientific conduct, the author laments the degeneration and loss of credibility for Indian science and its glorious history by such needless activities of the fringe groups. He says it is no less a battle now to restore the soul of India and this requires courageous effort by the rationalist scientists and citizens of India. He gives brief overviews of different developments in Indian thought and their advancements that would fit into the definition of scientific temper.

The author suggests that the topic of Ancient Sciences through Sanskrit when approached in Indian Science Congresses could cover genuine noble and lofty aspects of scientific dialogues seen in the Indian philosophical schools of Darshanas, philosophy of science, health and medicine in Yoga and Ayurveda, astronomical ideas of Vedas and works of Aryabhatta, predictions of eclipses, planetary movements and conjunctions and the almanac and calendar development, mathematics from the Vedas and the Kerala school. The author asserts that for the soul of India to grow and shine
a real rationalist and realistic science of India needs to be understood and propagated by the scientific community if they care for the soul of India.

2.2.4 Science and Indian Epistemic Cultures: Ganeri (2013)

The author proposes that science itself is dynamic. It has been different at different times and different places. Thus science is polycenterted and any history of science should reflect this. Science appears different in different times, at different places and in different cultures. The current Euro-centric idea of science needs to change. The author argues from the perspective of two ideas about the nature of scientific enquiry, ‘epistemic cultures’ as described by Karin Knorr Cetina and ‘a system of public knowledge’ as described by Philip Kitcher.

A properly functioning enquiry which can be termed as well-ordered science is one which is of utility and for the good of the society which is different for different cultures and at different times. Many prominent European philosophers of science tried to project science as coming from a religious narrative and used aspects of the Bible to enforce their views. What a Euro-centric scientist thinks as modern science need not necessarily be so as it is relative and the science has evolved with equal rigor and logic in other cultures. The author demonstrates this by delving into the ancient Indian traditions. He emphasises the importance of refocussing and reframing and re-examining the micro-processes of scientific practice in tandem with an analysis of the theoretical self-knowledge and understanding of the nature and scope and ambitions of the methods employed by the practitioner of science.

The author especially focuses on the Jaina and Buddhist traditions of philosophical arguments and discourse. The scientific enquiry is demonstrated in this essay by two discourses or conversations available in historical accounts of Indian thought which are the ‘synthetic pluralism’ or syaadvaaada from the Jaina tradition and the ‘balanced deliberation’ or vaadayutti of the Buddhist tradition. These can be seen as genuine ideas of
scientific interpretation that evolved in India thus allowing for a shift in the conceptualization of the history of science from a centre/periphery model to a polycentered approach. Science in the Indian context has flourished without the constraint of social value and democratic consent colouring the discourse much in contrast to the Euro-centric expectation of ‘modern science’ to be well-ordered. The author emphasises that this form of broad and open view of science is a necessity for the progress and flourishing of ideas and therefore of science.

2.2.5 Unification of Modern and Ancient Science: Srivastava (2000)

The author clarifies that there is no necessity to classify science into Western Science and Indian Science. All are valid study of nature. Different forms of research and study arose out of a local need and prevailing culture and environment. He goes on to describe many aspects of Indian Ancient Science which have actually contributed to the basic foundations of scientific thought with certain similarities and some differences with the so called Modern Western Science. Ancient Indian science is generally referred to the indigenous work and body of knowledge that existed before the colonization of India by the Europeans particularly the British. Western science is generally referred to the science that evolved in Europe after the renaissance.

The works of ancient India are those that survived massive destructions during the medieval period. The works may thus have undergone alterations and adulterations. The author suggests two guiding principles to decipher the Sanskrit body of works to be applied which are firstly, a view of nature from one point always complements the view from another point and secondly, there are recognizable patterns of concepts, symbols and logic in the description of scientific principles. The scientific development took two different routes in the two systems, according to the author, which was due to different environmental conditions and demands. The West took the horizontal route of space-light-matter as this was motivated by survival needs and pursuit of material phenomena, whereas the Indians took the
vertical route of time-sound-mind in pursuit of mental and cosmological phenomena.

Thus evolved yoga in the Indian system along with art, music, philosophy and ways of achieving harmony. The author makes a comparative study in different subjects between ancient Indian science and its similarities in modern science in the fields of logic, mathematics, phonetics, metaphysics and philosophy, life sciences, medical sciences, cosmology, physics, chemistry and military science with references from ancient Indian literature and artefacts. The author calls for a unification of science as the way forward to a better understanding and healthy progress of the world.

2.2.6 Ancient Indian Medicine and Scientific Temper: Preisendanz (2009)

The author clearly demonstrates rules and procedures that have been in existence from ancient times for the conduct of research. The methodology is discussed with charakasamhita the ancient Indian treatise on medicine by Maharishi Charaka, where throughout we find the use of logic, debate and epistemology to prove and counter-prove arguments with a sound foundation in the earlier, contemporary and later works like nyaya shastra and vaisesika darshana or philosophy.

The charakasamhita demonstrates the existence of observational-rational attitude of early classical Indian medicine provided by epistemological models. The three modes of knowledge discussed are sense perception or ptatyaksha, inference or anumana and tradition or agama which are also concepts in sankhya, vaisesika and yoga darshanas. There are similar concepts in the shushurutasamhita as well, which is the ancient treatise on surgery by Maharishi Shushruta.

The basis and evolution of such works is described which possibly could be traced to even earlier works like the Aanvikshiki by Medhatithi Gautama. The author has based her analysis on the work of charakasamhita as described by the great Indian scholar Sri Satish Chandra Vidyabhusana in
his scholarly work published posthumously in 1921 titled History of Indian Logic – Ancient, Medieval and Modern Schools. Thus scientific temper has existed throughout the evolution of ancient Indian medicine.

2.2.7 Science of Consciousness: Kak (1997)

Consciousness was not taken up as a study in science until recently following advances in neuropsychology. In physical science research like physics and computer science the nature of the observer is a fundamental question. This has led to an increased interest in the study of consciousness as an interdisciplinary science. Consciousness, whereas has been basic and central to ancient Indian thought. In this article the author sets about to show how cognitive science has been thoroughly studied and explained in the ancient Sanskrit works. Even the founders of the modern Western science have taken inspiration from the ancient scriptures of India. The author describes the ancient Indian philosophical scientists’ understanding of neurology, brain and the mind by quoting from the Vedas, Upanishads, Darshanas, Mahabaratha, etc.

The concept of self and consciousness has been a constant subject of enquiry by the ancient seers. There are parallels between Vedic ideas on consciousness and modern quantum dynamics. Schrödinger developed his ideas in quantum mechanics taking inspiration from the Vedanta. His renowned and very influential work in biology ‘What is Life?’ uses Vedic ideas. Modern psychology still struggles with a coherent theory of the ‘self’ even though this is a fundamental pursuit of psychology.

The wave-particle duality of the quantum mechanics led to the development of the principle of complimentarity. This proposes that description of reality in any one of the mutually contradictory states is incomplete but between them they form a complimentary and complete description. Therefore as in quantum mechanics, in life, and in cognitive processes too complimentarity principle applies. The Vedic concept right from the early works of Rig Veda, assert that knowledge can be of two
types, at a superficial level it may appear to be dual but at a deeper level there is unity. This implies a complimentarity in the existence of material (achit) and consciousness (chit) with an underlying transcendent reality. Due to this fundamental complimentarity we find that Indian philosophy or the darshanas are grouped into pairs: nyaya-vaisesika (logic and physics), sankhya-yoga (cosmology and psychology), and mimamsa-vedanta (linguistics and reality).

The Vedic concept of the self-psychology is described in the Bhagavad Gita and the Katha Upanishad. The body is compared to a chariot drawn by five horses representing the five senses. The reins represent the mind being directed by the charioteer as the intellect and seated as a passenger inside the chariot is the self. The Taittiriya Upanishad describes five levels of the self in the form of five sheaths starting from the gross and going to the subtle. The gross physical aspect is the annamaya kosha (food sheath), the vital aspect is the pranamaya kosha (life energy sheath), the mental aspect is the manomaya kosha (mind sheath), the evolved wisdom aspect is the vijnanamaya kosha (intellect sheath) and the absolute reality aspect is the anandamaya kosha (the bliss or here interpreted as emotion sheath). As per the sankhya system mind is divided into manas or the lower mind that collects sense impressions, ahamkara the sense of I-ness or ego sense, chita the higher mind-stuff that includes memory, buddhi the intellect and atman the self or soul.

The atharvana veda describes the self to be accessed through the eight chakras and nine doors. Through psychic process of yoga and meditation, the I-ness is able to perceive the true self. The chakras have neurophysiological representations in the body: the muladhara is the perianal plexus at the bottom of the spinal cord, the swadishtana is the genital plexus, manipura is at the solar or epigastric plexus, the anahata is the cardiac plexus, vishuddi is at the cervical plexus, ajna is the area of the third eye, the crown being the bindu and the brain representing the sahasrara. The Siva Sutra has an elaborate psychology of the consciousness.
The theory behind speech and cognition as aspects of understanding consciousness is described in the Rig Veda and the author describes the concept as per sage Bratrahari. The author hopes that further advances in science will lead to a better understanding of the concept of consciousness and bring it closer to the concepts in the rich Vedic tradition and lead to a better appreciation of and place more value to ancient Indian thought.

2.3 Yoga and Medical Science Research

Over the past two decades there is great interest in the subjects of yoga and aspects of yoga such as meditation. In the past yoga was considered as an alternative or complementary system. But more recently yoga has come into mainstream medicine with several institutions and centres of repute having taken up the scientific study of yoga and its clinical applications. Several hospitals in the West now offer yoga as therapy for several medical conditions.

There is an increasing acceptance of yoga as a legitimate mind-body therapy that can have significant positive implications in treatment, rehabilitation and prevention of several physical and psychological conditions. Yoga is accepted as a simple and cost-effective therapeutic modality. There is also increasing awareness and acknowledgement of the historical, cultural and spiritual origins of yoga with ancient India and the Vedic tradition.

Preliminary scientific studies on the medical effects of yoga were done in the West, especially in USA, in prestigious medical universities. It is now heartening to observe that the maximum research studies in yoga in recent times are being done in India and published in reputed journals.

2.3.1 Integrated System of Medicine: Bajaj (2013)

The author who was a member of the planning commission, Government of India, describes efforts to establish the ancient Indian traditions of medicine as part of a comprehensive system in the healthcare of India. He describes
the rich tradition of Indian scientific thought pertaining to life and health. He traces the historic origins of medicine in India from pre-vedic times. Ayurveda is the ancient and comprehensive integrated indigenous medical system that was developed to an advanced level in the Vedic culture. The author provides an example from his own life-long practice of treating diabetes mellitus which had a very advanced and sophisticated management methodology in the ancient Indian system.

A policy recommendation to the government has been to include the traditional and indigenous systems of medicine along with other complementary systems of medicine to a certain level into the mainstream or modern medicine system teaching in the medical schools in order for the doctors in training to appreciate and develop a mutual sense of respect and camaraderie with such diverse traditions.

A significant development in the department of health was the inception of the AYUSH department comprising of the complementary systems of medicine including Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy. Interestingly, he highlights the yoga systems as futuristic systems of Indian medicine in terms of prevention and promotion of health. It is envisaged that the future trend in Indian healthcare delivery is an integrative and personalized system of medicine. It is further hoped that joint research is conducted in order for progress and optimization of public healthcare. He predicts a renaissance of further research into these systems as a healthy trend and the way forward in the development of an integrative modern Indian medical science.

2.3.2 Yoga in Medicine: Bali (3013)

The author succinctly summarises the current burden of life style disorders in India with special reference to Cardio-Vascular Diseases which has become an epidemic in recent times. All over the world, Cardiovascular Disorders (CVD) are the leading cause of morbidity and mortality. This is of great concern clinically and for the economic burden it causes to the patients
and families and society as a whole. This is an important public health concern and requires effective primary preventive measures that are clinically effective and also cost-effective. Though there is a predisposition and a genetic risk factor for CVDs there is a big component of modifiable risk factors related to lifestyle that contribute to disease expression, maintenance and progression and development of atherosclerosis disease dependent complications. Along with hypertension, dyslipidaemia and diabetes, metabolic syndrome is an important modifiable risk factor in the populations of the Indian subcontinent.

Chronic stress leading to increased sympathetic activity, increased cardiovascular tone, reduced parasympathetic tone, along with negative affective states leading to development and progression of atherosclerosis, insulin resistance, glucose intolerance, hypertension, dyslipidaemia and metabolic syndrome is the pathway of pathogenesis for CVDs.

Since there is a strong influence of psychosocial factors in the genesis of CVDs, it is logical to see that interventions that are based on mind-body medicine have a great potential in the prevention and treatment of CVDs. Yoga is an ancient mind-body discipline which originated in India in very ancient times and has now been studied and determined to be a very useful therapeutic tool in CVDs.

The author in this important editorial briefly reviews the different systems of yoga, effectiveness of yoga in diseases and possible mechanisms of action, current research, and limitations of the studies. He further recommends physicians to consider yoga as a harmless, simple and yet effective system to treat and prevent the risk factors of Cardio-Vascular Disorders.

2.3.3 Yoga Clinical Research: Field (2011)

In this comprehensive article the author reviews yoga in medicine. She begins with origins of yoga and takes us through the current research of the use of yoga in several disease conditions including psychological,
neurological, cardiovascular, metabolic, endocrine, musculoskeletal, and immunological conditions and pregnancy. The conditions affected by yoga as determined by this review were classified and enumerated as follows: (1) Psychological Symptoms and Disorders: Mindfulness and Job Stress, Depression, Anxiety, Sleep (2) Pain Syndromes: Low Back Pain, Headaches, Osteoarthritis, Rheumatoid Arthritis (3) Cardiovascular Conditions: Coronary Artery Disease, Hypertension (4) Autoimmune Conditions: Asthma, Diabetes, Multiple Sclerosis (5) Immune Conditions: Lymphoma, Breast Cancer (6) Pregnancy Conditions: Hypertension and Preterm Labour, Stress and Vagal Activity, Labour Pain (7) Physiological Effects: Heart Rate and Blood Pressure, Pulmonary Measures (8) Physical Effects: Weight Loss, Balance and Flexibility, Leg Strength.

The author discusses possible mechanisms of action. The limitations of the studies are discussed. She concludes with the proposal that the beneficial effect of yoga on improving immune function, reducing stress response and reducing prematurity rate is possibly through stimulation of the pressure receptors enhancing vagal activity leading to reduced cortisol secretion as the final physiological pathway.

2.3.4 Yoga Programs for Chronic Diseases: Yang (2007)

Chronic diseases such as heart disease, stroke, diabetes, and obesity are fast becoming major causes of morbidity and mortality all over the world. The common causes for the chronic disease are altered physio-pathological conditions like high blood pressure, over weight, high blood glucose and high cholesterol.

The author reviews research on yoga as an intervention in reducing risk factors for chronic diseases. The key risk factors studied are over-weight, hypertension, high blood sugar and high cholesterol. The electronic data bases used for the search were CINHL, Ovid, MEDLINE and PsychInfo. The studies selected used either an experimental or a quasi-experimental study
design. First the key word yoga was used and then refined with the key words overweight, blood pressure, glucose and cholesterol.

Studies reveal that yoga in its more physical forms of Asana and Pranayama, have a beneficial influence and positively correlated with the reduction of all the above risk factors of non-communicable diseases or also termed lifestyle disorders. The contents of different yoga programs are reviewed.

The effects of yoga as discerned through this review were broadly divided into three areas: (1) Behavioural changes which included increased physical activity and improved healthy diet (2) Physiological changes included decreased body weight, decreased blood pressure, decreased blood sugar and decreased cholesterol (3) Psychological changes which included improved mood, decreased level of stress, improved self-efficacy and improved quality of life.

There were some limitations to the reviewed research. The types of yoga interventions used were varied and full details of the programmes were not described in many studies. Studies on long-term effects and sustainability of benefits were limited to a maximum of six months. A large number of studies originated from India which has a cultural and philosophical tradition of yoga practice. Dosage and frequency of intervention with yoga based treatment is hard to determine. Suggestions for developing practical interventions based on yoga is suggested.

2.3.5 Yoga on Mental and Physical Health: Bussing et al (2012)

The authors, who are well known in the area of yoga research, have tried to collate all the current reviews on the research in yoga. The authors chose high quality research data which included the reviews in the evidence report on ‘Meditation Practices for Health’ which cited studies in yoga produced by the Agency for Healthcare Research and Quality Report (AHRQ). They were able to identify medical conditions which were shown to have variable and
heterogeneous evidence with respect to diagnoses, outcomes, methods, sample sizes, effect sizes, methodological quality, control interventions and type of yoga based practice interventions.

The following medical and physiological conditions for which evidence was reported were reviewed: Depression, Fatigue, Anxiety and Anxiety Disorders, Stress, Post-Traumatic Stress Disorder, Physical Fitness, Sympathetic/Parasympathetic Activation, Cardiovascular Endurance, Blood Pressure and Hypertension, Pulmonary Function, Glucose Regulation, Menopausal Symptoms, Musculoskeletal Functioning and Pain, Cancer and Epilepsy.

The levels of action and the observed effects of yoga interventions were broadly classified as follows: (1) Cognitive: Specific effects included contemplative states, mindfulness, self-identity, self-efficacy, beliefs and expectations. The non-specific effect included control of attentional networks. (2) Emotions: Specific effects included emotional control and/or regulation. Unspecified effect included quality of life. (3) Physiology: Specific effects included vagal afferent activity, heart rate and respiratory rate, relaxation response and/or stress reduction. The unspecified effect included social contacts. (4) Physical Body: Specific effects included physical flexibility, fitness and endurance and unspecified effect included a healthy lifestyle.

In India yoga is an integral part of a long standing cultural and spiritual tradition. As such yoga was considered a way of life. But the practice diminished through the ages particularly following invasions and colonization by outside forces. There is now a resurgence of interest in yoga. Particularly, the younger generation now see yoga as a practice to keep oneself fit which is different to the older generation that see yoga as a deeper practice.

As such most of the research in yoga is done in India. Hence it may be difficult to find these in Western databases. The authors highlight the
heterogeneity in the methods and programs. They also highlight robust and high level evidence of use of yoga in mental health and in pain conditions. They recommend the need for further randomized control trials and long term studies in order to make yoga based interventions to be widely used for curative and adjunct therapies in medicine.

2.3.6 Mechanisms of Yoga: McCall (2013)

Research in yoga is increasing over the recent years at a very fast pace. The author introduces yoga as a practice dating back to 5000 BCE comprising of specific postures or asanas, breathing techniques or pranayama, meditative techniques or dhyana, chants or mantras and wisdom teachings or sutras to encourage the union between body and mind.

By applying the physiology and practice of yoga individuals can empower themselves to progress towards greater health and wellbeing which is termed as Yoga Therapy. Many doctors even in Western countries like USA prescribe yoga to their patients and yoga is also recommended by the National Health Service (NHS) in the United Kingdom. The author meticulously does a systematic review of the current research into the mechanisms of yoga as a preventive and curative intervention in numerous health conditions.

The data bases used in the conduct of the search were the Cochrane library, PubMed and the Scopus databases. Hand search of yoga journals, conferences and websites of prominent yoga institutes were also done. The effects of yoga suggested are hypothetical and are most prevalent on metabolism, circulation, inflammation, oxidative stress, behaviour and also on the psychological thought processes.

There is also a review of the new and emerging methods of neurophysiological research in yoga involving nerve conduction studies, immunology and bioelectromagnetism.
The strongest evidence for the effect of yoga is its effect on the endocrine system with lowering of the levels of stress hormone cortisol and increasing the levels of serotonin and melatonin with regular practice. Further research appears to encourage towards looking at biomarkers for altering immune function, effects on oxidative stress and effects on nerve conduction and modulation with yoga practices.

With the increasing focus on the practice of evidence-based medicine and development of criteria and guidelines by national bodies, the directions for future research are discussed.

2.3.7 Meditation Research: Shapiro et al (2003)

The authors trace the origins of meditation to over 3000 years in the ancient yoga system of India. They review the meditation in all the religious traditions. Meditation is an aspect of several world religious traditions. This is because there is a common core of wisdom and world view that is basic and central to all world religious traditions and this is called the perennial philosophy. This is based on three important assumptions: (1) The psychological state that one is usually in is suboptimal and immature and there is a larger aspect of the consciousness that is still not known (2) There is great developmental potential and for this higher states and stages of consciousness are available (3) A variety of psychological and spiritual practices are available to catalyse the psychological development to higher transpersonal states and stages. For these same reasons, meditation is also of interest to researchers in integral and transpersonal studies.

Meditation, a system derived from yoga, can be broadly defined as a family of practices used to train attention and awareness, usually with the aim of fostering psychological and spiritual maturity. There are detailed reviews of meditation and its physiological, psychological and transpersonal dimensions and therapeutic applications. Meditation was initially seen as helpful in stress management. Later several research studies have been published that demonstrate the effectiveness of meditation practices in
several disease conditions including cardiovascular diseases, chronic pain, anxiety and panic disorders, substance abuse, depression, dermatological disorders, reduction of psychological distress and symptoms in cancer, and reduction of symptom severity and symptoms in clinical and non-clinical population.

There are also recently studies in positive psychology and meditation where it has shown to help facilitate compassion, understanding and wisdom. There are studies that have looked at meditation to improve self-actualization, empathy, sense of coherence and stress-hardiness, happiness, increased autonomy and independence, a positive sense of control, increased moral maturity and spirituality. The observable and recordable changes are seen in neurophysiological and psychological parameters.

The authors suggest criteria for any future research in meditation which is non-reductionist and encompasses the broad interdisciplinary nature of these ancient practices. A need to expand the paradigm for studying meditation is emphasised. They suggest areas of future research in differentiating types of meditations, studies in temporal effects, short-term and long-term follow-up assessments, inclusion of long term or expert or experienced meditators, conducting component analysis, examination of interaction effects, mediating variables that may be present, qualitative research with qualitative data, expanding the paradigm, and studies of the value of continued practice.

2.4 Yoga and Medical Neuroscience Research

The modern scientific theory of disease causation follows the bio-psycho-social model. This model is called the Stress-Vulnerability Diathesis. This proposes that in any individual vulnerability or the predisposing factors for any disease are biologically determined and can be genetically transmitted. But the disease will not express itself unless environmental or psycho-social stress exceeds certain level of tolerance which is unique for each individual. The stress
response itself is determined by how the mind-brain system perceives and processes information received from the environment and sets into motion physiological, immunological, neuropsychological and psychosomatic processes to restore equilibrium. If this is disturbed or overwhelmed then disease can set in. Yoga and meditation techniques that have been scientifically studied seem to influence this mind-brain-body system to produce their beneficial effects. Hence most recent research studies focus on the neuroscience of yoga.

2.4.1 Yoga on Stress and Inflammation: Kiecolt-Glaser et al (2010)

Psychoneuroimmunoendocrinology is an emerging field of research. This field studies the connections between the mind, brain, endocrine and immune systems. Inflammation is increasingly being observed as a common final pathway in several disease conditions especially the non-communicable diseases and even neuropsychiatric disorders. Especially inflammation is a major factor for increased morbidity and mortality in several lifestyle associated disease conditions.

The inflammatory markers can be detected in blood and are called pro-inflammatory cytokines. These are Interleukin-6 (IL-6), Tumour Necrosis Factor-α (TNF-α) and C-Reactive Protein (CRP). These are seen to play a role in the aetiology of cardiac disease, Type 2 Diabetes Mellitus, osteoporosis, arthritis, Alzheimer Disease, periodontal disease, frailty and functional decline. Inflammation is a risk factor in cancer. It is also a risk factor in obesity which is now considered as an inflammatory condition as the adipose or fat cells are capable of producing and secreting the pro-inflammatory cytokines.

Psychological stressors and conditions of anxiety and depression can increase the production of the pro-inflammatory cytokines. Hatha Yoga as adapted in the West, comprises of asanas or physical exercises and postural techniques, pranayama or controlled breathing techniques and meditation. These practices when applied and practiced regularly have
effects in reducing the sympathetic activity and hence the stress response, improve or enhance vagal tone and reduced inflammatory responses.

In this study the authors report a controlled experiment comparing the practice of *hatha yoga* between novices and experienced practitioners. The study sample consisted of 50 healthy women, 25 were expert practitioners of yoga and 25 were novices. Both the groups were exposed to each of the study conditions, namely, yoga, movement control and passive video control. Iyengar Yoga was the method of yoga chosen which involved the use of props to facilitate performance of asanas.

The first control condition included movement by walking on a treadmill. The second control condition was a passive watching of a neutral video without any sound. Various parameters were measured which included psychological parameters and physiological and immunological parameters. Experimental stress was induced with standard psychological stress induction procedures. The results showed that the serum IL-6 levels of novices were 41% higher than those of expert practitioners across all three sessions. The odds of a novice practitioner having detectable CRP were 4.75 times higher than that of an expert practitioner. The differences in the stress responses between expert and novice practitioners provided one plausible mechanism of action for their divergent serum IL-6 levels; expert practitioners produced less lipopolysaccharide (LPS)-stimulated IL-6 in response to the stressor than novice practitioners, and IL-6 promoted CRP production.

The study demonstrated significant effects on neurophysiological and stress induced inflammatory responses. Normally the burden of stressor on an individual is determined by the intensity of the inflammatory responses to stressful encounters. Sustained practice of yoga minimized this response and thus made the experienced practitioner more resilient to stressors.

2.4.2 Yoga for Neuropsychiatric Disorders: Balasubramanyam et al (2012)
There is a growing demand for safe, acceptable, efficacious and cost-effective therapeutic interventions for mental disorders. Studies have shown benefits of yoga for specific psychiatric symptoms and also for overall wellbeing. Yoga includes both physical and mental procedures and practices. Hence several studies have looked at yoga as a therapeutic intervention in neuropsychiatric disorders. The authors have used stringent criteria to look at robust studies in yoga from reliable data bases for high grade research. The data-bases searched by the authors included the Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE and PsycINFO.

The types of yoga practiced varied widely. The following different types were defined in the study: Ashtanga Yoga, Hatha Yoga, Iyengar Yoga, Power Yoga, Jivamukti Yoga, Kali Ray TriYoga, White Lotus Yoga, Integrated Yoga Therapy, Viniyoga, Swarupa, Bikram Yoga (Hot Yoga), Phoenix Rising Yoga Therapy, Sivananda Yoga, Integral Yoga, Ananda Yoga, Kundalini Yoga, ISHTA Yoga, Kripula Yoga, Anusara Yoga and Tibetan Yoga. Most techniques to a greater or lesser extent have the format that pertains to few or several elements of the eight limbs or ashtanga of Patanjali Yoga Sutra that comprise of yama (observances), niyama (self-regulation), asana (exercises or postures), pranayama (controlled breathing techniques), pratyahara (control of senses), dharana (concentration), dhyana (meditation) and samadhi (self-realization).

The various neurophysiological effects reported from varied studies included the following: effects on the Hypothalamus-Pituitary-Adrenal (HPA) Axis especially decrease in cortisol levels; effects on neurotransmitters such as up-regulation of Gamma Amino Butyric Acid (GABA), Glutamate, Serotonin and acetylcholine and down-regulation of Dopamine and Norepinephrine; action on the neurotrophic factors like increase in the Brain Derived Neurotrophic Factor (BDNF); and effects on the immune system. The neuroanatomical and physiological correlates have been observed in the prefrontal cortex, hippocampus, hypothalamus, amygdala and the locus ceruleus.
The general positive effects observed in the studies included decreased symptoms of depression, anxiety and negative symptoms and improved or enhanced effects on cognition, attention and sleep. The search yielded 124 trials out of which sixteen trials met the rigorous criteria for final review. There were good quality studies indicating the benefits of yoga based programs in neuropsychiatric conditions of depression, anxiety, sleep disorders, attention deficit hyperactivity disorders and adjunctive treatment of Schizophrenia.

The research studies were graded for the level of evidence based on the criteria developed by the Oxford Centre for Evidence Based Medicine. Level 1 included high quality RCTs with narrow confidence intervals. Level 2 included low quality RCTs or high quality cohort studies. Level 3 included case-control studies. Level 4 included case series or poor cohort studies or poor case-control studies or case reports.

Based on the levels of evidence the studies were divided into recommendation grades as follows: Grade A implied ‘Recommended’ and included studies with level 1 or level 2 evidence; Grade B implied ‘Suggested’ and included few studies with level 1 or 2 evidence, many studies with level 3 or 4 evidence and expert consensus; Grade C implied ‘May be considered’ and included studies with level 3 or 4 evidence.

Four Randomized Controlled Trials (RCTs) showed Grade B recommendation level for acute benefit of yoga in depression, three RCTs showed Grade B recommendation level of yoga as adjuvant therapy along with pharmacotherapy in Schizophrenia, two RCTs showed Grade B recommendation level of effectiveness yoga in children with Attention Deficit Hyperactivity Disorder (ADHD) along with pharmacotherapy, three RCTs showed Grade C recommendation level of yoga in Sleep Disorders. Results of RCTs in cognitive disorders and eating disorders yielded conflicting evidence. There were no studies that looked at yoga in primary prevention,
prevention of relapse, or comparison of effectiveness of yoga with pharmacotherapy.

The limitations of the review of literature included non-availability of Double Blind Trials, inability to do multiplicity of comparisons within smaller studies and the lack of replication studies. The authors recommend that double blind randomized controlled trials, replication of studies, long term follow-up studies, bio-marker and neuroimaging studies and comparison studies with standard pharmacological and psychotherapeutic interventions is the way forward.

2.4.3 Yoga and Health Research, Patanjali University, India: Menezes et al (2013)

For any research to be good one has to pay attention to the environment. Yoga too being a subject of modern research should have the modern scientific infrastructure to progress and become acceptable widely. This study and observational report describes the infrastructure, procedure and advances in the scientific study of yoga in the research department of Patanjali University, Haridwar India where large scale and systematic research is being carried out in yoga in recent times.

The report is part of a research internship of the first author who was a research scholar and intern from the Federal University of Rio Grande do Sul (UFRGS), Brazil, with a scholarship from the Brazilian National Counsel of Technological and Scientific Development, who was visiting the Patanjali University, Haridwar, India, so as to inform development of infrastructure to facilitate yoga studies in Brazil.

The research at the university is directed by the last author (Telles). The university has four main laboratories in the Yoga Research Department. (1) The Oxygen Consumption and Metabolic Testing Laboratory: here research was being carried out using an open circuit metabolic analyser, and a specially designed canopy to study oxygen consumption during pranayama
breathing practices involving nostril manipulation. (2) Autonomic Function Testing Laboratory: here recordings were done using a sixteen-channel polygraph that measured oxygen saturation, heart rate variability (HRV), respiration (thoracic and abdominal), skin conductance response (SCR), blood pressure (BP), cardiac output, finger plethysmogram amplitude (FPA), etc. A two-channel polygraph was being used for measuring heart rate and breathing rate. (3) The Clinical Neurophysiology Laboratory had equipment to measure regional cerebral blood flow using a sixteen-channel Functional Near Infra-Red Spectroscopy (FNIRS), brain electrical activity using electroencephalogram (EEG), and Evoked Potential (EP) (4) the Perceptual and Motor Skill Testing Laboratory had facility to measure fine motor skills, visual perception, reaction time, flexibility and muscular endurance.

The laboratories were supported in the researches by facilities for clinical testing, such as body composition, anthropometry, biochemistry and immunology. This gives an idea of the technological advances and modes of study that is now possible in our country to study our ancient mind-body techniques of yoga. The paper describes researches completed and ongoing research in each of the several areas currently being studied in the department in the following areas: physiology, human performance, therapeutic outcomes and rehabilitation.

They carried out search for published research that represented each of the broad areas of studies in the various laboratories of the institute. They have reviewed the salient features of key research that had come out of the university. The study indicated that techniques such as asana or yoga postures, pranayama or regulated breathing, relaxation and dhyana or meditation can have significant clinical implications for mental and physical health. They conclude that yoga certainly shows great benefit to society. They also report the limitations and the need for more research with a particular reference to Brazil from where the first two authors were visiting scientists.
2.4.4 Classical Yoga, Psychotherapy and Health: Rossi et al (2015)

The authors innovatively combine neuroscience, philosophy and mythology as a transformative model for understanding and alleviating human suffering. The authors present a new spiritual practice of yoga which is consistent with the research in modern neuroscience. The paper deals with processes that optimize consciousness and sleep. Research has revealed that a purpose of sleep is to clear the brain off toxic metabolites by about sixty percent. This is essential for facilitation of neuroplasticity and creation of new consciousness. Building of the self requires the process of learning to think first and building communications between the body, mind, heart and experience.

The authors describe a process of four-stage cycle of creativity that can be applied at different levels of mind, brain plasticity and even gene expression. The four-stage cycle can be optimized to follow the chronobiological rhythms that operate in the human system that repeat every 90 to 120 minutes in 24 hours producing the Basic Rest and Activity Cycles (BRAC). This can be very useful in optimizing therapeutic changes in physical and mental health. This process can be augmented by a psychological sense of awe called numinosum forming, creating what has been termed as the Novelty-Numinosum-Neurogenesis Effect (NNNE).

This four-stage cycle is adapted from the Buddhist teaching of the four noble truths. Stage 1: The existence of suffering (dukkha), Stage 2: The causation of suffering (samudaya), Stage 3: New insights (nirodha) and Stage 4: the integration of the new consciousness into everyday life (marga).

Based on this concept the authors developed the brief intervention technique called the Mind Body Therapy Transformations (MBT-T) protocol where they studied DNA microarray assays post intervention which
demonstrated that this was linked to turning off of key genes that were associated with oxidative stress and dysfunctional chronic inflammatory responses and significant activation of healing stem cells even 24 hours after the MBT-T intervention.

The authors assert that the over 5000 year old yoga tradition of the classical Patanjali yoga sutras offers a comprehensive philosophy of communication between the body, mind and spirit. They emphasize the four stage creative process has its correlates in Indian religion, philosophy and tradition. Sleep and conscious activities are equally important for addressing the progress of consciousness.

The authors use the mythological story from Indian Puranas to elaborate the four stage creative process combining story with practice of yoga as a healing method. They take the example of practice of matsyasana or the fish pose, an asana sequence of hatha yoga, with the puranic story of matsya avatara. They suggest that traditional yoga practice along with retaining cultural roots and traditions could perhaps activate healing processes at the physical genomic level and perhaps have a similar effect of clearing the toxic metabolites in the brain even in the waking state allowing for renewal of consciousness.

The authors suggest further study of the phenomena through molecular biology and genomics of gene expression as future directions for global consciousness in health. They encourage Indian scientists to take up such interdisciplinary studies so as to enrich the healing traditions of India, its culture and health.

2.4.5 Yoga as Psychotherapy: Jee (2012)

In this significant presidential address of the Indian Science Congress, the author elaborates the science of yoga starting with its historic origins in the Vedas. Yoga signifies unification and oneness. It is a process of realization of the union of the jeevatman or the lower or basal self with the paramatman
or higher or divine self. It is a method of bringing balance into our lives and is the art and science of healthy living.

Swami Vivekananda enumerated the three principles of yoga. These are: (1) Every soul has a potential divine nature (2) By controlling internal and external nature one can manifest the divinity which should be our goal (3) Freedom is achieved by pursuing this goal through work, worship, psychic control or philosophy, either by one or more or all of these pursuits. These forms of pursuit can be achieved through the yoga of action or karmayoga, yoga of devotion or bhaktiyoga and the yoga of Patanjali termed as the rajayoga or royal yoga. He highlights the importance of Patanjali Yoga Sutras in the understanding of yoga.

The author traces the history of yoga from very ancient times with evidence in the excavations of the Indus valley civilization, the references in the vedas of rig, yajur, saman and atharvana, the Upanishads, puranas, the epics of Ramayana and the Mahabharata and particularly the Bhagavad Gita. The tradition of yoga was transmitted from yore through the guru-chela or the guru-shishya parampara or through the lineage of teachers (gurus) passing on the yoga tradition by instructing and imparting it to their disciples (chelas or shishyas). He further looks at yoga as an alternative and complementary form of medicine. Yoga is seen as part of Ayurveda which is the ancient Indian system of medicine dating back to over 5000 years.

The term Ayurveda itself means the science of life. There are many conceptual similarities between modern psychology and the yoga psychology. Many yogic concepts are also seen in psychoanalytical principles and theory. The author further goes on to elaborate yoga as a spiritual science with a long history and compares and contrasts it with psychotherapy with its relatively short history as a form of treatment. He covers the evidence for the use of yoga as psychotherapy and its neuropsychological correlates. He sets out to describe in detail various practices of yoga with Patanjali Yoga Sutras as the foundation. The author has reviewed in detail the scientific support for using yoga in therapy. He
covers several research studies of use of yoga in physical and mental disorders. Yoga as a complementary part or even an important ingredient of psychotherapy is emphasized.

The various components of the *ashtanga yoga* or the eight limbs of yoga of Patanjali are described in some detail and how these can be incorporated into therapeutic practice are discussed. The author focuses on the importance of pranayama or breathing technique as an important tool of yoga useful in modern therapy. He recommends that the Indian administration should compulsorily include yoga at every stage of education in order to achieve real education of the coming generation to live a life of character with sound physical, mental and spiritual health.

2.4.6 Patanjali and Neuroscientific Research: Bærentsen (2015)

The author uses the definition of yoga as given by the first aphorism of Patanjali Yoga Sutras as, “stilling the fluctuations of the mind” as the basis of studying the brain phenomena with modern neuroimaging technology of PET, SPECT and fMRI scanning. He asserts that the *sankhya* philosophy on which the yoga sutras are based is not in contradiction to studying phenomenology in the human system. The spiritual aspect of *kaivalya* or freedom as the goal of the yoga sutras need not necessarily indicate a separation of spirit from the mind and body but a continued existence and an experience which can still be studied scientifically.

Various interpretations of “stillness” and “fluctuations” are discussed and how they may modify the geography of the brain and neural processes that can become the basis of neuroscientific studies. The brain changes seen during meditation are mainly relative changes to another activity state and as such cannot be assumed to depict the actual brain change of the practice. Besides the practice of yoga is a mind-body holistic practice and dynamically affects the whole brain and hence the need to study not just specific regions but the entire brain phenomenon.
Patanjali describes five types of fluctuations of the mind or consciousness. These are: (1) veridical cognition on the basis of perception, logical reasoning, and verbal communication (2) illusory imagination (3) linguistic conceptualizations (4) sleep (5) memory. These states correspond to the full range of mental states of the mind during normal activities of life as described in modern psychology.

These active states of mind are goal-directed and are characterized by continuous changing patterns of motivations, cognitive-affective processes, regulatory operational mental processes and sensorimotor processes. These are distributed functions of the brain and are not localized. So the practice of yoga and particularly the meditative aspect possibly bring about global change in the dynamics of the brain and alter the activity from the default fluctuating state comprising of the five fluctuations to another state of consciousness. Stillness can be considered as a variable state of the mind-brain that is controlled and thus counterbalance the fluctuating state of the mind-brain. The study along such lines should be interesting and may have practical implications in health and well-being.

2.4.7 Neuroscience of Yoga Practice: Solomonova (2015)

There has been a recent surge of interest in studies on contemplative practices. Most such studies have focused on seated or static meditative practices. However more recently the dynamic or movement-based practices are increasingly being researched. Among the movement-based practices are yoga, tai-chi, and qigong. Such contemplative practices are termed in research as Movement-Based Contemplative Practices (MBCP). Yoga in its general form is seen as a movement-based exercise and is studied as such in terms of exercise physiology and kinesiology. Whereas yoga cannot be separated from its contemplative heritage. In this significant article the author highlights the need for studying yoga in its whole aspect as a Movement-Based Contemplative Practice (MBCP).
Most studies in neuroscience on yoga have focussed on the physical aspect. The concept of yoga is historically and culturally derived from an Eastern contemplative tradition and philosophy. Yoga is a lived experience and needs to be studied as such including short-term and long-term effects of a dedicated practice. Embodiment is a concept which forms the foundation of consciousness where dynamic interaction and interplay exists between the mind, the world and the body. Thus in phenomenological terms, movement forms a pragmatic function of interaction with the world. It is also fundamental to dynamic and plastic way of knowing and the very foundation of formation of the sense of self or selfhood and subjectivity.

The subjectivity is conditioned by the lived-body through kinaesthetic patterns and habits formed over the lifetime. Yoga can therefore be seen as a systematic changing of the ‘lived-body’ through deconditioning of old defunct and aberrant patterns into new, healthy habit patterns through positive plastic alterations of neural connections. Neurophysiology research has shown that the sensorimotor ‘coupling’ between the moving body of the individual and the world, is central to the concept of the embodied self and the subjective experience. Therefore studying yoga as an MBCP should provide new insights into the central nervous system processes of the practice and their practical and clinical applications.

Studies on embodied and enactive cognitive phenomenon as part of contemplative neurosciences should use the methodology of neurophenomenology. The uniqueness of this method is the combining of sophisticated neurophysiological measurement methods with nuanced first-person experiential methods. Keeping the Yoga Sutras of Patanjali as the basis for the yoga tradition itself, the author points out that studies should consider the neurophenomenology of yoga. This necessitates that the cognitive and neural correlates of yoga are studied phenomenologically as dynamic, lived, individualized experiences.

There is a need to explore ‘intention’ as part of contemplative neuroscience studies. In phenomenology, intention or intentionality is the quality of
'aboutness' of consciousness as it is being conscious of or conscious about something. This behaviour of Intentionality has been associated neurophysiologically to activities in the right posterior temporal superior sulcus network, the mirror neuron systems and the reward systems in human beings. This involves neuroanatomical structures like the ventral striatum, ventral tegmentum, dorsal striatum, putamen and the caudate nucleus. In the contemplative yoga tradition motivation and the setting of intentionality or sankalpa is a very important part of the practice.

Recent research has revealed the neural correlates of contemplative intentional practice to be associated with attentional networks including insula, anterior cingulate, frontal-parietal regions, and dorsolateral prefrontal cortex as seen in studies on focused attention practice. A study of the neural correlates of the dynamic practice of yoga within the framework of contemplative intentional practice should throw light on the short-term and long-term intentions, motivations, expectations, aspirations and goals of the practitioner and provide new neurophenomenological insights. Cognitive and affective changes are bound to occur in one’s subjective experience during the practice of yoga and it is important to study this in the context of neurophenomenology.

Study of the embodied first person experience of contemplative practice in target groups like for example patients suffering from specific disease conditions would provide greater understanding of the lived experience of the patients and the neural basis of such experience which could inform the development of yoga-based and individualized interventional methods. Study of regular healthy practitioners also has implications for long term health and wellness benefits of yoga and development of preventive medicine strategies. Lastly the author suggests that there is great benefit in the contemplative neuroscience research that studies not just expert yoga practitioners but the lived and embodied experiential neurophenomenological study of scientists practicing yoga themselves which would contribute to a more comprehensive understanding of nuanced contemplative practice.
2.5 Neuroscience of Meditation and its Medical Application

Meditation is a technique and practice of contemplation and thought training. The concept itself is quite ancient and is associated with philosophy and religion. It is seen as a skill that requires practice. There are different types of meditation. Recent interest in the science of meditation has come from the health enhancing benefits observed in the practitioners of certain Eastern traditions of Yoga and Buddhist practices. Several scientific studies using rigorous criteria have confirmed the immense benefits of meditation in psychological and physical health. This section reviews the brain and nervous system correlates of the practice of meditation and its practical application in health and wellness.

2.5.1 Neuroscience of Meditation: Deshmukh (2006)

The author explores the concept of meditation from the perspective of the Indian tradition of Dhyana Yoga and reviews the brain and nervous system basis of the process or different meditative mind states as observed through imaging and neurophysiological technology. The brain is seen as an intermediary or interface between the outside environment and the inner environment of the organism. Brain and mind are two aspects of the same phenomenology and exists together just as light can be as wave or particle.

The brain itself is seen as a self-organizing entity through information from the environment and connected to the whole. The neural structures, neurotransmitter systems and neurophysiology has been briefly reviewed and summarised. Consciousness and its neural basis is presented. Consciousness is a distributive function of integration of several cortical and subcortical brain regions. The thalamocortical and reticular activating system are the core neural basis of consciousness. Attention is another important higher brain function. In cultivating attention through practice and training there is voluntary inhibition of irrelevant mental activities which is
similar to the definition of Yoga provided in the second Sutra interpreted in this context as the stopping of the cyclical activity of thoughts.

Social-Emotional Intelligence is reviewed next. These are a set of capabilities and competencies that facilitate an individual to cope effectively with the demands of the environment. Yoga is seen as an elevated development of the skill or behaviour in action. The prefrontal cortex is seen as the neural organization for this capacity. The sense of self is later explored. The process of self-reflection is also seen as function of the prefrontal cortex.

The meditative mind is a subject of interest from ancient times. Several ancient scriptural aphorisms are quoted from Upanishads and Yoga literature describing the meditative state, the means of achieving it and the high virtue and worthwhile pursuit in attaining that state. Two forms of meditative states with different neurological mechanisms as studied through imaging and electroencephalographic studies are reviewed. There is activation of systems that produce positive emotional and cognitive states and inhibition of negative or undesirable emotional and cognitive states.

There is activation of parasympathetic system, the prefrontal cortex and positive neuro-hormones like the Arginine Vasopressin system and endorphins. The inhibition of the sympathetic flight-fight response system and stress hormonal systems like Adrenaline and Cortisol and its feedback cascade system through Adrenocorticotropic Hormone (ACTH), Corticotrophin Releasing Hormone (CRH) of the Hypothalamic Pituitary Adrenal (HPA) axis.

Finally the author concludes with a new hypothesis of neuroscience of meditation through the explanation of turiya state. On achieving the turiya state, one experiences boundless energy, unlimited capacity and intense sense of wellbeing. Meditation facilitates this through effective and efficient management of the neuro-behavioural energy. There is a continuous
renewal of the potential energy when this is cultivated through moment to moment awareness through meditation.

2.5.2 The Exploration of Meditation in the Neuroscience of Attention and Consciousness: Raffone and Srinivasan (2010)

The authors here explore the two main groups or family of meditation techniques widely studied in neuroscience. These two groups are, the Focused Attention (FA) meditation and the Open Monitoring (OM) meditation. An example of FA meditation is the Transcendental Meditation (TM) that has been very widely studied where a mantra is used for focussing attention but with a detached attitude thus producing deep relaxation. An example of OM meditation is Mindfulness Meditation derived from Vipassana of the Buddhist tradition. Here a non-judgemental and non-reactive observation of the present in terms of thoughts, feelings, impulses and sensations is engaged in. One other form of meditation briefly referred to is Loving Kindness or Compassion Meditation.

Meditation is also studied in two contexts, state and trait. State is studying the subject while practicing the particular meditation technique in real time. Trait is studying the qualities and long-term neuroanatomical and neurophysiological changes in long-term or expert meditators like Buddhist Monks. The authors contend that this is very important to investigate to have a better understanding of cognitive and affective neuroplasticity and attention and self-awareness. These have important clinical implications in terms of potential for developing medical interventions.

The investigations are especially valuable in the better understanding of the neuroscience of attention, neuroscience of consciousness, neuroscience of empathy and neuroscience of theory of mind. The authors review the current approaches to the scientific investigations utilizing current technological advances in the form of neuroimaging and electrophysiological techniques.

This is an exhaustive systematic review along with meta-analysis of the studies involving Loving Kindness or Compassion based meditation that have been done in various institutions across the world. The authors have used the term Kindness Based Meditation (KBM) as a rubric for the various techniques that have been developed to consciously and deliberately elicit feelings of kindness in the practitioner. Several of the techniques involving KBM have already been included in programs for improving health and well-being in many modern healthcare settings.

All of the studies reviewed are the gold standard of clinical trials involving Randomized Controlled Trials (RCTs). The inclusion criteria also included peer reviewed publications, theses and conference presentations. The Random-Effects Model have been used in the meta-analyses. Using quite a rigorous criteria, 22 studies were short-listed. The results show a positive effect to a moderate degree. The health and well-being effects seen were in decreasing depression, increasing mindfulness, increasing compassion and self-compassion against passive controls. There were increased positive emotions as compared to a well-known and routinely used technique of progressive muscle relaxation.

The authors however report limitations to the studies in the form of methodologies being of low to moderate quality and imprecisions in reporting of results due to wide confidence intervals in small studies. They recommend further more robust studies of RCT with large sample sizes. But in spite of these the studies do impressively show evidence of benefits of KBM in the health of both individuals and communities through its effects on improved well-being and also social interactions.

2.5.4 Functional Brain Mapping of the Relaxation Response and Meditation: Lazar et al (2000)
This is a significant study conducted by Harvard University in the Massachusetts General Hospital, Boston, USA. It confirms the utility of fMRI or functional magnetic resonance imaging of the brain as a valid method to study brain changes during meditation. It also demonstrates and confirms earlier studies especially one using PET or positron emission tomography scan to show region specific brain changes during meditation. Five subjects who were experienced meditators were subject to brain scans during the process of meditation after adequate preparation to eliminate effects and artefacts and co-occurring events during the process of the scan itself.

The subjects practiced a well-known meditation technique popularized in the US called the Kundalini Meditation. Here the subject has to focus on the breathing and chant a mantra in the mind: On inhalation ‘sat nam’ is chanted and on exhalation ‘wahe guru’ is chanted and this is repeated for a pre-agreed duration. The fMRI detected during meditation consistent and significant activation of specific brain regions, namely, the dorsolateral prefrontal and parietal cortices, hippocampus and parahippocampus, pregenual anterior cingulate cortex, striatum, and pre- and post-central gyri. These areas of the brain are particularly involved in the processes of control of attention and control of activity of the autonomic nervous system. The scans also showed global decreases in the fMRI signals. This was interpreted as probably due to cardiorespiratory changes that are often seen to be associated with meditation.

The study also significantly demonstrate that the neural changes during meditation are dynamic, evolving over the time period of meditation practice. The experienced meditators are also able to subjectively observe and report the changes in their mental state during the practice consistent with observed changes on the scan.

2.5.5 A Systematic Review of Meditation Using the Four Immeasurables Meditations: Zeng et al (2017)
This is an interesting and pertinent article with respect to the study of the Patanjali Yoga Sutras. It reviews the studies that have involved the Four Immeasurable Meditations (FIM). FIM comprises of four types of attitude cultivation meditations as practiced by Theravada Buddhist tradition. Interestingly this is similar to the *parikarmas* mentioned in the Patanjali Yoga Sutras. The FIM comprise of (1) Loving Kindness Meditation (LKM), (2) Compassion Meditation (CM), (3) Appreciative Joy Meditation (AJM) and (4) Equanimity Meditation (EM).

In each of the meditations, the meditator tries to bring into himself/herself the particular attitude and feelings in order to develop positive qualities and thus progress spiritually. The meditation is done to counter the opposite negative qualities. Thus, LKM is done to counter anger, CM is to counter hatred, AJM is to counter Envy and EM is to counter attachment. We see the parallel to this in Patanjali Yoga Sutra, sutra 33, chapter one which delineates the four *parikarmas of maitri* or friendliness towards the happy, *karuna* or compassion towards the suffering, *mudita* or good will towards the fortunate and *upeksha* or benevolent indifference towards evil.

The authors were able to identify 22 good studies that had reported significant positive emotions through practice of one or more of the FIM techniques. The review identifies and covers in detail studies done under each of the four sub-categories of FIM. The discussion highlights how the studies were numerically less and in many aspects very much variable. The sample sizes of the studies have tended to be small across types of meditations.

Significantly, the short term effects have shown good promise but are not explored adequately in the studies. There is tendency towards positive bias in the published research. The authors also recommend an exploration of translation of the meditation benefits into daily life and practice. As per scientific observation criteria the use of experimental manipulation and better measurement of meditation practices are also suggested for future research to make them more scientifically robust.
2.6 Neuroscience of Mindfulness and Mindfulness-Based Therapies

Mindfulness has become an established paradigm in positive psychology research in recent times. It has applications in therapeutics as an intervention in many physical and mental conditions. It is the most widely studied activity which has its origins in Eastern spiritual traditions. The concept has been incorporated into modern neuroscience as derived from the Buddhist practice of vipassana. But the practice itself can be traced back to more ancient spiritual practices of yoga and Vedic culture. There is accumulating research evidence gathered through robust scientific studies showing strong neural mechanisms that positively affect human health related behaviours through the practice of mindfulness. Many different therapeutic interventions have been developed. The concept of mindfulness or awareness is also a central theme in the Yoga Sutras of Patanjali. Hence the review of mindfulness as a concept and its neuroscientific basis becomes relevant.


The concept of self is the underlying relatively constant characteristic in the external phenomenal existence that is constantly changing and of varied experiences. This was first conceptualized by early psychologists including William James, considered the father of modern psychology. To give a sense of continuity to the self over time through the narrative of experiences, the concept of ‘me’ is used and to refer to the sense of self at the present moment the concept of ‘I’ is used. In recent times the neural basis for this sense of ‘me’ described as narrative self-reference or Narrative Focus (NF) has been determined to be localizable to the medial prefrontal cortices (mPFC). This links the subjective experience and self-awareness across time. There are also other self-related capacities that can be linked to the mPFC including memory for self-traits, traits of similar-others, reflected self-knowledge and future aspirations of the self.
The ‘I’ness which can be conceptualized as momentary self-reference or Experiential Focus (EF) has been hypothesised to have a distinct neural substrate. Thus there is a dual mode of self-reference. This thesis has been examined in this study. FMRI scan has been used to study the brains of subjects in this study. Two groups were studied: a group of novice participants and another group of participants who had undergone an eight-week training in mindfulness meditation.

Mindfulness meditation trains a person to increase the trait of awareness and focused attention of the present moment. In participants who were trained in mindfulness meditation, engaging in experiential focus (EF) activity, resulted in a more pervasive and increased reductions in the mPFC, and enhanced engagement of a right lateralised neural network, consisting of the lateral prefrontal cortex (lPFC) and the viscerosomatic regions like the insula, secondary somatosensory cortex and inferior parietal lobule. Functional connectivity analyses revealed a strong coupling between the right insula and the mPFC in novices. This was uncoupled in the mindfulness meditation group.

These results suggested that there may be a basic neural dissociation between two separate forms of self-awareness that may be habitually integrated but could be dissociated through training of attention. These two forms of self are the self that is across time and the self of the present moment.

2.6.2 Mindfulness Training Modifies Subsystems of Attention: Jha et al (2007)

This research addresses the effect of mindfulness training (MT) on the attention aspect of general cognition. It takes a closer look at the effects on the sub-systems of attention. Mindfulness itself is an attentional process. It is voluntarily focussing the attention to the present experience from moment to moment. The study tests the hypothesis that mindfulness
training can alter or enhance specific sub-components or sub-systems of attention regulation. The study looks at three overlapping but distinct aspects of attention that have neuroanatomical and neurophysiological correlations: alerting subsystem, orienting subsystem and conflict monitoring subsystem. The Attention Network Test (ANT) was used to index the subsystems of attention.

The study examined two types of mindfulness training. Testing of behaviour was done before and after the training in both the groups. One group who were naïve to mindfulness, attended an eight-week Mindfulness Based Stress Reduction (MBSR) program. The other group were participants who were already engaged in a concentrative meditation practice and attended a one-month intensive mindfulness retreat. The control population were naïve to meditation and did not participate in any mindfulness training. The findings showed that at the pre-MT time, the retreat group showed better performance in the conflict monitoring component of attention compared to the MBSR group and controls. Post-MT, the MBSR group showed improvement in the orienting subsystem as compared to the retreat group and the controls.

The ability for conflict monitoring did not differ in either of the groups. There was alteration of the alerting task performance in the retreat group with significant improvement demonstrated in detection of exogenous stimuli. This study therefore demonstrated the utility of mindfulness training on the different subsystems of attention and has practical application in the potential for developing interventions in neuropsychological conditions involving specific areas of attentional regulation.

2.6.3 The Neuroscience of Mindfulness Meditation: Tang et al (2015)

This article is a significant one as it appears in one the most prestigious scientific publication i.e. Nature and is a recent one focussing on mindfulness meditation as this form of meditation is being used in several clinical conditions in many medical institutions. The article reviews in detail
the challenges of studies in mindfulness meditation and also the limitations due to methodological constraints and biases especially towards positive findings. It highlights an important point that researchers are themselves practitioners of meditation or are using the techniques in their clinical practice. The article explains the various technological advances in the study of neuroscience that has enabled neuroscientific study of mindfulness meditation. It lists the various types of mindfulness practices and the important neuroscientific findings or changes in brain functioning.

Mindfulness can be conceptualized as an exposure therapy for a fear response that is internally activated. The technique allows greater control with acceptance and ability to remain calm to the unnecessarily fearful or anxiety inducing thoughts serving no useful purpose thus allowing a sense of safety and being able to respond appropriately to other emotions. Stress is the most commonly affected aspect through mindfulness training. The neuroanatomical, neurophysiological and neurochemical correlates of mindfulness meditation have been examined and presented in detail.

One thing that is certain from the research is that mindfulness meditation does influence neuropsychological functions of attentional regulation, emotional regulation and self-awareness leading to self-regulation. There is a need for better and more robust long term studies with bigger sample sizes. It concludes that this does have positive implications in clinical medicine in improved mental and physical health and well-being.

2.6.4 Brain and Immune Function and Mindfulness Meditation: Davidson et al (2003)

Davidson and Kabat-Zinn are pioneers in meditation research. The researchers studied the antibody response to influenza vaccine in this study. Twenty five participants were enrolled in a short term training program in mindfulness, the Mindfulness Based Stress Reduction (MBSR) program of eight weeks duration. They were compared with a control group of seventeen. Measurements were done on affect and anxiety measures using
standardized rating scales, brain electrical activity measure using electroencephalogram (EEG) and measuring serum antibody titre for the influenza vaccine.

This study is significant in that it was one of the first study to demonstrate an in vivo immune response to meditation intervention. The results were significant in that there was significant enhanced activity in the left sided anterior region of the brain in meditators. There was a significant increase in antibody titres to the influenza vaccine in the meditators. There was also predictability of magnitude of rise in antibody titre with the magnitude of left sided electrical activation of the brain. The study demonstrated that even a short term meditation program could significantly and positively influence brain function and immune response. This also indirectly showed the nervous system immune system connection.

2.6.5 Mindfulness Interventions: Creswell, J. David (2017)

This article is a most recent review of the various mindfulness interventions and guidelines for use in clinical practice by an authoritative clinician and researcher in this field. In recent times there is a growing number of randomized controlled trials (RCT) in mindfulness interventions. This review has organized the various evidence into distinct categories. The main categories are: (1) mindfulness intervention effects in health, (2) mindfulness effects in cognitive function, (3) mindfulness effects in affective states, and (4) mindfulness interventions in interpersonal situations. He has also reviewed the mindfulness based interventions in certain new settings and populations as in workplace settings, school and military personnel.

The review also includes not only the neurobiological correlates of mindfulness interventions but also the psychological correlates. An important aspect that has been covered which does not find much mention in other studies is the dosing effect or how much is necessary and how much is safe. The review also lastly and most importantly discusses the potential risks and adverse effects of mindfulness interventions.
The clinical effectiveness of mindfulness interventions in certain disease conditions and the RCTs to support these have been presented e.g. chronic pain, relapse prevention in depression, and rehabilitation of addictions. A further detailed discussion focuses on the various challenges of research in clinical mindfulness, application of the interventions in community programs and also opportunities in this emerging field.

2.6.6 Physician Mindfulness and Health Care Quality: Beach et al (2013)

This study is an interesting and important one related to the effect of mindfulness practice by physicians themselves and its impact on the patients. The study was based on the premise that practicing mindfulness was associated with improved well-being of physicians. The study was an observational study and recruited 45 clinicians that included 34 physicians, eight nurse practitioners and three physician assistants from four speciality clinical centers across the United States. It also included 437 patients who were HIV-infected attending the speciality HIV clinics at these centers. The clinicians completed the Mindful Attention Awareness Scale.

The researchers measured the quality of patient-physician communication by audio recording interactions and subjecting them to coding on the Roter Interaction Analysis System (RIAS). They also obtained patient ratings of the care received from the clinicians.

The results showed that there was an increased likelihood of patient-centred pattern of communication in those physicians who had practiced mindfulness and had scored as being high-mindfulness clinicians. In these interactions clinicians and patients engaged in more rapport building and discussing psychosocial issues. The emotional tone displayed by the clinicians was seen as superior in those who had scored as having high-mindfulness. The likelihood of patients giving a higher rate for quality of communication and overall quality of care was higher with high-mindfulness clinicians. The other significant finding was that there was no correlation
with mindfulness in communications involving information exchange and conversations about biomedical issues.

2.7 Mind-Body Medicine

Mind-Body Medicine (MBM) is a recent development in the field of medical science. Though the concept itself is old, it has recently become generally accepted and incorporated into mainstream medical and healthcare services. Mind-body medicine was earlier considered as alternative and complementary medicine. Mind-body medicine includes several drugless therapies. The common mind-body therapies are: mindfulness meditation and mindfulness-based therapies and programs like, Mindfulness Based Stress Reduction (MBSR) Program, Mindfulness Based Cognitive Therapy (MBCT), yoga, Tai Chi, Qi Gong, Transcendental Meditation and other meditation techniques, biofeedback, Relaxation Training, Autogenic Training, hypnosis, guided imagery, Reki, and other lifestyle modification programs. Several of the practices and principles of Mind-Body Medicine programs have similarities with many features of ashtanga yoga which forms a core practice of the yoga described in the Patanjali Yoga Sutras. Some or all of the practices can in fact be traced to the yoga and spiritual traditions of India.


Mind Body Medicine is an emerging concept in mainstream medicine. Medicine had till recently and to a large extent even now, follows a reductionist biophysical model. This had excluded the psychological or mental and social aspects of disease and interventions. This is slowly changing and a paradigm shift is taking place that is more holistic using the bio-psycho-social model. In this context mind-body medicine based interventions are increasingly being developed and used as an integral part of therapy. Several evidence based research studies are now available establishing mind-body medicine (MBM) as a medical intervention.
The authors of this article have done a detailed review using systematic reviews, meta-analysis and randomized controlled trials (RCTs) of the available evidence based research. They have concentrated on those studies that have used mind-body medicine interventions in physical disorders. They have excluded interventions in mental and psychological disorders. They have also excluded mind-body therapies that involve physical or body based activities like yoga and Tai Chi Chuan. The mind body interventions that this study has looked at in detail are relaxation techniques, meditation, guided imagery, hypnosis, biofeedback, cognitive behavioural therapy and psychoeducational approaches. The following disorders have been studied: tinnitus, rheumatoid arthritis, urinary incontinence, diabetes, chronic pain, chronic obstructive pulmonary disease, asthma, pre-surgery, coronary heart disease, hypertension, post-stroke rehabilitation, chronic benign headache, fibromyalgia, paediatric migraine, adult migraine, cancer, insomnia, osteoarthritis, low back pain, acute pain, and child birth.

The findings have been that the evidence for effectiveness of mind-body medicine interventions is strong to moderate-strong in almost all conditions and moderate in hypertension. The authors conclude that the overall clinical evidence does support the premise that medicine should adopt a bio-psycho-social model of health rather than a narrow biologic-genetic model. They also go on to recommend that mind-body medicine based interventions should be integrated into clinical practice as a priority.

2.7.2 Mind-Body Medicine: Clinical Impact of the Acute Stress and Relaxation Responses: Dusek and Benson (2009)

Mind-Body medicine practices and techniques activate the relaxation response. The foundations for the studies in mind-body medicine were laid nearly 100 years ago when Walter Cannon, physiologist at the Harvard University, first described the Flight and Fight Response. About 40 years after that Hans Selye, an endocrinologist, expanded on and revised on the
work of Cannon. He described the General Adaptation Response, which is a three-stage adaptation response in the humans to stress. These adaptations in the physiological response to stress are termed the Stress Response (SR). The SR is observed as alterations in blood pressure, heart rate, respiratory rate, temperature and metabolic shifts, all for the purpose of liberating more energy in order for the human physiological system to cope with the stress.

Nearly 40 years ago, Herbert Benson, one of the authors of this article, also from Harvard University, first described a set of adaptive responses to stress and called it the Relaxation Response (RR). The Relaxation Response (RR) can be voluntarily elicited. This causes a decrease in the blood pressure, heart rate, respiratory rate and oxygen consumption and produces an enhanced sense of well-being. The SR triggers a cascade of physiological and biochemical responses. These involve two main psycho-neuro-endocrinological pathways, the Sympatho-Adreno-Medullary Axis (SAM) and the Hypothalamo-Pituitary-Adreno-Cortical Axis (HPA). Hypothalamus produces Corticotrophin Releasing Hormone (CRH) that induces the pituitary gland to release Adrenocorticotrophic Hormone (ACTH) which in turn induces the Adrenal Medulla to produce epinephrine (adrenalin) and norepinephrine (noradrenalin). This is directly linked to the physiological alterations of stress.

The Sympathetic excitation by stress activates the Adrenal Cortex to release Cortisol. This induces the liver to cause metabolic changes to release glucose to produce Adenosine Triphosphate (ATP), the energy currency of the cells, to enable the cells to respond to stress and also repair damaged cells. Nitric Oxide (NO) release inhibition has been associated with stress and seen to be associated with vascular tone modification leading to vasoconstriction which has deleterious effects.

The relaxation response (RR) has been seen to modify positively the NO-linked vascular tone and hence reversing the deleterious effects of the stress response. Thus elicitation of the Relaxation Response (RR) along
with other methods like Cognitive Behaviour Therapy (CBT) can enhance the stress bearing capacity and altering the SR to produce overall well-being. The authors recommend further research in this direction of RR, its association with alterations in NO and the long term effects especially on gene expression by use of mind-body medicine techniques.


Pain is one of the commonest reasons for which someone visits a doctor. Chronic pain is a significant public health concern. It is a common cause for disability, psychological distress, social difficulties, financial difficulties, loss of man power to society, and work related issues. Conventional treatments are not very effective in tackling the issues. The treatments can be expensive and may be associated with adverse effects, and hence these can be very demotivating for the patient. Complementary and Integrative Medicine (CIM) therapies are holistic in nature considering the whole person and addressing the body, mind and spirit. They also emphasise on the role of the person himself or herself who is experiencing the symptoms in the process of healing.

This article reports a systematic review conducted by the authors with the copyrighted Rapid Evidence Assessment of Literature (REAL) methodology. This is used to assess rigorously the quality of the research. They have also assessed the effectiveness and efficacy of the mind body interventions in the treatment of chronic pain. They did key database searches and identified 54 studies involving mind-body medicine therapies that are self-administered for chronic pain. The broad range of mind-body medicine therapies were mindfulness, meditation, biofeedback, laughter therapy, imagery, self-hypnosis, autogenic training, relaxation therapy, breathing exercises, mental healing, therapeutic self-touch or Reiki, prayer, sensory art therapies including aromatherapy, movement therapies like yoga, tai chi, qi gong and martial arts.
The significant mind body therapies that formed the subset for study in terms of the rigorous criteria set by the methodology were mindfulness/meditation, relaxation, biofeedback, guided imagery and self-hypnosis and autogenic training. The authors conclude that it is very important to include CI M therapies and especially mind-body medicine therapies as an essential part of an integrated and practical management of chronic pain. The important advantages are that they promote self-efficacy, are cost effective and can be self-administered and self-directed. However, the current available evidence have several shortcomings and require further studies with greater power, better quality, cost-effectiveness, safety reporting and effect size. They also recommend that the investigations should include and take into account influence of other clinical support systems, use of pain medications, poly-pharmacy, functional improvement assessments, quality of life, and return to work assessments which are common factors in people suffering from chronic pain.


The authors review the state of the recent advances in use of mind-body therapies in specific neurological conditions. About fifty percent of the population in the United States of America use mind body therapies in some form or the other. Physicians in practice are confronted every day increasingly by patients regarding the effectiveness and further information on mind-body therapies in neurology. The authors therefore review in a practical sense the body of evidence. They searched the database specifically for particular neurological conditions and terms along with mind-body medicine and therapies.

The authors describe the common mind-body therapies used in neurology which are meditation, relaxation and breathing techniques, yoga, tai chi and qi gong, hypnosis and biofeedback. They review the application of mind body therapies in general pain management, back and neck pains, headaches, Carpal Tunnel Syndrome, Multiple Sclerosis (MS),
Fibromyalgia, Epilepsy, muscular dysfunction, Stroke, aging, Parkinson Disease (PD) and Attention Deficit Hyperactivity Disorder (ADHD). They conclude that there are several conditions where there is good evidence to show that the mind-body medicine techniques are efficient especially in conditions like Migraine headache where the supporting evidence is very strong. The evidence for some of the other conditions in the use of mind-body therapies are limited by the decreased quality due to small sample sizes and lack of controls.

2.7.5 Top-Down and Bottom-Up Mechanisms in Mind-Body Medicine: Taylor et al (2010)

Medical science research in basic mechanisms of health are increasingly revealing that there is a bidirectional influence, termed the Top-Down and Bottom-Up processes, on mental and physical health. This means that psychophysiological functions are affected by processes originating from the mind-brain interactions down to the periphery which include the cardiovascular and immune system functions and processes in the peripheral systems influence the brain/mind functions. Mind-Body Medicine (MBM) therapies can be conceptualized as affecting these systems bi-directionally. Mind-body interventions are particularly used in chronic conditions where there are relatively permanent alterations in the affected systems. These affect the functional links between mind/brain and the body.

A wide range of medical conditions both mental and physical, can be influenced by mind-body therapies. The present study tries to integrate several models of explanation of the neuroanatomical and physiological frameworks of action of the mind-body interventions. Current concepts including the relaxation response and neuro-visceral integration are reviewed briefly. Definitions of concepts of mind, mind-body medicine, and the top-down and bottom-up mechanisms are explored. The study proposes the framework for understanding the mechanism of mind-body interactions and interventions.
The mind/brain neural substrate comprises of a functional neural network in the frontotemporal circuitry labelled as the Executive Homeostatic Network (EHN). This includes the prefrontal cortex (PFC), anterior cingulate cortex (ACC) and the insular cortex (IC). These are conceptualized as representing the principal neurophysiological substrates of mind-body therapies. The primary task is to maintain balance in the mind-body system otherwise termed as homeostasis. The EHN does this through interaction with and feedback from reciprocal areas in the sub-cortical neural circuits comprising of the limbic system, thalamus, hypothalamus and vagal autonomic system. The structures directly regulate affective, autonomic, endocrine and immune functions.

Feedback systems operate through the peripheral nervous system including the autonomic nervous system with its sympathetic and parasympathetic sub-systems and the hormonal system. Vagal tone and vagal communication forms an important pathway in the periphery which may be modulated by hormonal influence, immune-derived pro-inflammatory cytokines and several varieties of brain-derived neuropeptides and neurotransmitters. The model proposes that specific areas of the EHN encode for response patterns of physiological and behavioural dysregulation which form the higher order cortical representations of persistent symptoms.

Mind-body therapies produce shifts and enhance the bidirectional communications and mechanisms in the top-down and bottom-up pathways depending on the choice of mind-body medicine interventions. The study goes on to review in detail the various mechanisms in the EHN network. It also suggests experimental approaches to study the mechanisms and efficacy of the mind-body therapies. Functional neuroimaging is reviewed in considerable detail as tools for studying the mechanisms and even effectiveness monitoring or as part of the intervention itself as in biofeedback. Heart Rate Variability (HRV) is an important measure of vagal tone that is a most useful tool in measuring mind-body interactions. Study of inflammatory markers is another useful tool for assessment. The paper
thus presents a theoretical framework representing an integrative model to explain, study and understand mind-body medicine for greater integration into medical interventions for a variety of disease conditions.

2.8 Neuroscience of Compassion and Positive Attitudes in Health

Virtues and positive attitudes have not been given much attention in the prevailing contemporary technology based medical system till very recently. These were not seen to be relevant to health and well-being. Whereas when we look at our ancient traditional systems of wellness like Ayurveda and yoga, there is great importance given to these aspects of living. They have also been considered as essential components for reducing the burden of suffering and for a wholesome life. The Patanjali Yoga Sutras lays great emphasis on cultivation of certain wholesome positive attitudes and qualities in order to reach higher levels of balance and equanimity. These are in fact seen as essential steps for further development and progress along the path of yoga. This concept of developing compassion and such other positive attitudes as being helpful for mental and also physical health has now become a subject of relevance and importance in contemporary psychology and medicine.

Several research studies have now been undertaken in this area. What has commonly emerged is that these are higher human capacities that indeed have neurophysiological correlates and can be seen to be abnormally developed or affected in certain pathological conditions. These can be enhanced through cultivation of certain practices and mind-body techniques that produce neuroplastic changes. These can indeed affect the progress of several disease conditions in a positive way. It is indeed imperative that further research and effort go into better understanding of the neuroscientific basis of the positive attitudes in order to develop the therapeutic application and incorporation into healthcare. The main positive attitudes that are gaining increasing attention and are being studied increasingly are compassion, loving-kindness, forgiveness, gratitude, altruism and overall
positive attitudes. This section reviews the recent advances in this new and emerging area of neuroscience.

2.8.1 Loving-Kindness and Compassion Meditation: Hoffman et al (2011)

Loving-Kindness Meditation (LKM) and Compassion Meditation (CM) are techniques of Mindfulness Meditation. These are derived from the Buddhist tradition and practices. They are techniques to develop positive feelings and reduce negative feelings. Because of this outcome, it is of interest to clinical neuroscientists as a potential treatment intervention in mental and also certain physical conditions. Loving-Kindness is described as metta in the Buddhist literature. This is a quality of friendliness and loving attitude towards all living creatures. Compassion is described as karuna and is an attitude of benevolent sympathy towards the suffering of others with a genuine concern and motivation to take steps to alleviate the suffering.

These two attitudes form part of the four brahma viharas or divine abodes or virtuous states that the practitioners are expected to cultivate for their own emancipation. The other two brahma viharas are mudita or joy at others’ success or happiness and upbekka or calmness in the wake of experiencing harshness from others. These are also called the immeasurables. These are similar to the parikarmas of Patanjali Yoga Sutras, which are maitri, karuna, mudita and upeksha. The Buddhist versions are the same Sanskrit concepts but in the Pali, a language derived from Sanskrit, which had become the common language in the Indian subcontinent at the time of the Buddha. The deliberate cultivation of these virtues through meditation practice was taught in both traditions of Buddhism and yoga.

The particular practices of Loving-Kindness Meditation and Compassion Meditation have been adapted by modern researchers and studied in recent times. The authors of this study review the available studies from contemporary psychology on LKM and CM. LKM and CM have shown to affect positive changes in affective states of the mind. Some studies also show that the practice also reduce negative affective states.
Neuroendocrine studies with CM have shown that this may reduce stress induced subjective distress and regulate the immune response.

Studies using various neuroimaging techniques have demonstrated that LKM and CM can improve the increase in the activation of the brain areas responsible from emotional regulation and processing and enhance empathy. The authors have also looked at the application of these techniques in people suffering from various conditions. They looked at studies in personality and chronic mood disorders, and paranoid schizophrenia where significant improvements in subjective distress and self-regulation were observed. The authors acknowledge the limitations of the review. The available studies are few and some have small sample sizes. There were also variations in the meditation techniques used. Despite the limitations the authors see the potential of the LKM and CM techniques as useful adjuncts to well established interventions and techniques like cognitive behavioural therapies and other related therapies.

2.8.2 Effect of Compassion Meditation on Neuroendocrine, Innate Immune and Behavioural Responses to Psychosocial Stress: Pace et al (2009)

This is an experimental study design looking at a particular form of mindfulness meditation called compassion meditation on stress response and its biological correlates in a laboratory setting. The experimenters chose an adapted version of a particular form of Tibetan Buddhist meditation technique for developing compassion called the lojong meditation. Sixty one healthy adult subjects were randomized to thirty three in the experimental group and twenty eight in the control group. The experimental group participants underwent a six-week training program in the lojong-based compassion meditation (CM) technique.

The control group participated in a health discussion group program for a similar time duration. All the participants were then subject to exposure to a standardized laboratory stressor situation called the Trier Social Stress Test (TSST). Pre- and post-test measurements were made repeatedly on
behavioural and physiological parameters. The physiological measurements included assessment of plasma concentrations of cortisol, which provided the neuroendocrine parameter, plasma concentration of interleukin-6 (IL-6), which is a measure of the immune response. The behavioural response was measured with the total distress scores on the Profile of Mood States (POMS) scale.

The measures of IL-6, cortisol and POMS did not show any main effect on TSST responses of the control group that participated in the group assignment. In the meditation group, interesting variations were observed. There was greater correlation between increased compassion meditation practice and lowered TSST-induced IL-6 response and decreased distress scores on POMS scale. Participants who had practiced CM for more than the median time showed lowered responses in the TSST-induced IL-6 levels and lowered distress scores on POMS as compared to those participants who practiced the CM for less than the median time and their measures were comparable to that of the controls.

Whether those who practice CM show reduced stress-reactivity has to be determined by further studies. The authors give in good detail the limitations of the study. The innate immune inflammatory signalling pathway has been implicated increasingly in the pathogenesis of several disease conditions including vascular disease, diabetes, cancer, and neurodegenerative disorders. The risk factor for these illnesses has also been repeatedly shown to be associated with stress and stress related mental conditions like major depression. Acute and chronic stress and stress-induced depression are also associated with increased activity of the innate immune inflammatory pathways. This suggests the possibility that through these pathways stress and stress-induced depression may transduce into physical illnesses.

Chronic and repeated stress by activating the innate immune inflammatory pathway may induce major depression as it has been observed that patients who have received therapy in which they are exposed to chronic innate
immune cytokines show high rates of depression. Therefore meditation and such other mind-body techniques may be used to modify the innate immune inflammatory pathway and thus have therapeutic implications for management of psychological and physical conditions.

2.8.3 Compassion Training Alters Altruism and Neural Responses to Suffering: Weng et al (2013)

This study demonstrates that positive attributes like compassion leading to altruism is a trainable skill that can translate into a more enduring behaviour. It also demonstrates structural changes in the brain that occur with the training that leads to a reorganization of neural substrates of particular behavioural domains. The main motivation for altruistic behaviour is compassion. The ability to cultivate compassion can be very helpful to society in general towards promoting peaceful coexistence. It is a quality much desired in medicine and healthcare professionals. It also has application in the potential therapy for individuals classified as having psychopathic personality where the capacity to feel compassion is absent.

The study used an experimental design. Forty one participants were randomized to, twenty in the experimental group who were given training in Compassion Meditation (COM) for two weeks, and twenty one in the active control group who were given Reappraisal Training (RT). Trainees in the COM arm were taught to cultivate and practice compassionate feelings towards various targets presented to them. The RT trainees were taught to practice reinterpreting of personally stressful events in order to reduce their negative affectivity. So, even though both trainings promoted emotional regulation strategies to enhance well-being, they differed in their goals. In COM, the goal was to increase empathy and concern for others and motivate action in order to relieve the distress of another. In RT, the goal was to decrease one’s own personal distress.

Neural systems that may be responsible for altruism as a result of increased compassion training are the ones that mediate recognition and
understanding of another’s suffering and an ability to self-regulate one’s emotional responses in such a way that supports affiliation to the sufferer and helping behaviours. The neuroscience of empathy brings out two systems for this behaviour: experience sharing and mentalizing. These processes are neuro-anatomically represented by differential functioning in the prefrontal cortex (PFC), the anterior insula (AI), nucleus accumbens (NAcc) and the amygdala.

To study this the research used fMRI scans of the brains of the participants in the testing. The altruistic behaviour was tested using a Redistribution Game task. Training induced altruistic behaviour was seen to be associated with enhanced activation in the dorsolateral prefrontal cortex (DLPFC) and the connectivity between the DLPFC and the NAcc. The finding that could well be considered as a marker for altruistic activity was activation in the inferior parietal cortex (IPC).

A limitation of this study acknowledged by the authors was not measuring for a baseline altruism trait in the participants. The results provide evidence that mental training induces functional and structural changes in the human brain which is a known fact but extends this to the socio-emotional domain of compassion and altruism. This study also demonstrated that compassion and altruism can be considered trainable skills rather than stable traits. This has a profound implication in the understanding of the neuroscience of social-emotions and has application in medical and psychotherapeutic care.

2.8.4 Self-Compassion and Adaptive Psychological Functioning: Neff et al (2007)

Self-compassion is a novel concept. This has recently been considered as an important characteristic for psychological well-being. Self-compassion is the feelings of kindness and compassion towards oneself during circumstances especially when one is experiencing physical and psychological pain and due to any failures in life instead of going into a state of self-blame and indulging in over self-criticism and self-punishment. It is
the ability of one to see difficulties as a larger part of a shared experience with others who would all experience similar situations at some time or the other in some form or other and to a greater or lesser extent in their lives. It is also the ability to hold painful thoughts and feelings in mindful awareness and not over-identify with them.

Self-compassion has been adapted from Eastern philosophy and tradition which focuses more on spiritual development and less on materialism. In Western psychology, great importance is placed on self-esteem as a desirable quality requiring addressing and development for good psychological health. But recent investigations and experience have brought to light certain negative characteristics associated with high self-esteem that include narcissism, distortion of self-perception, prejudice and violence towards others who threaten the ego. Whereas in self-compassion, all the positive aspects of self-esteem like positive self-affect, self-acceptance and self-confidence are developed but not based on evaluation of self-performance in comparison and competition with others. Once the skill of self-compassion is developed the individual will not find the need to put down others or indulge in self-praise or boasting in order to satisfy the ego but sees the flawed nature of the human condition as a shared human experience.

Other research in this field has revealed the neurobiological basis of self-compassion. Self-compassion is said to deactivate the threat system that involves the limbic system and incorporates a defence system and associated with insecurity. It also proposed to activate the self-soothing system that involves the oxytocin-opiate system mainly in the frontal cortex that incorporates safeness and associated with secure attachment. The principal author has also developed the Self-Compassion Scale (SCS) that has been well validated. The scale has also been used in this research. In this research, the authors have combined two studies looking at the link between self-compassion and well-being.
The first study evaluated the ability of self-compassion to protect an individual against anxiety induced by threat to the ego. It also compared the relative merits and demerits of the protective qualities of self-compassion versus self-esteem. The second study evaluated whether the changes in self-compassion levels were associated with enhanced psychological well-being after undertaking therapeutic exercises deemed to increase this attribute.

The first study found that self-compassion unlike self-esteem did have a protective effect in reducing anxiety when faced with a situation that was deemed as an ego-threat in the experimental setup of the study. It further showed that self-compassion was associated with a connectedness as opposed to separateness in the use of language during descriptions of weaknesses. The second study revealed that self-compassion developed over a one month period by use of previously developed therapeutic techniques was associated with increased psychological well-being. Further, it showed that the ratings of self-compassion as done by the professional was comparable and well correlated to the self-rating of compassion by the participants themselves. The authors propose self-compassion as a conceptual alternative to other more egocentric concepts of self as prevalent at present in Western psychology.


It has long been observed and generally accepted that positive emotions have a beneficial effect on health and wellness. This was regarded as a folk theory. But recently there is good evidence through research to show that this is indeed true. The authors have reviewed the research and also propose theories and explanatory models for the positive effects of positive emotions and attitudes on health. Studies have demonstrated that laughter and humour have positive influence on psychological and physical well-being. They are seen to enhance the immune system functioning.
Expressing and disclosing positive feelings like “counting one’s blessings” has beneficial influence on health. Positive emotions also have positive effects on the progress of cardiac disease. Studies also show a positive correlation of positive emotional disclosure with longevity. Positive emotions also facilitate adaptive coping in acute and chronic stress thus promoting psychological well-being. Based on several such studies, the Broaden-and-Build Theory of Positive Emotions has been developed.

Positive emotions help reduce or prevent autonomic arousal that is associated with the stress response of any mental or physical condition that generate negative emotions and broadens the repertoire of one’s attention, thinking and behaviours. By having a habitual broadened outlook and mindset, builds one’s personal resources and repertoire of coping. The advantages of positive emotional attitude on health can be attributed to the development of certain traits of which the significant ones may be psychological resilience and positive emotional granularity.

Psychological resilience is the ability to be flexible in demanding situations and being able to bounce back from the effects of difficult experiences. Positive emotional granularity is the ability and the tendency to precisely and specifically represent positive emotional feelings and experiences. The authors describe two studies that demonstrate these personality characteristics as associated with positive health and well-being.

Study one uses psychophysiological methods to show that persons with enhanced psychological resilience are able to quickly bounce back in the wake of negative emotional arousal through their experiences of positive emotions. Study two used an experience-sampling to show that positive emotional granularity is associated with self-reports of enhanced emotional coping.

These studies demonstrate that the effects of positive emotions are adaptive personality characteristics that can enhance health and well-being through...
their broadening and building function. Cultivating such positive traits can be now seen as essential for psychological and physical wellness.


Forgiveness as a component of counselling interventions came to the fore in the 1990s. The concept of forgiveness is an ancient one and is prevalent as a positive thing in most cultures. This is relevant in the context of relationships of different kinds like friendship, couples, parent-child, professional, etc. Forgiveness is an act of choice by the person who forgives. Forgiveness is an act of wilfully giving up resentment towards another where there is considerable injustice. The forgiver acts with benevolence towards the offender in spite of the offender having no moral right over the goodness of the forgiver. The authors conducted a meta-analysis of nine studies that had used quantitative measurements of forgiveness.

The authors considered the studies under three broad theoretical framework categories. The first was Decision-Based, the other two were Process-Based, one in a group context and one in an individual context. In the test for homogeneity, the group as a whole did not qualify, but when tested within the three framework categories, the Q value was below the critical for each group separately which would be expected if the test for homogeneity was affirmative. The groups were compared with controls. The variables measured were forgiveness and other emotional health measures.

The findings were interesting in that, the decision-based intervention group showed no effect, the process-based intervention in the group context showed significant effects, whereas the process-based intervention in the individual context showed large effects. Forgiveness is not yet seen as a construct in mental health in terms of directing counselling interventions. The present study highlights the potential for the utility of using such a
construct in clinical interventions and motivate further empirical research in this area.

2.8.7 Altruism, Happiness and Health: It’s Good to be Good: Post (2005)

Altruism is the characteristics of showing regard for others. It is an unconditional positive emotional and behavioural attitude with no expectation of anything good in return. Empirical research has shown that altruism is indeed associated with good health, well-being and longevity. The author of this study reviews the research in this field and summarizes the existing research data on the association between altruism and mental and physical health.

The various studies have generated interpretative models of explanation of the positive effects of altruism on health. The models span life science fields of evolutionary biology, physiology and positive psychology. These models also complement each other and are not in conflict with each other. There are also potential public health implications of these research findings. The studies are very encouraging and highlight the potential implication of actually using altruism as a clinical treatment recommendation by clinicians and as a public health intervention.

The helping nature of compassionate people whose behaviours and emotions direct them towards altruism indeed has positive benefits on their health, happiness, well-being and longevity with the caveat that they are mindful such that their behaviours do not overwhelm them and lead to what has been termed as compassion fatigue. Future directions for further research in this field are discussed in the article.

2.8.8 How Do Simple Positive Activities Increase Wellbeing? Lyubomirsky and Layous (2013)

Research and experience has shown that people engaging in simple intentional positive activities can increase their happiness and wellness and
thus improve their health. The simple positive activities are ones that can be practiced deliberately like expressing gratitude, being kind, thinking optimistically and being mindful. Investigators have now started studying the optimal conditions that facilitate the effect of positive activities on one’s happiness. They are also engaged in the study of mechanisms by which these effects work.

A model has been proposed to explain the effect of positive activity called the Positive-Activity Model. This model tries to explain the how and the why of happiness mediated by the performance of positive activities by people. Engaging in positive activities is seen to increase positive feelings or emotions, positive thoughts, positive behaviours and need satisfaction. All these factors together enhance well-being.

The degree to which the positive activities improve happiness and well-being is influenced by two parameters: (1) activity features such as dosage and variety, social support and trigger, present vs future vs past, other vs self-oriented, and social vs reflective and (2) person features such as motivation and effort, efficacy beliefs, baseline affective state, personality, social support and demographics. An overlap between the activity features and the person features which is called the optimum person-activity fit, predicts further the increases in well-being.

Practicing positive activities may satisfy certain basic psychological needs such as autonomy of feeling of being in control, relatedness or connectedness and competence or efficacy and thus increase happiness and boost well-being. The authors advice that there is no need to depend on unsubstantiated advice from self-help books, magazine columns and informercials. But instead there is empirical evidence based data now to support that practicing simple positive activities in daily life through intentional changes in thoughts and behaviours can enhance happiness and well-being. They recommend that future research should focus on how people chose positive activity and the characteristics of people and their particular chosen activities.
2.8.9  **Gratitude and Wellbeing: Wood et al (2010)**

Gratitude has been shown to enhance well-being. In this paper the authors propose the model of gratitude that incorporates the thankful feelings one expresses after receiving help from others but also the habitual practice and focussing on the positive aspects of life. The individual differences in gratitude and well-being have been reviewed. The authors also review the research in this field with respect to psychopathology, personality, relationships, health, subjective well-being and eudemonic well-being and humanistically oriented functioning.

The quantification of gratitude through the use of various scales are looked into. The clinical application of gratitude as an intervention in clinical psychology is reviewed. The use of simple gratitude enhancing activities and exercises and their use in clinical practice is reviewed. The limitations which may have been neglected by positive psychology research have been highlighted. The mechanisms by which gratitude enhances well-being through schematic biases, coping strategies, positive affects and broad-and-build model have been reviewed.

Gratitude is very much relevant and is part of clinical psychology because it has a strong explanatory power in understanding well-being itself and because of the potential clinical benefit and application by incorporating the teaching of simple exercises and interventions that enhance and foster gratitude and thus improve well-being.

2.9  **Wisdom as a Concept in Medicine and Neuroscience**

Wisdom has long been considered the highest level of human attainment. It is considered as a certain human quality or characteristic that is desirable. Wisdom is gained through knowledge and experience. It is generally believed that as people grow and mature they accumulate wisdom. Wise people are revered and held in high esteem by societies across cultures. In all areas of
human activities, wise decisions and actions are seen as positive outcomes. Wisdom is also associated with health and well-being. People making wise health choices have a better and positive health outcome. Therefore in recent times wisdom has become a subject of scientific inquiry and study.

There have been attempts to see if wisdom is a mind-body trait that can be developed or acquired. Studies have shown that this is indeed possible. It appears that in some wisdom may be inherent or natural and in some others it can be cultivated or enhanced through training. In this context, mindfulness is emerging as a phenomenon that can be linked to developing or facilitating the capacity of wisdom. This part explores the relevant research in the field of wisdom within medicine and more particularly the field of neuroscience.

2.9.1 Neurobiological Basis of Personal Wisdom: Sanders and Jeste (2013)

The concept of wisdom is an ancient one and is consistent across cultures and recognized as important throughout human history. Wisdom has been defined as a system of logic to understand this world. This notion also forms the basis of science itself. The concept of personal wisdom is the oldest known and studied and refers to the personal ability to cope with life and live life to its full.

A detailed study of personal wisdom has demonstrated its distinctness from intelligence and spirituality. There are also specific dimensions of personal wisdom that can be considered such as cognitive dimension, reflective dimension, and affective dimension. There are certain other items that are considered as descriptive of wisdom. These are emotional regulation, openness to new experiences, sense of humour and maturity gained with experience.

The authors refer to a landmark study on wisdom called the Delphi Study in this review. The authors have collated data from several research studies and animal model experiments to discuss the underlying neurobiological correlates of the different aspects of wisdom. The authors have thus come
out with a putative neuroanatomical model with the regions involved in the functional components of wisdom.

Personal wisdom has been conceptualized as having six broad areas of construct: (I) Prosocial attitudes and behaviours mediated by medial prefrontal cortex (mPFC), nucleus accumbens (NA), ventral striatum (VS) and the limbic mirror neuron system (II) Social decision making and pragmatic knowledge of life defined neuroanatomically by anterior cingulate cortex (ACC), prefrontal cortex (PFC), posterior superior temporal sulcus (pSTS), and temporo-parietal junction (TPJ) (III) Emotional homeostasis represented by dorsal anterior cingulate cortex (dACC) and the prefrontal cortex (IV) Reflection and self-understanding whose neurological basis are in mPFC, posterior cingulate, precuneus and inferior parietal lobule (V) Value relativism and tolerance mediated through ACC and PFC (VI) Acknowledgement of and dealing effectively with uncertainty and ambiguity neurologically represented by ACC, orbito-frontal cortex (OFC) and PFC.

The authors caution that the theory proposed are preliminary and speculative. However the aim of their discussion is to highlight the development of a heuristic framework for the study of personal wisdom and to provide a template on which further research could be based and developed to uncover the neurobiological foundation of wisdom that is such an important aspect of the human psyche and activity.

2.9.2 Wisdom: A Metaheuristic (Pragmatic) to Orchestrate Mind and Virtue towards Excellence: Baltes and Staudinger (2000)

From a historical standpoint, wisdom was considered as a subject of interest in philosophy and religion. In recent times, there is a growing interest in the study of wisdom in disciplines as wide ranging as education, psychology, cultural anthropology, political science and even medicine. Wisdom is seen as a pinnacle of human achievements and insight into the human condition. It is also considered as the means and ends of a good life.
In their study the authors look at wisdom from the scientific paradigm of wisdom study called the Berlin Wisdom Paradigm. For this paradigm the scientists have used a historical and cultural analysis. This defines wisdom as an expert knowledge system that concerns the fundamental pragmatics of life. These fundamental pragmatics include knowledge and judgement about the meaning and conduct of life, orchestration of human development towards excellence and at the same time conjointly attending to not only one’s personal well-being but also the collective well-being of society.

The measurement of wisdom included several protocols that encouraged participants to think aloud the various problems of life. The life situations measured were in the context of life planning, life management and life review. The evaluation of the responses used a family of five wisdom paradigm criteria: (1) rich factual knowledge (2) procedural knowledge (3) life span contextualism (4) value relativism and (5) recognition and management of uncertainty. The first two are considered basic criteria and the last three are the meta-criteria.

The authors review a series of empirical studies of wisdom within the Berlin Wisdom Paradigm. They examined the role of chronological age, the role of professional experience, in their study – clinical psychology, wisdom related performance requiring the interplay of intelligence, cognitive style and personality, the study of persons considered or nominated as being wise, the role of social collaborative or interactive-minds aspect of wisdom and wisdom in proverbs.

In the study the authors ventured to explore a new line of work exploring how and to what degree the wisdom-related knowledge and judgement could aid the function of planning and optimization of human development. The new theoretical perspective considers wisdom as a cognitive and motivational metaheuristic (pragmatic) that is able to organize and orchestrate knowledge towards human excellence in both mind and virtue that is applied both individually and collectively.
2.9.3 **Wisdom as Expert Knowledge System: Ardelt (2004)**

A new emphasis on positive psychology research has brought to fore research interest in wisdom. A prominent concept of wisdom that has been operationalized is defining wisdom as an expert knowledge system. The author argues that wisdom has to be considered in association with the person who possesses it. Hence the term wisdom has to be in association with the wise person and not merely a depiction of expert knowledge.

Expert knowledge is more akin to concepts like intelligence. Intelligence is in the cognitive neuropsychological domain. Intelligence can decline with time but wisdom is generally believed not to decline with age and to the contrary increases with age. The author contends that the Berlin Wisdom Paradigm that has the operationalized definition of wisdom used explicit theories of wisdom. Whereas wisdom being a higher mental phenomenon has to be seen through implicit theoretical perspectives.

The author gives examples of wisdom as an endowment of great people like Jesus Christ and Gautama Buddha. The expert knowledge system criteria cannot be used in their case as their wisdoms were unique attributes and could not be achieved by a collective gaining of knowledge and expertise. Though they did gain some through tutelage by other wise-people, but their ultimate wisdom was through their self-efforts leading to discovery of paths to emancipation and enlightenment.

The author therefore argues that wisdom cannot be considered independent of the individual who possesses it. Wisdom is understood not at the intellectual level but at the experiential level where there is self-realization and personal transformation. The author proposes that in order to get a true measure of wisdom one has to know what a person is like rather than what a person knows. The alternative model suggested by the author is a three dimensional personality characteristic model comprising of a cognitive dimension, reflective dimension and affective dimension. The author
encourages further dialogue and research to define, operationalize and measure wisdom.

2.9.4 Comparison of the Conceptualization of Wisdom in Ancient Indian Literature with Modern Views: Focus on the Bhagavad Gita: Jeste and Vahia (2008)

The Bhagavad Gita is an ancient scriptural text of Indian philosophical thought and yoga practice. It is part of the epic the Mahabharata. The Bhagavad Gita is considered as a book of wisdom and contains advice and wise counsel given by Krishna, considered an avatar and friend, philosopher and guide to Arjuna, a great warrior prince, in the battle field when Arjuna goes into a state of despondency when he finds himself having to fight against his own relatives, friends and teachers.

The authors have made a mixed qualitative and quantitative analysis of the contents of the Gita using text analysis software. They particularly looked at wisdom concept terms that reoccur in the discourse of the Gita. They found that certain key components were associated with the concept of wisdom in the Gita: Knowledge of Life, Emotional Regulation, Control over Desires, Decisiveness, Love of God, Duty and Work, Self-Contentedness, Compassion and Sacrifice, Insight and Humility and Yoga or Integration of Personality. These are comparable and similar to several of the modern conceptualization and definitions of wisdom. Particularly of note are rich knowledge about life, emotional regulation, insight, and a focus on the common good or compassion. There are certain differences in the Gita that highlight the cultural aspect of wisdom in the form of emphasis on control over sense desires and renunciation of materialistic pleasures.

The Gita is considered as a manual of right living. Thus it provides for teaching and learning of certain skills in order to lead a wise life. The authors discuss that the tenets and propositions in the Gita have therapeutic advantages and can be incorporated into modern psychotherapy for interventions in mental health conditions. They highlight that the Gita based
therapy can be more holistic and individualized which would be better than the commonly available modern methods. The emphasis in the Gita is in overall self-development and well-being which are higher health outcomes than mere treatment or alleviation of symptoms that the modern therapeutics focus on.


Empirical research on wisdom is becoming more common in recent times. Wisdom as a valid human endowment and necessary for overall well-being and progress in life has been acknowledged by the scientific community and clinicians. Several definitions of wisdom exist. The prominent ones are the Berlin Wisdom Paradigm, Sternberg's Balance Theory of Wisdom, the Epistemic Theory of Brugman, and Ardelt's Personality Dimensions of Wisdom.

The present authors endeavoured to characterise better the concept of wisdom for better operationalization and making it conducive for research. They designed a method to form an expert panel to seek their consensus using a 2-phase Delphi Method. They developed a survey questionnaire that comprised of 53 Likert Scale items related to concepts of wisdom, intelligence and spirituality. This was done so as to determine if the concepts were different and distinct from each other and if so how. The questionnaire was sent to wisdom experts across the globe. Of the 57 experts that the questionnaire was sent to 30 completed the phase one survey and 27 of them also completed the phase two survey.

The phase one survey revealed significant group differences in rating by experts on the concept of wisdom, intelligence and spirituality. Based on the phase one results the phase two survey sought to refine the concept of wisdom by grouping wisdom items into 12 key items. There was agreement among the experts on most characteristics of wisdom.
The items defining wisdom were: wisdom is a uniquely human characteristic, it is an advanced form of cognitive and emotional development that is driven by experience, it is a unique personal quality and a rare one, that wisdom can be learnt, it increases with age, it can be measured and does not increase with the use of any medication. The agreement among the experts about characteristics of wisdom was considerable. This should therefore help in designing future empirical research on wisdom and the practical application of wisdom in therapeutics.

2.10 Qualitative Research in Science

Qualitative research is recently gaining more credibility as a valid methodology of scientific research. Several guidelines and criteria have been formulated to make the studies more robust and reliable. There is now consensus on the parity between qualitative and quantitative research methods and a movement towards combining the best of both.

2.10.1 Current Qualitative Research: Flick (2002)

The author describes the current state of qualitative research in the social sciences. There is a discussion of the historic beginnings of qualitative research in German Language based of philosophy and phenomenology. It also compares and contrasts this with the English Language qualitative research. The author then goes on to discuss the different types or schools of qualitative research: grounded theory, ethnomethodology, narrative analysis, objective hermeneutics, life-world analysis, ethnography, cultural studies and gender studies.

The internationalization of qualitative research is discussed along with development of definitive guidelines. Current guidelines and handbooks on qualitative research are critically reviewed. The linking of qualitative and quantitative methods is discussed. Methodological discussions include tendency towards building of different schools of thoughts to developing
pragmatics and the unnecessary mystification of methodological procedures.

2.10.2 Qualitative Research Standards: Malterud (2001)

The author asserts that qualitative research method can help improve the understanding of medicine as a science. The article demonstrates that quantitative and qualitative research are complementary and only enhances the discipline of science. It argues that though there are differences in the type of data and analysis of data in the two methods their underlying principles are the same. Terms used in qualitative research are defined and explained.

The author proposes three overall standards for qualitative enquiry: relevance, validity and reflexivity. Factors that affect qualitative research are enumerated defined and discussed: Reflexivity involving sharing of preconceptions and establishing metaconceptions; Transferability, involving adequately and sufficiently varied sampling and considering whom and what the finding would concern; Interpretation and Analysis, involving description of the theoretical frame of reference, transparency and systematic procedure. The article sets guidelines for good qualitative research.

2.10.3 Reliability and Validity in Qualitative Research: Golafshani (2003)

The author first defines and describes quantitative research and then qualitative research. He then looks at reliability and validity as concepts of quantitative research and their importance. Reliability in qualitative research is somewhat different though the concept is same as in quantitative research in that it emphasises on the quality of the research. This is dependent on validity. Validity is further related to rigor of the method and trustworthiness of the research which become important in qualitative research. Triangulation as a concept is introduced as a methodology for testing reliability and validity. Triangulation is the method of looking at
convergence among the different and multiple sources from which information is gathered to form themes and categories in the study.

2.10.4 Importance of Validity: Cho and Trent (2006)

Qualitative research describes human experiences. As the body of qualitative research has grown there is an increasing concern and interest in the validity of qualitative research among the researchers. Traditionally validity was tested with the criteria of how close the researcher’s claim of knowledge corresponded to reality.

As qualitative research reports have become more prevalent, two trends have emerged in the field. The authors have classified these trends as: Transactional Validity and Transformational Validity. In transactional validity the emphasis is on the technique on conduct of research. The terms that can be used to describe validity under this are trustworthiness, dependability, transferability and confirmability. Member checking also forms an important aspect of achieving credibility.

Triangulation involves cross-referencing from several sources to achieve robustness. In transformational validity there is a consideration of multiple meanings of a concept in a social context. This demands that the researcher engages in introspection. This is termed reflexivity. This can be implicit or explicit. This focuses on the impact of the research itself on the subject/subjects researched.

The researcher through the process of the research itself should be able to empower the subject/subjects of the research and bring about transformation. The authors further discuss the validity with respect to different purposes of the research. In the end the authors propose a holistic view of validity. This approach is an open and eclectic conception of validity. Text and actions are validated as recursive, polyvocal, narrative and non-judgemental. There is a confluence of transactional and transformational
validities along with scope for purpose dependent or multi-purpose validity and open for other possibilities.

2.10.5 *Qualitative Research and Translation: Temple and Young (2004)*

The article is relevant to the present study as the original Patanjali Yoga Sutras is in the Sanskrit language. Translations into English have their advantages and also limitations. This article delves into this process using the example of sign language. The epistemological implications of the source of translation is discussed.

How far the involvement of a translator can impact the outcome of the research is discussed. The different methods researchers have developed to overcome hurdles in such research enquiries are discussed. The ultimate goal is one of understanding, and if it remains the underlying principle, then one can move forward in spite of the dilemmas of interpretation.

2.11 **Qualitative Research in Medical Science**

Qualitative research in medicine is relatively new. Medicine is a dynamic field and the human organism is a non-linear system. Therefore mathematical models and study of medicine in physical terms can be difficult. Therefore with the coming together of medical science with humanities has helped take new and more relevant perspectives in medical science research in terms of adding the qualitative dimension.

2.11.1 *Art and Science of Clinical Knowledge: Malterud (2001)*

Medicine is considered as a scientific discipline. Evidence-based medicine has gained a significant influence on the practice of medicine in recent times. Experiments of treatment procedures follow a rigorous criteria based quantitative methodology. But when clinical decisions are made, the
Physician relies on experiential knowledge and wisdom which are qualitative entities. The author discusses these peculiarities of medicine.

Science requires refutation whereas medicine is based on affirmations. Analysis of experiences of patients and knowledge gained from anecdotes and descriptions and the physician's personal experience also go into the algorithm of clinical decision making. Qualitative methods are now becoming more common with inputs from other disciplines and perspectives. The author suggests that quantitative research should be complemented by qualitative research to the process of medical knowledge aggregation and organization.

2.11.2 Validity of Qualitative Research in Health Care: Giacomini and Cook (2000)

The article uses the format of critical appraisal of scientific research. This method is generally used to evaluate the experimental research reports in medical science. Qualitative research is equally important in health care as it can better deal with aspects of emotions and experience of people. Validity and reliability of qualitative studies can be systematically looked at using guidelines suitably developed. Reasoned method, appropriate collection of data, comprehensive data collection process and multipronged analysis of data and interpretation can ensure validity of the qualitative research.

2.11.3 Utility of Qualitative Research in Health Care: Giacomini and Cook (2000)

Continuing with the process of critical appraisal of medical research report, once the question of validity is clarified, the next step is to look actually at the results. In a qualitative study the process of analysis involves summarizing and interpreting the collected data in order to develop insights based on theory that are able to describe and explain the social phenomena under study. These are interactions, experiences, roles, perspectives,
symbols and organizations. Summarizing of the results is done through excerpts from transcripts of discourse, literature, field notes and documents. The process can be summarized as exploration, discovery, analysis and synthesis. This should lead to an empirically based theory contributing to the understanding of phenomenon. The concepts should be clearly explained in a way that is meaningful to the reader. Justification of arguments are to be made clearly. Comparison should be made and correlated to existing theories. Ultimately it should answer the question of whether the study justifies its utility in the care of the patient.

2.11.4 Evaluation of Qualitative Research in Health Care: Cohen and Crabtree (2008)

In the context of social sciences and more particularly health care, controlled experimentation may not be appropriate as the subjects studied are people. Hence interviews, analysis of scripts and dissertations may be more appropriate. In the middle part of the twentieth century, sociologists and anthropologists introduced the qualitative methodologies into health care research. Since then there is a development of this methodology with guidelines and evaluative criteria for the conduct of good qualitative research. The common paradigms that have prompted qualitative research in health care are: Positivism, Realism and Interpretivism.

After analysing several documents pertaining to qualitative research in health care the authors have distilled certain fundamental criteria for evaluation of qualitative research: 1) That the research is carried out ethically; 2) That the research is important from the health perspective; 3) That the report of the research is clear and coherent; 4) That the method used is appropriate and rigorous; 5) That due attention is paid to researcher bias or reflexivity; 6) That validity and credibility are established 7) That the research should be tested for reliability or credibility. When the authors used these criteria for evaluation, convergence was found in the first four of the criteria and some divergence of opinions in the last three.
The authors have discussed methods of using these criteria. In terms of research grants for qualitative research, broad and generic criteria may be used which can pose a challenge. There is need for openness and awareness of dogma and rigidity that may creep into certain research quarters. There is need for future work in educating health care researchers in adapting evaluative criteria within the appropriate theoretical and methodological framework.

2.11.5 Literary Narrative in Medical Practice: Kottow and Kottow (2002)

Contemporary medicine research is slowly turning towards humanities to get a greater understanding of the discipline and becoming more humane which it ought to be. Narrative and text interpretations are slowly gaining ground as valid aspects of scientific discourse. There is a realization of the need to understand and interpret the rich and personal experiences of patients either in the form of their scripts or as persons themselves.

The authors introduce the concept of hermeneutics as applied to medicine as an inherent quality. This is because stories enter medicine as narrative organization and clinical observations which would need understanding and interpretation. A lot can be gained by such studies of earlier literature which will only enhance the community’s insights and make for better health care. Literary narratives are alternative forms of the medical practice environment that can enhance the interpretive skills of the clinician and allow contemporary medicine to understand that “…an adequate sense of tradition manifests itself in a grasp of those future possibilities which the past has made available to the present” (Macintyre A, After Virtue).

2.12 Hermeneutics as Qualitative Research Method

Hermeneutics is the study of interpretation and meaning. It is considered as not only a science but also an art. Hermeneutics is derived from philosophy. It has its origins in the interpretation of religious and Biblical discourses in
continental Europe and especially from the German philosophical tradition. This has been adapted and applied to the new human science which includes health, psychology and education.

Hermeneutics is a method of qualitative research used in the analysis of scripts and texts. A good knowledge of this method is a prerequisite to embark upon the task of systematic investigation of ancient scriptures which is very much relevant to this present study of the Yoga Sutras of Patanjali. Besides, hermeneutics is very similar to our very own ancient tradition of understanding and interpreting scriptural texts.

The Indian Sanskrit literature is rich in interpretative works of scriptural texts especially the sutra literature. Great philosophical scholars including maharishis, paramacharyas, acharyas, shastris and pundits have produced eminent interpretative works in the Sanskrit language of older scriptural texts and particularly the sutras. These are in the form of commentaries and exegeses. They are called bhashyas or vrittis as discussed earlier. It is in this tradition that the present work is also undertaken and presented but with the modern methodological and contextual base of hermeneutics.

2.12.1 Hermeneutic Phenomenological Research: Kafle (2001)

This article gives a bird’s eye view of hermeneutic phenomenological research. It begins with introducing the philosophical origins of phenomenological enquiry. Phenomenology can be broadly categorized as Transcendental, Hermeneutic and Existential. Phenomenology simply put is the study of phenomena: their nature and meanings. It is a qualitative method where there is a focus of people’s lived or conscious experience. Four qualities common to different schools of phenomenological research are: description, reduction, essences and intentionality. The process is to capture the essence of experience which is a higher form of knowledge in order to reconstruct reality on a firmer ground.
The enquiry into reality has formed the very core of Indian philosophical thought in the spiritual traditions like Vedanta and Buddhism. In transcendental phenomenology one suspends personal prejudices to transcend the natural attitude and experience through conscious awareness in order to discover reality.

Hermeneutic phenomenology advocates interpretation of subjective experience as the way to get a genuine and objective nature of reality. It uses the hermeneutic circle as a tool for this process. Existential phenomenology focuses on being or existing as the method and lays emphasis on description of everyday experience the way it is perceived within the consciousness of an individual. In hermeneutic phenomenological research the researcher is concerned with the understanding of the text or script.

The aim of the researcher in hermeneutic research is to create a rich and deep account of the phenomena under study through intuition, and focussing on revealing the meaning and elaboration. The researcher has to accept the implicit assumption and make it explicit. The guiding principles of hermeneutic phenomenology are a dynamic interplay among six research activities: 1) commitment to an abiding concern; 2) oriented stand toward the research question; 3) investigating the experience as it is lived; 4) describing the phenomena through writing or other means, 5) re-describing or rewriting and 6) consideration of parts and the whole of phenomena.

The method used is a hermeneutic circle which consists of reading, reflection or reflective writing and interpreting. Paradigm is essential in order to proceed with research. When applied to the qualitative research tradition the paradigm includes metaphysics, methodology, quality and ethics. Hermeneutic phenomenology is an interdisciplinary qualitative method. It lies within the interpretive research paradigm. This is useful to uncover and better understand phenomenon for the good of mankind which is the goal of science.

In this article the author sets forth to re-establish the original methods of human sciences. He traces the origins of doing science to hermeneutics which is concerned with interpretation with the generation, transmission and acceptance of meaning within the lifeworld. He uses the perspective of analysis of meaning and interpretation from their philosophical origins of German philosopher Heidegger to the study of natural sciences. He endeavours to forge and establish connections between the current philosophies of natural science with hermeneutic philosophy.

The author has attempted to reorient the discussions on scientific realism around hermeneutics of meaning and the truth in science. Hermeneutics has been the forerunner of all scientific research and the author demonstrates convincingly through the works of great scientists like Heisenberg and Einstein who re-interpreted existing phenomenon to derive new, novel and life-changing insights which have revolutionized science and technology. Hermeneutics can potentially be a unifying agent or force among different disciplines of science and also human culture, history and folk wisdom.

2.12.3 Literature Review in Hermeneutic Research: Smythe and Spence (2012)

The authors question the traditional insistence of scientists to do literature review in a particular manner. They use the argument of hermeneutics that the literature review should be such that it makes what is being studied understandable and meaningful. More so in hermeneutic research this takes precedence. The main aim of the hermeneutic research literature review is to provide the context of the phenomenon studied and provoke scholarly thinking. This paves the way for the emergence of new insights. The process and methodology of hermeneutics are demonstrated with examples using hermeneutics itself. There is a critical discussion about current expectations of academia.
The most distinguishing features of hermeneutic research are discussed and highlighted. The authors used a novel method of dealing with this topic. They interviewed each other and reviewed and revisited their own doctoral dissertations and how they worked with literature review in their doctoral research. They did a hermeneutic analysis of their own experience of literature review to demonstrate the utility and method of using this methodology. The beginning point of a hermeneutic way of literature review is the reviewer herself or himself. The reviewer brings with her or him all their previous experiences.

In this instance one of the author (Liz) describes her own experience of working in a maternity setup in a remote area having to deal with deliveries and childbirths with little or no modern technical and expert backup. This prompted her own research and hence her literature search for her thesis. She describes the three elements of pre-understanding as fore-having, foresight and fore-conception as per the ideas of Heidegger’s hermeneutic interpretative method. There is a personal quality to the literature one is drawn towards and this may take the researcher to texts outside the subject, for example, for the author, it took her into English poetry and prose. Heidegger elaborates on the Aristotelian notion of kinesis which is a dynamic movement of hermeneutic thinking forming an arch of movement.

The other author (Deb) explores her research thesis with her background of experiencing the nursing of people who were from cultures other than her own. Gadamer also drawing on Aristotelian thought contended that what one expects is very much dependent on how much insight one has into the context. Differences are inherent in any context and an awareness of this difference is inherent in the choices and in this context the review of literature for research.

The analysis of findings is shaped by the philosophical insights the researcher gains by the dynamic movement of thinking within the scope of the hermeneutic circle in the hermeneutic interpretation of the literature. Perspective taking at certain times and certain other times narrowing down
on certain detail makes the whole process a hermeneutic one, This is so as the researcher is engaging in the dynamics of the hermeneutic circle of moving back and forth between the whole and the parts.

The authors express certain concerns which are expectations of the quantitatively biased research community. An often asked question is whether the literature are from the latest publications. While there is some need for looking at recent research in a particular subject, there can be great insights that can be acquired from historical literatures and this is very contextual to the subject of consideration. Hermeneutic research hence provides for the movement between what is relevant whether from old or new when it brings qualitative and philosophical insights into the present context.

Second is the expectation of working with standard formats. This certainly makes for some uniformity in the research literature but this may have a cost by becoming restrictive of ideas and rigid in thinking which can be a hurdle. Hence the hermeneutic methodology as applied to human science research could provide for greater clarity of thought process and positive and practical insights into better life and wellness.

Third, when it comes to publishing of research, the editorial requirements of scientific journals can be quite restrictive which can limit the fullness and richness of exploring and communicating ideas to motivate dialogue and gaining new insights into a subject or area especially in the health care and human science fields. Having a range of editorial expectation can help expand a journals richness.

Fourth, a great reliance and emphasis is placed on key word searches. This again can be restrictive and putting too great a reliance on technology and give a false sense of security. Whereas the study and understanding of human situations are complex and are abstract, expansive, full of uncertainties and much more diverse and rich which should reflect in the literature search.
The authors suggest hallmarks for literature review in a hermeneutic study:
(1) The relevant literature is broad-based and spans across time, genres, disciplines and cultures. (2) The researcher reveals their own preconceptions and notions including prejudices that they have brought into their selection of literature, refining and expressing them in their research. (3) The literature must act as a partner engaged in dialogue with the researcher to provoke thinking. (4) Philosophical literature becomes part of the methodology and the discussion. (5) Focus should be on identifying meanings which are expressed through descriptions, traditional ways of thinking, and the use of similes and metaphors. (6) It is important that language becomes the carrier of meaning which may be hidden and hence would require the use of original quotes that capture the deeper meaning. (7) It is important that the literature is such that they are not only relevant to the topic but also to the context which could be within a traditional, cultural, time and place context.

2.12.4 Literature Reviews and Hermeneutic Circle: Boell and Cecez-Kecmanovic (2010)

In this paper the authors review the process of review of literature in scientific research and highlight the need of collaborative working between the researcher and library and information science entities. There is a need especially for young researchers to understand the literature review process itself which requires wide ranging skills. They elaborate the short-comings of using structured approaches to searching databases. This methodology is the traditional one called systematic review. This is derived from medicine where large data base of research is searched in an organized way.

The system has been adapted by other fields as well especially computer software engineering. But there are limitations to this approach as it may not fully cover qualitative data. The hermeneutic circle which is a method of hermeneutic research is explored as a good methodology to do literature review irrespective of whether the research is a qualitative one or a
quantitative one. The stages of hermeneutic circle for literature review can be broken into several steps each associated with different techniques. The Searching stage comprises of search operators. These can be phrases, Boolean, brackets and truncations. Field search can include year, subject and document type. Searching can have data base dependency. In the stage of Sorting are included citations, relevance and date. The Selecting stage would include title, abstracts, key words and KWIC. The stage of Acquiring would look at availability, inter-library loan, and language. The Reading stage involves increased understanding, note keeping and referencing. The stage of Identifying would involve identification of the central terms, main authors and core journals. The Refining stage encompasses citation pearl grow, successive fractions and building blocks.

The circle then gets repeated. Literature review using a hermeneutic circle method is especially helpful in humanities and social science research as the research question may not be well defined in the beginning of contemplation of research and may emerge during the process of literature search. Whereas a systematic review requires that the research question be well defined right at the beginning. The use of the hermeneutic circle is not to generate large volume of literature but a small volume of highly relevant literature that makes for a better quality of the research itself.


Hermeneutics is often considered as an art of interpretation as transformation. Hermeneutics is especially very useful in studying qualitatively works of textual and interpretive nature. The author explores hermeneutics from the standpoint of American and English language researchers who may be unfamiliar with the concept as it is derived from continental research and science philosophy.

Hermeneutics is explored from the point of view of Gadamer and other hermeneutic thinkers. The five main characteristics of the hermeneutic approach is described. The five approaches are: (1) hermeneutics seeks
understanding rather than explanations (2) acknowledges the situated location of the interpretation (3) recognizes the role of language and historical context in interpretation (4) views enquiry as conversation, and (5) is comfortable with ambiguity. She introduces the concept of critical hermeneutics to make the interpretative process more acceptable and robust for the English language academia. Hermeneutics does indeed have a critical potential. Taking a critical look is important so that the various perspectives become apparent. It enables engagement with a self-critical consciousness which can help transcend the insights of the present context.

The author proposes a metaxological approach which is a method to navigate between dualities or existential dualisms. It looks for a way or path in between confusing and contrasting interpretations. The paper thus draws attention to the philosophical underpinnings of hermeneutics, proposes a conception of critical hermeneutics and invites further dialogue on the subject as related to qualitative enquiry and research.

2.13 Hermeneutics in Medical Science Research

Hermeneutics in medical science research is new to modern medicine but not new to the ancient Indian philosophical traditions and medical traditions of Ayurveda. There is now a resurgence of interest in the ancient medical and philosophical systems of India which will make the hermeneutic methodology as applied to the modern medical system more relevant and useful.

2.13.1 Hermeneutics, Human Sciences and Health: Smith (2007)

The author proposes that hermeneutic phenomenological method can be mutually enriching with the human sciences. He demonstrates the process through his own experience of studying the life-world phenomenon of the experience of identity change during transition to motherhood. He further proposes a project using the hermeneutic circle and empirical research in human science to further extend and enhance hermeneutics with application to medicine and health. The author has attempted to re-
illuminate the data and analysis in the light of the ideas from the hermeneutic writings of Schleiermacher, Heidegger and Gadamer.

Hermeneutics has a longer history than the human sciences. Hermeneutics developed from philosophy and was utilized to interpret religious discourse particularly the biblical literature in the Western culture. Human sciences was the term coined by Dilthey to a form of intellectual activity as distinct from the natural sciences. During that time humanities comprised of history, law, literature and arts. But during current times the human sciences have come to include self-defined areas of health, nursing, psychology and education.

The primary concern of research in the new human sciences as well as in the humanities is the qualitative analysis of textual material derived from human agents. The challenge of hermeneutics is the interpretation of texts with historical origin and being able to demonstrate that it has stood the test of time. Modern hermeneutic researchers however analyse discourses that are current generated by, for example, patients suffering from a condition talking about their experience or medical professionals talking about their experiences of diagnoses and performing their professional roles. Schleiermacher emphasised the role of intuition in interpretation after engaging in a holistic detailed and comprehensive analysis and being able to look at the historical text empathetically.

Gadamer saw interpretation more as a dialogue between the past and the present and gave more importance to the content and its current interpretation which had meaning in contemporary life. The important and relevant aspect of the hermeneutic philosophical process is the hermeneutic circle. This defines the dynamic relationship between the part and the whole. To understand the part, one has to look at the whole and to understand the whole, one has the look at the component parts. This circle of non-linear analysis can be applied between the interpreter and the objects of interpretation and in modern context between the researcher and the participant.
The hermeneutic circle begins with the researcher with his/her preconceptions based on experience and prejudices proceeding through awareness and reflection leading to bracketing and them approaching the participant on the other side of the circle. The focus shifts from the ‘self’ of the researcher to the ‘other’ of the participant. Now attention is closely paid to the participant’s story requiring intensive attentiveness and engagement. The encounter now changes perception of both. The circle proceeds with the analysis of the script of the story. A recounting and reflection of the encounter then produces a virtual mini-circle for the researcher in trying to make sense. The circle may repeat with further interactions between researcher and participant.

The process of engaging in hermeneutics requires agility as it is dynamic and involves moving back and forth making revisions and supplementation. Thus one gets closer and closer but never to that perfect understanding. These qualities of the process of hermeneutics makes it not only an art but also a science. The author explores these processes and phenomenon by doing a longitudinal qualitative discourse analysis and hermeneutic phenomenological interpretation of one of his patients named Angela and her experience in transitioning from pregnancy to motherhood.

The author here stresses the importance of paying attention both to the language and the psychology in the discourse. The author takes extracts from the discourse to explain the movement and dynamic nature of the hermeneutic circle. The surface and latent meanings are brought forth through this process of going round the hermeneutic circle demonstrating what Heidegger has termed the ‘appearance’ and the ‘appearing’ throwing light on what seemed quite benign on the surface to something pivotal and powerful in the discourse. At the end the author suggests going in the opposite direction of the hermeneutic circle and looking at how to interpret hermeneutics with human science instead of using hermeneutics to interpret human science.
2.13.2 Hermeneutic Phenomenology in Clinical Reasoning: Ajjawi and Higgs (2007)

The authors direct the subject of this paper to doctoral students and researchers starting out with using the hermeneutic methodology of research. They explore this through their own investigation of a group of health professionals of considerable clinical experience and how they communicate their clinical interpretation and reasoning. The paper suggests research strategies that have sound hermeneutic principles as their basis for direction, starting from the research question to the goal. They describe criteria to ensure quality, rigor and credibility in interpretative research. Another important aspect highlighted is the ethical conduct of the research.

Clinical reasoning and communicating reasoning are complex cognitive processes. They come through experience and expert knowledge honed and accumulated over time. The clinical reasoning processes are subconscious and sometimes automatic. They are difficult to discern merely through external observation of the expert. Whereas communicating reasoning is partially observable but still is multifaceted and derived through implicit learning.

The research question was broken into three sub-questions: (1) How was clinical reasoning understood and performed by experienced physiotherapists? (2) How was communication of reasoning done by experienced physiotherapists? (3) How was the reasoning learnt by experienced physiotherapists? The paradigm of the research was an interpretive paradigm. The methodology chosen was hermeneutic phenomenology after obtaining ethical clearance, participant information and informed consent.

Data collection involved reflective preparatory exercise with observation of the participants. Written field notes were prepared comprising of transcript file, personal file and analytical file. Three sets of interviews were conducted
at different times. Learning timelines and report of particular incidents were collected.

The stages of data analysis consisted of (1) immersion: this consisted of organizing the data-set into texts, iterative reading of texts, and preliminary interpretation of texts to facilitate coding (2) understanding: this involved identifying first order or participant constructs and coding of data using NVivo software (3) abstraction: identifying second order or researcher constructs, and grouping second order constructs into sub-themes (4) synthesis and theme development: this comprised of grouping sub-themes into themes, further elaboration of themes, and comparing themes across sub-discipline groups (5) illumination and illustration of phenomenon: this involved linking the literature to the themes as identified, and reconstructing the interpretations into stories (6) integration and critique of findings: this was undertaken internally (within the research team) and externally and a final reporting of the interpretation of the research findings.

The final end product was the emergence of themes and stories. The explanation for how experienced physiotherapists learn to apply clinical reasoning and how they communicate their clinical reasoning emerged in seven themes. (1) Theme 1: Learning to reason and communicating reasoning are situated, embedded and enriched in the practice. (2) Theme 2: The drivers of learning to reason and communicating reason are due to professional attributes and responsibilities. (3) Theme 3: The development of clinical reasoning and communicating reasoning are fostered and framed by communities of practice support. (4) Theme 4: A major influence of clinical reasoning and communicating reasoning is the workplace culture. (5) Theme 5: Powerful tools for enhancing clinical reasoning and communicating the reasoning are strategies of experiential learning. (6) Theme 6: Important strategies to monitor and critique clinical reasoning and its communication are self-evaluation and reflection on one’s practice. (7) Theme 7: Clinical reasoning and communication of reasoning are stimulated and deepened by incidents or episodes that promote reflexivity.
The implications of this research are the learning and teaching of clinical reasoning and communicating clinical reasoning in the universities and workplaces during clinical education or practical clinical field placements. The importance of role models, peers and mentors in the learning of these important aspects of clinical care are highlighted. Becoming better critiques of their own practice makes for a good professional and the ability to be able to be good at clinical reasoning and communicating reasoning are hallmarks of good professional practice.

The authors have also listed the limitations of the research and the scope for further research. The research gave the researchers themselves new insights into their profession and their own abilities of clinical reasoning and communicating reasoning and develop methods for teaching these skills by incorporating them into their professional teaching work and developing course curriculum. Thus the utility of a qualitative interpretative hermeneutic phenomenological research paradigm in medical science is well highlighted in this study.

2.13.3 Interpretation/Analysis Methods in Hermeneutics: Crist and Tanner (2003)

Interpretive methodology can be defined as the science of interpreting human meaning and experience. This can be achieved through hermeneutic interpretative phenomenology of the practical act of living as obtained through narratives by interviewing and observations in order to reveal meaning. This form of doing research helps develop a sensitivity to the different forms of living and being in the world and not simply provide a theory for generalization or prediction of phenomenon as happens in quantitative research. This type of hermeneutic research many times reveals new and unexpected findings that can be productively and usefully incorporated into practical clinical practice.

The authors here hence direct their focus to qualitative research and especially hermeneutic interpretive phenomenology in nursing research.
which forms a part of medical science. Using their own research examples, they explore methodological processes involved in hermeneutic interpretative phenomenology as qualitative research process. The purpose of the research process is to introduce researchers to the process of observations and analysing interviews in the clinical setting as part of the interpretive hermeneutic phenomenology. They cover research question, data collection, interpretation and reporting that is done in non-linear formats in such a research paradigm systematically. For this they use a recent research study as an illustrative example.

There are reviews of the whole research process starting from development of the research question, choosing the sample and sampling issues, collecting the data, and interviewing and observation methods. The authors then discuss the systematic approach to interpret the non-linear data and the methods of interpretations. The interpretive process in dealt with in five phases: (1) Phase 1: Early focus and lines of enquiry (2) Phase 2: Central concerns, exemplars and paradigm cases (3) Phase 3: Shared meanings (4) Phase 4: Final interpretations and (5) Phase 5: Dissemination of the interpretation. This study helps in understanding the feasibility of using and applying hermeneutic research in medical science.


Heidegger is considered as one of the founders of the hermeneutic philosophical inquiry. This does provide an appropriate philosophical foundation for social science research that enquires into the lived experience of people. In Heidegger it is argued that there is no clarity of process and hence making it difficult to apply to the demands of current research as it is dominated by a positivist paradigm.

This article is an example of hermeneutic research in medical science incorporating the ideas of Paul Ricoer. Paul Ricoeur developed the methodological process of conducting hermeneutic phenomenological research basing it and expanding on the ideas of Heidegger and Gadamer.
The development of hermeneutic phenomenology has been an evolutionary process. Edmond Husserl introduced the concept of *Lebenswelt* or the life-world. This is the understanding experienced as a preliminary to the reflective process. This is not readily available as it is always coloured by our assumptions or prejudices and past experience and hence taken for granted. The way round this is to take a perspective which is a process of awareness of habitual ways of seeing and thinking and has to be cultivated through the process of bracketing.

Wilhelm Dilthey contributed to hermeneutics more rather than to phenomenology which is seen as a turning point. He provided methodologies that elevated the research in human sciences to that of the natural sciences.

Martin Heidegger focused on ontology. He embarked on the phenomenological study of the essential nature of the human being which he termed as *Dasein*. He asserted that acts of interpretation are inherent in human existence and understanding and thus pre-understanding always influences understanding of phenomenon.

Hans-Georg Gadamer, who also was more inclined towards hermeneutics, developed the objective method in human sciences. He emphasised the importance of tradition in our understanding and this is always linked irrevocably to language. Interpretation is seen as a collaborative process between the researcher and the people or material being interpreted and subjected to research.

The authors thus trace the history and development of Ricour’s theory. Paul Ricour is credited with cementing the two areas of hermeneutics and phenomenology together. This formed the philosophical basis of much of his work and he is credited with the development of the theory of interpretation. The authors explore the concept of the theory of interpretation with a hermeneutic phenomenological analysis in a medical setting by discussion and hermeneutic phenomenological interpretation of their own
work on family meetings as an instrument of spiritual care of palliative patients and their families.

The three levels of Ricoeur’s theory of interpretation are discussed and the validity or rigor of the theory is analysed. Three main roles are described with the model which are (1) the story teller, which is the patient and later the family member of the patient (2) the witness or witnesses who are people who listen to the storyteller, and (3) the guide or facilitator who supports and encourages the storyteller and the family members. An important aspect of the research process was the recording of the background, believes and views of the key researchers.

Journaling was used as a means of recording views and experiences of the patients and their families. The key concepts of Ricoeur’s process of interpretation are (1) distanciation (2) appropriation (3) explanation and (4) interpretation. In the process of interpretation, there is a movement back and forth from naive interpretation and an in-depth interpretation, which Ricoeur termed as the hermeneutic arc. He however also retained the use of the hermeneutic circle developed by Heidegger. Ricoeur defined two ways of looking at and interpreting a text (1) consideration of only the internal nature of the text and (2) to restore it to a living communication.

The application of Ricoeur’s theory of interpretation is through three levels: (1) the level 1 Analysis of Explanation (2) Level 2 Analysis of Naïve Understanding and (3) Level 3 Analysis of In-Depth Understanding. The authors also describe the issue of rigor in applying the theory of interpretation in five main areas of consideration including theoretical, procedural, interpretative, evaluative, and reflexive rigor.

The authors recommend the use of hermeneutic interpretation as a valid research methodology in the human science. They have demonstrated this by applying the principles of Ricouer’s theory of interpretation for the qualitative study of texts of data collected in studies which have the philosophical base of hermeneutic phenomenology.

In this paper the authors explore hermeneutic phenomenological research practice and attempt to show the need for the method to be grounded in the historical origins and development of the process from philosophy. The author begins by exploring the historical roots of hermeneutics. This is essential as humans as a group are rooted in history and shaped by it. The authors emphasise the concept of Lebenswelt or life-world which is a pre-given basis of all experiences. This concept was developed by Husserl.

The authors incorporate and elaborate Gadamer’s three elements of practice of philosophical hermeneutics which are: (1) reflexivity (2) dialogue and (3) interpretation. True to the hermeneutic method itself personal viewpoints and prejudices are revealed. The authors take the view point of the topic of research from Buddhist tradition. The view point is interpreted more in the form of perspective as per the Buddhist text, the abhidhamma, which is described as an analytical compendium of the teachings of Buddha which in modern terms can be compared to phenomenological psychology. Prejudices are seen as part of the hermeneutic interpretative process but the way round is inherent in the process itself as reflection, so that prejudices are not taken as conclusions.

The authors draw parallels between Buddhist practice and nursing practice. (1) The mode of knowing the world is the emphasis on direct and practical experience. (2) Suffering is seen as a question of constant concern. (3) The response of suffering is through the practice of compassion. (4) Practice is defined as a process of cultivation of how one attends to the world. (5) Relationship and interrelationship are emphasised in both practices.

The hermeneutic research process itself is demonstrated in the medical setting of exploring and interpreting nurses’ relational practice on acute care mental health units from an Eastern philosophical Buddhist perspective. Hermeneutics can thus be considered as an important research approach.
in the practice of healthcare sciences as there is always a lived experience of the treater and the treated in complex relationships and thus provides the possibilities of reinventing oneself on both sides. It also provides for the incorporation of different view-points and perspectives, cultural interpretations and lines of thoughts and do equal justice to all in terms of interpretations and thus ultimately leading to influence practice in positive ways.

2.14 Medical Neuroscience as an instrument of Hermeneutics

Hermeneutics is a process of discovery or investigation. In order to apply the method it is necessary to employ tools or instruments. In this research the attempt is to use the body of scientific understanding of medical neuroscience as a method or application or an instrument of the hermeneutic process in interpreting the ancient scriptural work of Patanjali Yoga Sutras. This section reviews the pertinent literature to support the validity of the present choice of the use of medical neuroscience as the instrument to explore the Patanjali Yoga Sutras through hermeneutics.


In recent times there is a tendency and fashion to attach ‘neuro’ to many varied fields to give them a higher scientific feel. In several instances it is indeed justified as more and more insights into diverse human activities have neuroscientific models of explanation. Neurological explanations have become common in the media for various human phenomena.

The authors say that neuroscience this way can create political dynamics in its favour. This it does by capturing the public cultural imagination to use novel ways of explaining and understanding key human affairs. Based on the neuroscientific based models have initiated reforms in diverse fields of education, health, law enforcement, etc. In the context of current cultural, economic and cultural changes, there is a need for a political theory of neuroscience to analyse the impact on the diverse fields and institutions.
using a brain-based approach within a changing social and academic landscape. In such an approach of wide use of neuroscience, a habitual critical enquiry is required to be cultivated in order that it does not become dogmatic. If not properly directed there is the danger of totalitarian politics of de-civilization, preventive measures and fear under the guise of developing a secure society.

Looking objectively at the neuroscience itself can help prevent it from becoming a disadvantage and a threat by using critical political philosophy of neuroscience itself using the hermeneutic method of interpretation. The dangers of neuroscientific explanations in political assertions can be seen in such studies as the correlation between brain size and intelligence and increased intelligence of atheists and liberals due to their evolutionary adaptation to novel values. This supposes cognitive abilities as a natural evolution and the status of different people as an effect of such social cognitive interactions, the brain being solely moulded by such phenomena.

In order to critically look at such assumptions and prevent the dangers inherent in such assertions it is important that the task of critical neuroscientists has to be strategical. They should be able to finely evaluate the classificatory tendency of such enterprise and the vested or otherwise interests of funders of such research in their results. This should thus open up a public debate that should be able to negotiate whether the results or effect of the interaction between brain and society as demonstrated in such studies is desirable or not.

True ‘neuropolitics’ should not try to crudely and in a shallow sense try to put together ‘neuro’ sounding stuff into their own agendas incorporating dubious research findings to make it sound scientific. Thus critical neuroscience should look closely and create the environment for open discussion and discourse. This should be broad and interpretative in the tradition of hermeneutics. This should be such as to facilitate open, resourceful, creative, and balanced. It should be also such that socially responsible mode of enquiry is assured. This is superior and broader than
merely such dualistic black and white distinctions like mind-body, nature-nurture, material-social, etc.

2.14.2 The Brain as a Hermeneutic Device: Erdi and Aradi (1999)

The brain is a complex system. To understand the brain scientists and philosophers use metaphors. For example, the brain is compared to a computer. The functions of the brain and its neural circuitry are explained with physics and information theories. But such analogies and metaphors still do not fully address the mind/brain duality puzzle. Philosophy also has tried to explain the mind/brain either leaning towards dualistic or monistic theories. These do not however meet the strict criteria of neuroscience. The authors propose hermeneutics which is the art of interpretation and which is neither monistic nor dualistic.

The brain is unique in that it can be the subject of interpretation and also the interpreting itself. So it can be considered as a hermeneutic device. In the physical framework, the brain can be conceptualized as a thermodynamic device. There are electrochemical activities that are observable in the neurons and neural circuitry of the brain. There is a constant energetic and material engagement of the brain with the environment. The modern brain imaging technology has shown links between metabolic energy changes in the brain with mental activation and cognitive processes.

According to engineering perspective the brain can be seen as a controlling device following control theory where the complex machine functions with a series of controller and controlled units constantly in feedback and feed-forward loops. The selective stabilization hypothesis is yet another way of seeing the brain as a learning device. The neural connected network is pre-specified by genetic endowment. The activity of the system itself then determines the connectivity. Memory plays a role in the process of learning through conditioning. The brain as a computational device is a popular conceptualization and used as a
frequent model. The brain can be seen as a complex information processing, storing and creating device. The mind-brain-computer trichotomy combines the thermodynamic process with the information-theoretical entropy relationship as an explanatory model.

The brain is a self-organizing device. This is demonstrated by plastic behaviour of the brain which modifies circuitry through learning. The authors further review the neuroanatomical characteristics of the brain. They also look at the brain from the perspective of chaos theory. The complex system itself has been explained in terms of homeostasis from earlier times in medicine. To define the dynamic nature of the brain activity, the concept of homeokinesis is used and to make a compromise between homeostasis and chaos the organization is said to be in a homeochaotic state. To study the brain there arises the objectivity-subjectivity dilemma. Hence one has to resort to philosophy. Hence a self-reflexive interpretation allows hermeneutics to be a useful tool or concept. Thus the brain becomes an interpreter and interpreted and hence a hermeneutic device.


This paper describes the interpretative hermeneutic approach to understanding the brain. It is a product of long collaboration and dialogue between the authors in the true tradition of philosophy of which the hermeneutic concept is a part of. The paper is a self-reflection by the authors about brain theory.

Tsuda was inspired by chaos theory to look at the brain as a complex system. The neurons organize and function through electrochemical processes. This very nature the author argues is interpretative of information from the external world. A dual or double structure of interpretation of the brain is necessary. Chaos acts as a gadget for the hermeneutic property of the brain. The activities of the brain follow a chaotic dynamics. This is based
on the difference between the internal logic of the observed brain with the external logic of observer brain.

Erdi was fascinated by the common lines connecting aesthetic principles and biological sciences. He set out to resolve the dualistic approaches to study the brain with the device approach and the philosophical approach by combining them and as the object of study or interpretation is itself the studier or interpreter of the object and hence the brain becomes a hermeneutic device.

The authors then go on to review hermeneutics and its various categories including classical methodological hermeneutics, philosophical hermeneutics, critical hermeneutics, phenomenological hermeneutics, hermeneutics and science and hermeneutics of life. Looking at the brain as a hermeneutic device, the authors review the various interpretative ways.

Metaphors are useful to study biological systems like the brain by defining concepts and relationship between concepts. The device approach sees the brain as following various physical and thermodynamic and information processing principles. The brain can be approached philosophically where two categories are relevant: materialistic monism and interactionist dualism. The convergence of the device approach and the philosophical approaches leads us to conceptualise the brain as a hermeneutic device.


The nature of human experience has been approached through several disciplines and traditions of the sciences, philosophies and religions. The conceptualizations from these varied angles are very often mutually exclusive. These fields in their own ways have provided enriching insights into the human experience.
The author attempts in this paper to demonstrate the usefulness of a multi-layered personal narrative as a means of looking at and talking about the human experience. The author was inspired to contemplate on the subject from a study of the Changeux-Recoeur Dialogue in their work, ‘What Makes Us Think?’ This significant dialogue discusses the meeting of science and philosophy and the role and meaning of religion in contemporary times. The author proposes the multi-layered personal narrative as a ‘third dialogue’ as suggested in the Changeux-Recoeur Dialogue using a theological methodology as expanded in the work of McGrath’s ‘Scientific Theology’.

Human nature is generally explored as a specific subject by the discipline of philosophical anthropology. There is now a new resurgence in the interest of consciousness studies. This has been considered in modern times as the ‘final frontier’ in neuroscience. It is also pondered as the ‘hard problem’ in philosophy and as the ‘basic question’ in theology. The author discusses the historical development of philosophical anthropology as a journey from soul to self. In the development of the ‘third discourse; the author critically discusses the Changeux-Recoeur Dialogue and the conceptualization of the multi-layered personal narrative as a confluence of science, philosophy and contemporary meaning of religion.

The author further goes on to expand on the multi-layered personal narrative as a semantic dualism or linguistic pluralism and in sync with modern conceptualizations of consciousness by looking at and studying at the impact of such a proposition on the modern clinical practice and research in psychiatry. Giving examples from his clinical experience in treating various psychiatric conditions and their neuroscientific and psychological paradigms of explanations and treatments, he cautions at not falling into the trap of reductionism in assigning causality and specificity which the multi-layered personal narrative hopes to allay.

This can be looked at as critical realism which has to look at personal meaning and interpretations of the nature of humanness which is the scope of hermeneutics. This he considers the first step in the dialogue on this
subject where philosophical hermeneutics of renewal and suspicion mediates between the ever advancing field of neuroscience and other disciplines engaging theological anthropology that focusses on observation of facts and reason.


Hermeneutics has not been widely used in psychological research and the authors hope to change that trend. They reckon that perhaps psychologists have in the past been presented with a kind of hermeneutics that is radical. The authors encourage modern psychologists to transcend the simplistic way of categorising research by contrasting and comparing quantitative and qualitative epistemologies.

The authors invite psychologists to consider a hermeneutical realist perspective. It is important to value both quantitative and qualitative perspectives and in order to achieve this the authors propose a dialectic of understanding and explanation, which are the corner stones of hermeneutics using Ricoeur’s philosophy of distanciation.

The authors first review and provide a broad historical and conceptual overview of hermeneutics as originating from philosophy and as a legitimate paradigm for knowing. Secondly, the authors go on to demonstrate the applicability and usefulness of the hermeneutic paradigm in psychology in general and also take up its applications in individual sub-disciplines of psychology. Lastly, the authors take up the understanding of the quality of virtue. They explore virtue in psychology through the hermeneutical realist perspective in order to beneficially approach the multicultural study of virtue.

2.15 Neuroscience of Wisdom in the Hermeneutics of Yoga

Neuroscience particularly as applied to medicine can be seen as a tangible look at mind and consciousness which are intangible and difficult to study objectively. Yoga being a higher metacognitive human practice and
phenomenon which comes from the wisdom traditions of the Indian philosophical body of knowledge, a tangible device is necessary to objectively study and understand in the gross material domain of human activity. We now have hermeneutics as a legitimate methodology of scientific study and exploration. This qualitative research method would therefore be appropriate to study the wisdom of yoga as the whole body of yogic philosophy and practice can be appropriately conceptualized and find a wider acceptance through understanding and interpretation from a modern scientific perspective.

2.15.1 Yoga Psychotherapy: The Integration of Western Psychological Theory and Ancient Yogic Wisdom: Caplan, Portillo and Seely (2013)

Yoga is increasingly becoming popular and is being more and more accepted into ‘mainstream’ medicine and psychology in the West. The authors are psychologists and psychotherapists who are also yoga practitioners. They review the evidence base of using yoga in psychological therapeutic work. They have attempted to synthesize and integrate modern western psychological conceptualizations with the ancient wisdom of yoga. They contend that psychologists have much to learn from the insights of the yoga philosophy and practice that they can integrate into their therapeutic applications.

There is good evidence to show that yoga can effectively reduce symptoms of psychological distress in several Mental Disorders as classified in the Diagnostic and Statistical Manual Fifth Edition (DSM-5). Evidence has been published on the effects of yoga in Depressive Disorders, Anxiety Disorders, Post-Traumatic Stress Disorder (PTSD), Attention Deficit/Hyperactivity Disorder (ADHD), Eating Disorders and Schizophrenia. Western Yoga practitioners can enhance their knowledge and deepen their practice by incorporating psychological understanding especially from somatic psychology.

Yoga teachers can create a psychological framework for their students to make it more meaningful for them and have beneficial effects on their overall
understanding of life leading to wellness. Embodiment is a concept now seen as helpful especially in trauma work. The integration of yoga and psychology would provide for a fuller whole body awakening experience that is congenial to the healing process. The application of yoga in the psychological interventions for trauma by developing a trauma sensitive yoga program informed by trauma psychology would provide enhanced tools for addressing and treating victims allowing for the process of healing.

The authors have mainly looked at the studies with the popular aspects of yoga including asanas or physical postures and stretching exercises, pranayama or breathing techniques, and meditation. The increasing acceptance of yoga and interest in yoga from the scientific community should make available further opportunities for research and developing refined therapeutic techniques. The authors also highlight the higher psychological and perhaps spiritual aspect that is integral to yoga, addressing fundamental questions about life and existence and allowing for deeper enquiry into meaning and encouraging the process of interpretation and understanding that are part of the hermeneutics of wisdom.

At the end the authors describe a technique of integration called Yoga and Psyche Method that has been successfully used by one of the authors based on her long clinical experience, personal yoga practice and studies and incorporating aspects of a defined method called the Somatic Experiencing Model of Peter Levine as a practical and brief therapeutic model that could be easily incorporated into clinical practice.

2.15.2 Meditation and the Neuroscience of Consciousness: Lutz, Dunne and Davidson (2007)

The authors of this essay are high level researchers in meditation and contemplative science. The basic aim of the study was to explore the state of the science in meditation and consciousness research. The authors have divided the whole essay into three independent sections. The first section is titled Defining Meditation. This sets out to look at a definition of meditation
which has good explanatory characteristics in order for robust scientific research to be carried out. They acknowledge and argue for considering the distinct and distinguishing features and particularities of each of the several traditions of meditation.

The authors have then chosen the Buddhist meditation from a paradigmatic perspective to explain the theory of meditation. They also delineate and describe the difficulties one encounters when one sets out to work with such theories. The essay touches on the important Buddhist concepts of samatha or quiescence and vipasyana or vipassana or insight forms of meditation. It then describes three important techniques of Buddhist meditation, namely, buddhanusmriti or recollecting and remembering the noble virtues of the Buddha, maitribhavana or loving kindness and vayu or wind meditation or practices that channel energy flow through the subtle energy system in the body. The authors have tried to explain pragmatically the samatha and vipasyana aspects of meditation in their venture to develop a theory of meditation taken from Indian and Tibetan elaborative traditions. The three empirical techniques discussed that have modern correlates in neuroscience are ‘Focussed Attention’, ‘Open Presence’ and ‘Non-Referential Compassion’.

The second section is titled The Intersection of Neuroscience and Meditation. This chapter explores the main motivation of neuroscience for studying meditation which is the long term changes in brain structures and functions that are seen in long time practitioners of meditation. There is a general overall review of the neuroscience of mind-body interactions in the beginning.

Subjective experience and its neural mechanisms are reviewed as this has the potential for further research that would have implications in brain and mind science. Personal and first-person experience as means of exploring phenomenology that could be objectively studied through modern technology is explored. This therefore attempts to provide directions to the
study of the neuroscience of consciousness. Most meditation traditions refer to a baseline and the aim is to transform the baseline of the mind.

The third section deals with the ‘Neuroelectric and Neuroimaging Correlates of Meditation’. The main groups who have been studied for neurophysiological correlates of meditation are yogis and yoga students in India, practitioners of Transcendental Meditation (TM) in USA and practitioners of Zen and Tibetan Buddhism in Japan, USA and South Asia. Oscillatory neural synchrony is an electrophysiological phenomenon that can be recorded via the electroencephalogram (EEG) and is key in meditation studies. This mechanism is fundamental that implements coordinated communication between neurons that are spatially distributed.

The main imaging techniques that have been used to study meditation are Positron Emission Tomography (PET) and functional magnetic resonance imaging (fMRI) scans of the head and single photon emission computed tomography (SPECT). The various findings of good studies on different forms of meditation are reviewed that have been published in high quality peer reviewed journals. The authors’ hope of reviewing these findings was to stimulate further research and also encourage the use of the meditation techniques in everyday life.

2.15.3 Medical yoga: Another way of being in the world: Anderzén-Carlsson et al (2014)

Stress-related symptoms and disorders are at an increase in today’s fast paced lifestyle. Most of the patients especially in the Western countries where there is a system of primary health service are seen first in primary care. Yoga is now increasingly integrated into mainstream medical system and often utilized as therapy for specific disorders. The basic yoga aspects that have been incorporated into medicine are the asanas or postures and stretching exercises, pranayama or breathing exercises and dhyana or meditation techniques.
Based on the symptoms, yoga practice has been modified and a softer and gentler version than the one practiced by healthy individuals have been developed. This has been termed medical yoga. Medical yoga is offered in hospitals along with other treatments for specific diseases. The authors studied the medical yoga offered at a primary health care setting specifically for stress-related symptoms. The study methodology adopted was a qualitative one involving a descriptive phenomenological design. They wanted to investigate and explore the meaning of participating in and practicing medical yoga as a complementary therapy by the participants as an experiential phenomenon.

The participants were selected from a bigger group who were in fact part of a bigger randomized controlled trial in which they had participated in a twelve-week yoga program. The investigators collected the data using qualitative methods of direct interview and verbatim recording. This was then subject to qualitative discourse analysis. The analysis was able to develop the general theme of the collective experience of the medical yoga by the participants as ‘another way of being in the world’.

Through the differential discourse analysis this could be further divided into broad sub-themes: (1) Perceiving immediate and embodied sensations (2) Increased perception and awareness of the self (3) Re-evaluation of the self (4) A sense of increased well-being.

The participants were able to express that the yoga was not an endpoint in itself but a beginning of a process leading towards an increasing sense of wholeness. It presented to them as a way forward to alleviate suffering and the medical yoga was a tool to help them to deal more effectively with stress and so bring in change in their current life situation in a practical way.

The medical yoga program produced an increased level of self-awareness and enhanced their self-esteem. It produced a deepened sense of being in their life world enhancing their sense of self-identity. The yoga enabled the participants to look at and use their bodies in new ways which gave them
an opportunity to look at things happening in and around their lives differently providing new meaning and interpretation. This is the beginning of philosophical hermeneutics as well, applied by oneself in one’s own life. The experience allowed the participants to be enriched and in their perceptions of themselves and their lives.

2.15.4 Integrating Yoga Epistemology and Ontology into an Expanded Integral Approach to Research: Braud (2010)

The author discusses how principle and tenets of the yoga philosophy and psychology can be integrated into modern psychology especially into psychology research, to make not only research, but the subject itself more enriched, inclusive, relevant and integrated to address human psycho-spiritual concerns. The author has reviewed this by using the example of a graduate curriculum program in a US academic institute, the Institute of Transpersonal Psychology, Palo Alto, California.

The author points out that most students of psychology approach research and empirical research to mean quantitative methods and experimental approaches of studying. In order to provide a broad perspective of research and make research more meaningful for an understanding of human behaviours and its applications, the curriculum includes not just quantitative but also causal-comparative and correlational aspects and further, the qualitative aspect and methodology of research.

‘Empirical’ is given the broader and original meaning of being based on experience. Modern psychology has now started including several qualitative concepts in research like cooperative inquiry, grounded theory, hermeneutics, heuristic research, multiple case studies, narrative research, participatory action research, and phenomenological research. All of these methods critically emphasise an important aspect of doing research in the first place and that is research as an instrument of knowing. Therefore the primary subject matter in research is the emphasis on the human lived experience.
With this broadening approach of psychology, there is also an expansion of the field into other forms of studying alternative forms of knowing. The authors points out that there is need for greater depth in this pursuit of knowing which can have wide clinical and practical applications and also have an impact on the personal and psycho-spiritual life of the researcher himself or herself leading to self-transformation. It has become necessary to bring together and allow a synthesis of psychology with the wisdom and spiritual traditions for growth and transformation. This would also highlight really important concerns of morality, compassion, care and wisdom.

The author demonstrates how the yogic epistemology and ontology can be incorporated into research paradigms in modern psychology. The essay describes ways and means by which the yoga principles and processes can be usefully introduced into the research praxis and gives instances in which this has already happened. In the example of the Institute of Transpersonal Psychology, the faculty and students at the institute engage in broad and specific aspects of yoga by incorporating it into their lives having a regular practice of the aspect of yoga they are studying. Different traditions of yoga are studied from the perspective of Hinduism, Buddhism, Advaita Vedanta Philosophy, etc. Integral enquiry is used in the research atmosphere at the institute. Here several aspects are incorporated acknowledging radical empiricism and levels of inquiry acknowledging existence of different levels of reality.

In the institute there is incorporation of Indian psychology along with Integral Yoga as defined by Sri Arobindo, great Yogi, philosopher, poet and nationalist leader who founded the Auroville Ashram in Pondicherry, India. The institute has a program where importance is given to preparing the researcher through adequate training in order for the researcher to be adequately equipped to experience and become an instrument of knowing as a lived experience. In this regard yoga practice and process has been used as a part of the training.
The researchers are taught and are expected to develop certain qualities and traits that are determined to be desirable in order to have a psycho-spiritual disposition and integral research preparedness. A set of integral research skills are developed and taught at the institute. These are: working with intention, quieting and slowing, playing, working with attention, auditory skills, visual skills, imagery, visualization, imagination, kinaesthetic skills, proprioceptive skills, direct knowing, intuition, empathic identification, accessing unconscious processes and materials, mindfulness, discernment, compassion, and appreciation of differences.

The curriculum also covers psi research which is the study of paranormal phenomena and processes and application of yogic practices and principles to this research. The eight limbs of Patanjali’s ashtanga yoga as described in the Patanjali Yoga Sutras are aligned to specific categories of psi research like relaxation, hypnosis and physiology research with asana, pranayama, dream telepathy and Ganzfield research with pratyahara, concentration/visualization in receptive psi, concentration/visualization in active psi, meditation and absorption research with dharana, dhyana and samadhi.

The author proposes that for the further development and future research potential, the ashtanga yoga of Patanjali be more fully integrated and incorporated into the research field to make it a living and lived experience for the researchers and for them to gain new insights and knowledge. Other areas suggested are analytic meditation, projective differential, similar to the semantic differential in traditional research, development of the four layers of the inner instrument or antahkarana more fully which are: chitta or basic mental consciousness and memory, manas or sense-mind, buddhi or intelligence and vijnana or super-mind.

The further development of Insight Dialogue as a way of accessing inner knowing and also communicating that knowing with another is recommended. Several other aspects as derived from yogic traditions are discussed as useful tools of the research enterprise for the future. The
overarching principle as emphasised in the Indian yogic tradition is personal psycho-spiritual development, growth and transformation of the practitioner in ways to contribute positively to the world.

**2.15.5 Methodology, Meditation, and Mindfulness: Toward a Mindfulness Hermeneutic: Sikh and Spence (2016)**

Mindfulness is being increasingly used in clinical medical practice for treatment of a wide range of physical and psychological conditions. The concept of mindfulness is of a non-dualistic nature having been derived from Eastern yoga and philosophical traditions. Whereas most of clinical psychology and psychiatry derive from Western methodologies and methods of philosophy which are dualistic. This becomes important when developing research methodologies and methods while studying and researching mindfulness.

The authors argue and propose an integration of the Western philosophical hermeneutics with aspects of Eastern philosophy in order to provide a holistic and non-dual model of mindfulness hermeneutics. To bridge this gap of differing world views between West and the East, the authors have tried to bring together the non-dualistically aligned philosophical hermeneutics of Heidegger and Gadamer and selected Eastern philosophical traditions. The authors from their own experience and knowledge have selected the approaches of Eastern philosophy from the perspectives of Buddhist tradition and propositions of Osho and Jiddu Krishnamurti that are widely known in the West.

The authors used a combined method of textual interpretation of complex concepts with regular practice of meditation to have a lived experience and therefore enabling an understanding and interpretation of the subject matter. To have a deeper understanding of mindfulness as a lived method and experience, the authors have concluded the following to develop a basic understanding: (1) fusion of horizons (2) being in a hermeneutic circle (3) understanding as being intrinsic to awareness (4) the ongoing practice of
meditation. These aspects, the authors propose, would thus provide a heuristic guide for an ontologically hermeneutic methodology for studying mindfulness which they term as mindfulness hermeneutics.

2.16 Neuroscience, Medicine and Spirituality

Yoga is always associated with spirituality. Hence any review of yoga is incomplete without a reference to spirituality. The purpose of the practice of yoga itself in its traditional sense is seen as a spiritual practice for higher goals of self-realization and transcendence of material existence. Science has tried to address spirituality from very early times in its evolution. As science has evolved from philosophy it is not unusual that this association exists. Early scientists have been philosophers foremost. Even Albert Einstein is quoted as saying that he was a spiritual person. Scientists from several disciplines have tried to address spirituality from the point of view of their own discipline or subject expertise. The close association of consciousness to spirituality and also to the brain makes the topic of spirituality very relevant to neuroscience. Consciousness is also central to the Yoga Sutras of Patanjali. As neuroscience and its application in human activities is closely associated with health and medical science, spirituality is also significant to medicine and more so to psychological medicine or psychiatry. This section reviews the recent thinking and research of spirituality and consciousness studies as applied to neuroscience and medicine. It is seen that several concepts that are currently examined and explored in relation to spirituality with the lens of neuroscience and medicine, are dealt with in the Yoga Sutras of Patanjali.


This is a book that is an outcome of a conference held on that subject matter in Freiberg, Germany by scientists and experts from several varied disciplines. The vision of the conference was to build bridges between the various disciplines and getting scholars together for dialogue on the theme of the conference which was ‘Neuroscience, Consciousness and Spirituality’. It is a multi-author monograph comprising of the proceedings of
the scientific sessions in the conference along with the formulation of a consensus on the subject matter.

Science is defined as a systematic enquiry in order to describe and understand the world and to prevent, as much as possible, any errors, by humanity as a communal effort. Consciousness is described as complementary to the brain, which is considered as its material substrate and has its own capacity to access reality. Comparing phenomenon to quantum physics, it is proposed that consciousness and brain, apparently incompatible, are two aspects of one transcendental reality. Accessing this reality can therefore take two routes. One is the external, objective and material and the other is the internal, subjective and spiritual. Spirituality is defined as something beyond the immediate goals of an individual and is a connectedness to a reality that is beyond, which is realised experientially. The common goal of science and spirituality is the human endeavour to make sense of the world.

Mindfulness has emerged as an important and well researched process in the interdisciplinary field of neuroscience and consciousness studies and is part of the field of contemplative science. In the Buddhist tradition from which mindfulness has reached the West, the purpose of the practice is more spiritual and is for developing compassion, self-transformation and liberation. Whereas, in the West the purpose is more immediate in the form of stress management, better coping and self-regulation. Mindfulness has become a transcultural phenomenon between the East and the West, with mutual exchange of ideas, assimilation and transformation of spiritual approaches.

In mindfulness research there is an examination of certain practices like focused attention or dharana as a ritual and as a necessary process in the evolution of human beings. Religious, spiritual or mystical experiences have been studied and shown to have neurological basis with observable changes in higher brain regions.
Consciousness can be seen as being non-dual in nature. Therefore it cannot be considered as an emergent function of the brain and hence may not be localizable in the brain. Quantum mechanics may be a more appropriate model to describe consciousness.

Ideas from physics of generalized entanglement and complimentarity have been applied to consciousness. In line with the general intuition of natural science consciousness can be considered as monist or non-dual ontologically. Phenomenologically is can be considered dualistic in resonance with one’s own subjective experiences. Whether consciousness is following quantum dynamics or Newtonian laws depends on which viewpoint or perspective one is taking and the purpose. Hence both are operable. Generalized quantum theory can therefore be used to facilitate understanding both in terms of neuroscience and consciousness studies.

The quantum phenomenon of wave and particle behaviour of light can be extended to understand the consciousness and neurobiology of the mind-brain relationship and the paradox of subjective experience and neurobiological function. But it may be necessary to develop a science of inner epistemology to have a better understanding.

Meditative practices derived from spiritual traditions can shape the brain. These are well demonstrated with several experimental studies using electrophysiological and functional neuroimaging techniques. One thing that has emerged from the studies is the commonality among the various meditation styles derived from different traditions in the neuronal, physiological and phenomenological aspects. Future research may be possible in being able to have a taxonomy of the various meditative states achieved by practitioners.

There is an argument that consciousness forms the fundamental basis of reality. Beings with their individual nervous systems can be considered as nested hierarchy of distinct conscious observers. There is reference to the phenomenon of panpsychism which asserts that all things in the universe
experience some consciousness to a greater or lesser extent. The study of consciousness is possible through subjective experience which is an inside out introspection. This raises the question of existence of free will whereas neuroscience seems to look at this differently, attributing brain and biological changes to behaviours entirely.

Mindfulness meditation is derived from the Eastern Buddhist practice of vipassana which is a spiritual practice. Mindfulness meditation practised as per the methodology of vipassana has been subjected to scientific scrutiny and has demonstrated to produce neurobiological changes beneficial to health and wellness. In psychological terms, the practice of mindfulness meditation deconditions the mind and breaks old useless habits of the mind of feeling, thinking and reacting and changes them or re-conditions the system to produce more proactive responses. It also changes one’s perspective on and perception of oneself and one’s agency.

Consciousness studies have included the subjective accounts of people who have had near death experiences. These the authors claim give cogent argument that consciousness need not always coincide with brain function. Therefore consciousness cannot be localized but should be considered as a fundamental property of the universe. The near death experience is through the report of people who have survived a cardiac arrest and who have described as being in clear consciousness and have described in detail events that have transpired during the episode. But consciousness and also brain function is still a great mystery.

Neuroscience and spirituality has become an important interdisciplinary science. It is suggested that it is time to have a separate field of ‘neurospirituality’. Neurospirituality would incorporate the modern scientific techniques and tools especially neuroimaging to study the neurological correlates of characteristics that the spiritual traditions attribute to the divine.

What emerged in the deliberations of the conference and review is a Consciousness Field Model. Consciousness can be regarded as a
fundamental element of reality. Brain may act more as an intermediary or as a transducer of consciousness and it is not within the brain itself, or it is not a product of mere brain function. Unless associated with the brain consciousness is not experienced although it may be independent of the brain. What may distinguish humans from other beings is the ability to be aware of or sense or be conscious of or have a mystical experience of something greater.

The subject itself is a difficult one and the approach taken in this dialogue are novel and generate further questions. The nature of consciousness has been a pursuit of philosophers and sages from very ancient times. In fact the Indian rishis directed their *sadhana* and *tapas* or their devoted and intense life work to study and understand this ultimate reality and also accepted this as their main goal of life. The Vedas, all the *darshana shastras* and the Upanishads deal extensively with the matter of consciousness and methods to realize the ultimate reality.

2.16.2 Spirituality and Brain Mechanism: Bhutkar (2016)

The article attempts to provide a coherent theory of spirituality based on the meaning mechanism inside the brain. For this it uses the quantum physics conceptualizations. Consciousness is experienced as a mind field. It can be conceptualized as a quantum field which itself is a virtual reality. The conscious mind continuously acts as a decohesion agent. Apparent reality manifests as a result of the superposed collapse of the wave function caused by this conscious mind. The universe has both the apparent and virtual realities as aspects of its characteristics and sways between the two. Based on the quantum effects the mind-brain functionality creates and integrates these two aspects of realities through the meaning-mechanism. This meaning mechanism is conceptualized as the seat of consciousness possessing the intelligent knowledge systems which thus supports the relativistic nature of the universe.
Measurement is an important aspect of data. It helps in objective understanding by considering the probabilities and refining the choices. Within the framework of the quantum theory measurement helps bringing the meaning into the classical world through decohesion of the wave function by causing the collapse of several Eigen-states into a single Eigen-state. In order to complete the process of quantum measurement it is necessary for consciousness to be the agent causing the collapse as per the Von Neumann-Wigner interpretation. The measurement itself is an act of the conscious observer. Therefore measurement is the perception of the observer through the meaning mechanism occurring within the mind-brain functionality.

Consciousness is a function of the quantum mind field and can be conceptualized to emerge through a spin ensembles and paramagnetic oxygen mediated mechanism occurring in the nuclear membrane of the nerve cells. Orchestrated-Objective Reduction is the process that the conscious state of mind undergoes which is a quantum phenomenon as described by Penrose and Hammeroff. The quantum field theory of human psyche proposes that there is a super-field of conscious mind within which the Boson field represents the universal field of consciousness and the Fermion fields represent the individualized states of mind. The wave function collapse is facilitated by the meaning mechanism within the brain and the super-field of consciousness that acts as the decohesion agent.

The knowledge systems in the mind-brain functionality is continuously built through the apparatus of the body with its sensory system including the special sensory organs that act as the measurement agent. The objects and subjects through the sensory mechanism and the complex process of brain mechanism, produces corresponding perturbations in the quantum field of consciousness. The quantum consciousness observes the perturbations and recognizes patterns in the physical domain relative to the self or ‘I’ consciousness and quantum mechanically undergoes transformations and responses are generated in the physical world seen as behaviours.
The meaning mechanism is a mechanism of satisfaction or understanding or realization. It is a continuous process of measurement followed by perturbations and responses in the quantum mind field that causes intermediate collapse of the wave function as a result of the building of a decohesion state. The objects in the physical universe are in the form of quanta of energy in the consciousness mind field that get perturbed when measurement happens. At the time of this measurement, the quantum state gets divided or broken down into superpositions of the Eigen-states of the particular characteristics and qualities of the physical world that would produce the particular perturbations in the quantum mind field. When the peculiarly arranged quantons are transmitted through the quantum field of mind they possess the probabilities to manifest and go through the meaning mechanism of the mind-brain functionality. Simultaneous perturbations occur in the quantum field of mind.

The self or the 'I' acts a witness of the whole process. During the process of mind-mechanism the apparent reality is converted into the virtual reality. The self has the choice to witness the perturbations as such or along with retrieved superpositions of past events from the memory units of the mind-brain functionality. There are matrix elements of Schrodinger picture operators which contain all relevant aspects of the physical elements. As a result of the decohesion state of the wave collapse, a response is generated which appears as behaviour in the physical world whose magnitude is dependent on or indicated by the quantum of energy that is utilized to create the response.

Matter in the physical world have their own quantum fields within which they operate and by which their unique characteristics can be said to be possessed by them. Similar perturbations and responses happen in their own fields giving them their properties. The elements in the universe exist because of a continuous cycle termed the Measurement-Perturbation-Response-Measurement (MPRM) cycle. Such MPRM cycles have the potential to be causative or be the cause of phenomenon in the cycle of
causality. The cyclical MPRM processes give meaning to the apparent reality of the phenomenological world in the quantum field of the mind.

Thus the conscious mind can be conceptualized as a virtual machine of the quantum phenomena. The quantum mind field is very complex, sensitive, very vibrant and unstable. Thought-chains are created in the mind by the waves of potential probabilities. Responses can form by the collapse produced as a result of the decohesion of thought-chains.

Internal observation or contemplation can be described as a process of the Measurement-Perturbation-Response-Measurement (MPRM) Cycle creating a cyclical process in the mind field. This cycle can be conceptualized as the *chitta vritti* or the cyclical conditioning of consciousness that is so prominently described in the Yoga Sutras of Patanjali. The cyclical process can reach to a point of collapse or decohesion of understanding or realization. This can be termed as the Quantum Mechanical Reduction Process. This can be seen as a state of witnessing by the self of the understanding or realization or satisfaction. This can be understood in the Yoga Sutra as Yoga leading to samadhi. This can be understood as the Intermediate Quantum Collapse Effect.

The MPRM cycle in the mind field of consciousness as a result of decohesion through the mind-brain functionality in the virtual reality of intelligence based knowledge system. This has representation in the physical world identified as apparent reality of intelligence based knowledge system. As a result of the consciousness present in the mind field the meaning mechanism establishes the intelligent knowledge system as a product of the two realities. This would represent the Theory of Spirituality.

This theory of spirituality forms the foundation and illustrates the relativistic nature of the universe and supports the experience of the existence of this universe. The theory of spirituality connects the two realities of apparent and virtual through the meaning mechanism and intermediate quantum collapse.
The intelligence based knowledge systems are distributed in the virtual and apparent realities in the realm of spirituality that pervades both.

2.16.3 Spirituality and Medicine: Davidson (2008)

Spirituality is becoming an essential aspect of health and increasingly being recognized as part of the public healthcare systems especially in the modern organized medical systems of the Western world. Spirituality has been however a part and parcel of health and wellbeing in the ancient Indian conceptualizations of wellness and medicine which is apparent in the traditions of yoga and Ayurveda. The adaptation and scientific validation of some of the concepts of spirituality by Western science has allowed spirituality to be considered important in overall health and medical care.

Aspects of spirituality that have been studied as having an important bearing on health and quality of life has been in recognizing and acknowledging it in end of life care. It is seen as essential in the compassionate and humane care during this very sensitive time for patients and their families. Spirituality itself is multifactorial with much emphasis on the multicultural factors as it is related to unique experiences and beliefs arising in culturally unique and distinct situations. It is important to understand for physicians especially in primary care the symptoms of spirituality in order to better understand the person suffering from the disease and to offer holistic care.

In order to address this important dimension of healthcare by primary care physicians which is perhaps applicable to all health care professionals, is to develop and embody certain qualities that can facilitate and sensitize the physician or healthcare professional to the spiritual needs of the patients health care. An important notion in this context is the aspect of being present. This notion of paying sensitive attention to the patient’s needs is highlighted by the proximity of the physician to the patient and the intentionality. Embodying spirituality should also be seen as part of good medical care.
This concept of the spiritual dimension in medical care has important implications in training clinicians. The questions that require addressing in this context are how to measure the traits required by clinicians to address spirituality related issues in the patient, how to measure if such qualities are present, how does the presence of such qualities in the clinician affect patients, how do these qualities impact the patient over and above general wellbeing and perceived care, and can these qualities be taught or trained as skills in the health care worker or clinician.

Over the recent years, there has been great advancement in the knowledge of mind and brain interactions and in turn the brain effects on peripheral biological systems. There are advances in their operations in not only disease but also in health and wellbeing. Mind-Body Medicine has emerged as an important part of medicine and health care systems. There are important correlations of mind-brain mechanisms in not only the patients won health but also mind-brain mechanisms in the clinician affecting mind-brain systems in the patient which have important implications on spirituality in medicine.

An interesting study is discussed in this article which measured the pain matrix. This consists of circuits in the brain composed of interconnections and circuitry between anterior cingulate cortex, insula, prefrontal cortex and hypothalamus. The subjects studied were couples. The wife was subjected to functional neuroimaging of the brain while receiving an experimental pain stimulus. The different situations studies were, holding the hand of the husband when receiving the pain stimulus, holding the hand of a stranger during the procedure and being on her own during the event.

The finding was that in the situation where she held the hand of the spouse, the activation of the pain matrix was significantly diminished. Further, the greater and more close the relationship the greater was the attenuation of the response in several of the areas associated with the pain matrix. This demonstrated the effect and importance of social relationship and brain function.
The qualities of presence, compassion and positive intention are highlighted as qualities that could be incorporated into daily practice of the clinicians that can embody spiritual understanding and enhance care for the patients. In order to augment everyday activities with these qualities would require that the clinician engage in certain disciplines. This brings into focus and relevance the recently emerging field of contemplative neuroscience.

Contemplative neuroscience studies the brain functions and structures that emerge as a function of contemplative practices like yoga and meditation. This science is largely hinged to the larger study of neuroplasticity which holds that the brain is a key organ of change in response to experience and training. What has emerged from this research is that practice is key and repeated practice brings about transformation that is pronounced and lasting. When opportunities are made available to clinicians to undergo training in contemplative practice then this may help them to be trained to acquire or enhance in themselves such qualities as sensitive attention, compassion and positive intention.

One aspect of mind-body medicine incorporating contemplative training programs for patients with various disease conditions have shown to have positive effects on the course of the illness and the subjective wellbeing of the patients. The other aspect is the cultivation through practice, by the clinician, and its indirect health and positive effects on the course and response of illness in the patient and his/her wellbeing. It would be important for future research in this area to incorporate rigorous biological measures to determine the relation between patient-clinician interaction, care giver characteristics and outcomes in order for the wide biomedical community to appreciate and accept the spiritual dimension of medical care.

2.16.4 Interface of Spirituality and Medicine: Cloninger (2007)

The definition of spirituality as relevant to medical care and health can be considered as a search for something beyond human existence and a
means of reaching there, developing a sense of connectedness to the world and with the unifying source or force of all life. It is an expression of a profound need in all to have meaning, love and happiness in their lives. Spirituality can help manage stress and improve quality of life. Spirituality can reduce the vulnerability to diseases and allow to bring hope and reduce suffering. These health aspects of spirituality have been studied and shown to be a valuable dimension of health.

Physicians very often encounter patients who in their narrative describe a complex of physical, emotional and existential difficulties. Much of it is related to stress and how it is managed. The leading cause of death and disability in the world today can be attributed to lifestyle diseases maintained and promoted by chronic stress. Existential crisis can sometimes lead to suicide. Many times physicians are unable to recognise the crucial role of spirituality in its ability to help patients develop better coping of stress, be able to develop a sense of unity, have purpose and satisfaction with life.

Improved wellbeing is possible by developing a spiritual attitude to life and considering a unity of being and purpose. Developing a calm and realistic awareness of satisfaction with one’s life can be seen as the necessary criteria for wellbeing. Adaptability and flexibility are important qualities to incorporate in one’s life in a calm and serene attitude along with acceptance and without complaining or any regrets. Every human being is endowed with a natural tendency towards spirituality as an evolutionary requirement for wellbeing to face aspects of life, death, disease, disappointments, work satisfaction, rejections, frustrations and mysteries of life. For lasting happiness, health, meaningful life, satisfaction and resilience to adversities to be achieved, this is ultimately possible only with spirituality.

The process of evolution motivates beings to adapt to survive. The neurological basis for this process are distributed in three mind-brain systems. The limbic system is the emotional response system in the brain. It is involved in procedural learning of habits and skills. Individual differences in emotional responses like fear, anger, disgust and ambition are led by the
procedural learning system. Individual differences exist in the style of emotional expressions and can be considered as traits. These can be measured using the Temperament and Character Inventory (TCI). There are four broad TCI temperament measures: harm avoidance, novelty-seeking, reward-dependent and persistent. Temperament helps regulate emotional demands of drives and mediate between conflicting and competing traits. Character traits represent virtues of hope, love and faith which can be considered spiritual in nature.

The second main evolutionary system is the rational brain represented by the prefrontal cortex responsible for propositional or declarative learning systems or reasoning which impact life goals and social relationships. The third system of learning and memory that has evolved to a high degree only in the human beings is the capacity for self-awareness. Self-awareness allows human beings to introspect, take a perspective view and the capacity for art, science and spirituality.

The limbic cortical communication in the brain system through connecting matrix of circuits like the Papez circuit connect the anterior cingulate cortex with the hypothalamus, thalamus and hippocampus. Self-acceptance progressing to a calm state of self-awareness requires the integration and engagement of the cortical with the subcortical circuitry in order to facilitate balance and homeostasis and hence wellness. Self-awareness is a key to health in a curative and preventive sense.

In the path to wellbeing there are three stages to self-awareness. The preceding stage zero is the stage of unawareness psychologically characterised by a child-like ego state which is immature and seeking immediate gratification. Stage one is the average adult cognition characterised by an adult ego state which is purposeful but egocentric with an ability to delay gratification albeit with frequent negative emotions. Stage two is the stage of meta-cognition characterised by parental ego state which is mature and allocentric, mindful, calm and patient, being able to supervise conflicts and relationships. Stage three is the stage of contemplation when
there is effortless calm state, impartial awareness, wise, creative, loving, able to access what is needed without effort and distress which is a high state of wellbeing.

The character traits as measurable with the TCI, which can be considered spiritual, and which can be achieved by cultivating the capacity of self-awareness, transitioning and evolving through the stages, reaching high level of wellbeing are: self-directedness, cooperativeness and self-transcendent. Self-transcendence is a unique spiritual trait of human beings.

Growth in wellbeing is possible through practice of techniques. The author has developed sets of exercises to help individuals grow in wellbeing which has been shown to reduce vulnerability to depressive relapses and recurrences. This procedure is called the Silence of the Mind Meditation with guided instructions to facilitate people through the stages of self-awareness to achieve wellbeing.

Growing in awareness helps a person to transcend his or her distress, dissatisfaction and life problems, and rediscover a sense of unity.

2.16.5 Spirituality and Psychiatry: Vaillant (2008)

Psychiatry as a field of medicine and health care tends to focus more on the negative emotions and mental states and hardly on the positive states. The author uses neuroscience and ethological concepts to highlight positive emotions and encourages future directions in therapeutics of psychiatry to adopt focusing on positive emotions in helping patients. These positive emotions are not self-centred or selfish and promote a sense of belonging to a bigger humanity and therefore can be considered as equivalent to spirituality. These positive emotional characteristics are: (1) Hope (2) Compassion (3) Gratitude (4) Forgiveness (5) Joy (6) Trust/Faith (7) Love/Attachment (8) Awe.

Recently there is an increase in peoples interest and need for spirituality. With increasing emphasis on science and education there is a moving away
from religious dogmas and membership of organized religions towards secular ideas but then this has brought with it the other extreme of going towards pseudo-secularism and new age cults. Nevertheless there is a general interest and thirst for spirituality to find more meaning in life.

In this quest for spirituality, there is a need for scientific validation of the concept to bring meaning and give direction. The author has taken the approach of exploring this through study of positive emotions through the disciplines of cultural anthropology, ethology and neuroscience.

Positive emotions are pro-social and encourage pro-social behaviours. They are present in all species of the animal kingdom. Concept of spirituality is virtually indistinguishable from positive emotions and hence has its origins in biological evolution. Spirituality is a common factor in almost all religions as there is a collective striving for belonging and social bonding.

Religion itself can have different aspects. The cognitive ideological aspects can lead to strife and divisions and can be restricting. Whereas the deeper spiritual aspects are nourishing and allow cultivation of positive emotions. They are inclusive and allow acceptance and growth. There is a tendency for some to look at spirituality with suspicion as they may associate it with blind belief, occult, bogus faith healing, supernatural phenomena, cults and new age fads promoting covert narcissism.

From a scientific point of view spirituality can be considered foremost as related to positive emotions. These positive emotions are love, joy, hope, gratitude, forgiveness, compassion, trust and awe. None of them are selfish and are what Charles Darwin considered as social emotions. Negative emotions serve an individual's survival. They also ingrained and innate. There is a tendency for psychiatry to focus on negative emotions as these are what bring the patients to the medical facilities. Negative emotions makes the mind narrow.
Positive emotions are vast and expansive and facilitate to broaden and build. This is a theoretical construct as well of positive psychology. Positive emotions make thought patterns more flexible, creative, integrative and efficient. The author laments that it is unfortunate that psychiatry textbooks and academia pay very little or no attention to positive emotions whereas the literature from religious and philosophical works of all denominations are full of positive emotional references.

The author points out how positive emotions like compassion and gratitude have shaped society through philosophies of the Bhagavad Gita, Buddhism, the New Testament, etc. He makes an appeal to modern psychiatry to also pay attention to positive emotions which can have profound applications in therapeutics. The author shows that throughout history negative emotions and selfish behaviours of humans have only brought conflict, destruction and misery. Due to this the outcome for people and society is only made of losses. Whereas spirituality made of positive emotions have survived for thousands of years in the rich literatures and traditions of ancient cultures.

There are important ways in which religion and spirituality differ from each other. In religion there is usually a group that is institutional and based on doctrines and comprised of interpersonal aspects like membership with values and traditions. Spirituality is an individual’s sense of connection to something greater and transcendental associated with positive qualities of goodness, compassion, forgiveness, gratitude, awe and bliss. Both religion and spirituality are products of the mind-brain field. Spirituality may have a more natural origin whereas religion is bound by culture. Spirituality is inclusive whereas religion tends to draw circles and is confining. Cultures, nationalities, denominations and ethnic groups may differ in religion but are similar and shared in their spiritual values.

The human brain can be conceptualized as having three evolutionary parts. In the centre is the reptilian brain which is primitive, selfish, survival motivated and has not evolved in hundred million years. Surrounding this is the limbic brain or the emotional brain that is more evolved and mammalian
in character. This limbic system is comprised of a network of neural circuitry connecting the anterior cingulate cortex, hypothalamus, amygdala, hippocampus, thalamus, insula and the ventromedial prefrontal cortex. This is the seat of emotions and has evolved and refined over hundred million years. The limbic system plays the greatest role in positive emotions and in human beings underlies spirituality. Covering the limbic system is the third part which is the neocortex and highly evolved in the humans. This is a predominantly cognitive brain associated with thought, including decisions, analysis, judgement, ideology, culture and includes religious dogmas.

Experiments have demonstrated that the effects of meditation and positive emotions derived from the limbic system have similar effects on the autonomic nervous system providing the practitioners the sense of sacredness and spiritual experiences. In the prefrontal cortex there are differences between the left and the right with the right being associated with negative emotional disposition and the left being associated with positive emotional disposition. An integration and nurture and balance of limbic and prefrontal cortical regions underlie promotion of positive psychological disposition and spirituality.

Science has been late in accepting and studying positive emotions. With the advent of modern imaging and electrophysiological instrumentation especially the functional magnetic resonance imaging (fMRI) the study of positive emotions has taken on a momentum in recent times.

Psychiatry is in need of accepting and promoting positive emotions. Positive emotions are there hardwired into the limbic-prefrontal complex in the brain and has to be nurtured. They are the source of spiritual being and cultural progression. It is important that scientists and clinicians pay attention to this important aspect of humans even if it is merely in connection to health, wellbeing and quality of life. It can be a harbinger of greater connectivity progressing towards peace.